

CIHM Microfiche Series (Monographs)

23

10

ICMH Collection de microfiches (monographies)



Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques



| | | | | | | | | | | | т |
|----------|--|-------------------|-----------------------|------------|---------------|------------------------|--------------------------------|---------------|--------------|-----------|-------------------|
| | | Technic | al and Bibliog | raphic Not | es / Notes te | chniques | et bibliograp | hiques | | | to |
| copy | Institute has attemp y available for filmin be bibliographically | g. Features of | this copy wh | ich | lui | a été pos | microfilmé l ssible de se p | rocurer. L | es détails d | le cet | |
| | he images in the repr | | | Y | ex | emplaire | qui sont peut ique, qui peu | t-être uniqu | ues du poi | nt de vue | Tł |
| signi | ificantly change the | usual method | of filming, are | | rep | roduite, | ou qui peuve | ent exiger i | ane modifi | age | pc |
| chec | ked below. | | | | da | ns la méti dessous. | hode normale | e de filmag | e sont indi | qués | of fil |
| <u> </u> | Coloured covers/ | | | | | Colou | red pages/ | | | | |
| L | Couverture de cou | leur | | | L | Pages | de cortrar | | | | Orbe |
| | Covers damaged/ | | | | | - | | | | | th |
| | Couverture endom | magée | | | | | damaged/ endommagée | | | | sic |
| | | | | | | | indenninger. | 3 | | | ot fir |
| | Covers restored and | | | | | | restored and/ | | | | sic |
| | Couverture restaur | e et/ou pellic | ulée | | L | Pages | estaurées et/ | ou pellicul | ées | | or |
| | Cover title missing/ | , | | | · · · · | T Pager | liscoloured, s | tained on A | | | |
| | Le titre de couverte | ure manque | | | V | Pages o | lécolorées, ta | chetées ou | piquées | | |
| | Coloured maps/ | | | | <u> </u> | T 0 | | | | | Th |
| | Cartes géographiqu | es en couleur | | | | | letached/ létachées | | | | Th |
| | | | | | | a ruges e | ic toonees | | | | TI |
| | Coloured ink (i.e. a | | | | | | nrough/ | | | | wh |
| | Encre de couleur (i | .e. autre que b | leue ou noire) | | V | Transp | arence | | | | Ma |
| | Coloured plates and | l/or illustration | ns/ | | r |) Quality | of print vari | | | | dif |
| | Planches et/ou illus | trations en cou | leur | | L | | inégale de l'i | | | | ent |
| | B | | | | | | | | | | beg rigi |
| | Bound with other n Relié avec d'autres | | | | | 1 | uous paginati | | | | req |
| | | uocuments | | | L | l Paginat | ion continue | | | | me |
| | Tight binding may o | | or distortion | | - | Include | s index(es)/ | | | | |
| | along interior margi La reliure serrée peu | | and the second second | | L | Compre | end un (des) i | index | | | |
| | distorsion le long de | | | | | Title or | | | | | |
| | | | | | | | de l'en-tête p | | | | |
| | Blank leaves added | during restorat | ion may appea | ər | | | | providint. | | | |
| | within the text. Wh been omitted from t | | e, these have | | | | ge of issue/ | | | | |
| | Il se peut que certai | | ches ajoutées | | L | Page de | titre de la liv | raison | | | |
| | lors d'une restaurati | on apparaissen | t dans le texte | | | Caption | of issue/ | | | | |
| | mais, lorsque cela ét pas été filmées. | ait possible, ce | s pages n'ont | | | Titre de | départ de la | livraison | | | |
| | pas ete timees. | | | | | | | | | | |
| | | | | | | Masthea Génério | a/ ue (périodiqu | ues) de la li | Vraiton | | |
| | | | | | | | | | vi alson | | |
| | Additional comment Commentaires suppl | - | | | | | | | | | |
| | | | | | | | | | | | |
| This it | em is filmed at the r | eduction ratio | checked below | w/ | | | | | | | |
| | cument est filmé au t | | | dessous. | | | | | | | |
| 10× | 14: | × | 18X | | 22 X | | 26 X | | 30 X | | Requestion do not |
| | | | | | | | T | | T | | |
| | 12X | 16X | | 204 | | | | | | | 1 |
| | | | | 20 X | | 24 X | | 28 X | | 32 X | |

The copy filmed here has been reproduced thanks to the generosity of:

National Library of Canada

The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche shall contain the symbol \longrightarrow (meaning "CON-TINUED"), or the symbol ∇ (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagrams illustrate the method:

| 1 | 2 | 3 |
|---|---|---|
|---|---|---|

L'exemplaire filmé fut reproduit grâce à la générosité de:

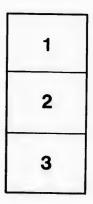
Bibliothèque nationale du Canada

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole \longrightarrow signifie "A SUIVRE", le symbole ∇ signifie "FIN".

Les cartes, planches, tableaux, stc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.



| 1 | 2 | 3 |
|---|---|---|
| 4 | 5 | 6 |

ju'il cet de vue je tion iés

32 X



THIRD EDITION - REVISED AND ENLARGED

CANADIAN Commercial Arithmetic

COMPRISING

OVER 3,000 PROBLEMS AND EXAMPLES

WITH

CLEAR AND CONCISE RULES, EXPLANATIONS AND SOLUTIONS NUMBERING OVER 300; NEARLY 50 PRINCIPAL TITLES AND OVER 700 DISTINCT DEFINITIONS, WITH MORE THAN 30 VALUABLE TABLES AND 30 ILLUSTRATIONS.

ALSO NEW CHAPTER ON

THE METRIC SYSTEM OF MEASUREMENT Now legal in Canada, from MS. examined by

SIR HENRI JOLY, MINISTER OF INLAND REVENUE FOR CANADA

AND A CHAPTER ON

THE INSTITUTE OF CHARTERED ACCOUNTANTS

REVISED BY HARRY VIGEON, ESQ., F.C.A., SEC'Y TO THE INSTITUTE.

WITH THEIR

EXAMINATION QUESTIONS IN MERCANTILE ARITHMETIC

MAKING THE MOST COMPLETE

TEXT BOOK AND READY-REFERENCE MANUAL FOR THE COMMER-CIAL STUDENT, MERCHANT, ACCOUNTANT, LUMBERMAN, CONTRACTOR, ARTISAN AND FARMER.

COMPILED AND EDITED BY

CLARKE MOSES, PUBLIC SCH. INSP., HALDIMAND CO. R. C. CHESWRIGHT, MATH. MASTER, SEAFORTH H. S.

TORONTO COMMERCIAL PUBLISHING COMPANY 88 CHURCH STREET 1897 QA103 M6 1897

> ** The answers to the Problems in this Book are printed separately in pamphlet form, and supplied in liberal proportion without extra charge, for the use of Teachers in Business Colleges, Schools and Institutions.

> Entered according to Act of the Parliament of Canada in the year one thousand eight hundred and ninety-seven, by C. A. BENGOUGH, in the office of the Minister of Agriculture.

ł

- PRINTING AND BINDING BY DAVIS & HENDERSON, PRINTERS AND BINDERS 84 BAY STREET TORONTO ELECTROTYPING AND STEREOTYPING BY NATIONAL ELECTROTYPE AND STEREOTYPE CO J2 ADELAIDE ST. WEST TORONTO Min

PUBLISHER'S PREFACE.

THIS Arithmetic has been so well received by Business Colleges, Schools, Accountants, and the General Public, and has been found so thoroughly practical and helpful, that a third edition has been called for. Advantage has been taken of this fact to add several new features, among them a full and complete Index, for the careful compilation of which we are indebted to MR. ELVEN J. BENGOUGH. By means of this Index, which has been arranged Topically as well as Alphabetically, the complete contents of the work can be rapidly reviewed. A glance over this Index will illustrate, more forcibly than any words of ours, the comprehensive character of the CANADIAN COMMERCIAL ARITHMETIC.

THE METRIC SYSTEM having been legallzed in Canada, a chapter has been added dealing with this important subject. This chapter is the most complete and practical to be found in any work. It has been compiled with special reference to commercial usage. and avoids Physics on the one hand and Higher Mathematics on the other. The MS. was submitted for revision to SIR HENRI JoLy, Minister of Inland Revenue for Canada, who is the highest authority on the subject in the Dominion, having made a special study of the Metric System, and having gone to the trouble and expense of getting diagrams, etc., from France recently. Sir Henri has examined our MS, with care,



SIR HENRI JOLY MINISTER OF INLAND REVENUE, CANADA

and offered valuable suggestions, and he considers that "the chapter will be very "useful in teaching the Metrical System, and that the comparison between that "system, which appears so logical, with the present systems of measurement, will "certainly be a most useful and intellectual exercise for students."

The new chapter on the INSTITUTE OF CHARTENED ACCOUNTANTS will be of value to all students who aspire to become expert Accountants and members of the Institute; while the EXAMINATION QUESTIONS IN MERCANTILE ARITHMETIC, now for the first time inade generally public, will give a correct idea as to the scope of the Institute, and will furnish valuable inaterial for exercise by students. This chapter has been revised by the Secretary of the Institute, HARRY VIGEON, ESQ., F.C.A., who, with the President, GEORGIE EDWARDS, ESQ., F.C.A., and the Treasurer, W. B. TINDALL, ESQ., F.C.A., have shown practical interest in the CANADIAN COMMERCIAL ARITHMETIC by valuable suggestions.

A thoroughly practical and scientific arithmetical education can be obtained from this Work, which embraces a treatment of all the subjects necessary therefor.

Attention is directed to the following features :--

1. To the clearness and conciseness of the definitions, solutions, and rules. the latter of which are logically deduced from preceding solutions. 2. To the many short methods in addition, multiplication, division, etc.

3. To the numerous solutions, and the large number of exercises, the practical character of which will doubtless commend them to all teachers. In this important particular the authors believe a long-felt want has been supplied.

4. To the thorough treatment of Percentage, and its applications in Interest, Discount, Partial Payments, Equation of Accounts, etc.

5. To the clear statement of the Commercial Law relating to Interest, Discount, etc.

Believing that this volume in its improved form will find an ever-increasing number of favorites, it is confidently sent forth.

Toronto, November, 1897.

INDEX TO TABLES.

| the second se | Page |
|---|---------------------------------------|
| Page | Insurance – (Endowment) Rates 346 |
| Accurate Interest, to Reckon 156 | " -Expectation of Life 344 |
| Annuities at Compound Int. for | " -(Straight or Whole |
| | Life)-Rates 345 |
| 40 years | Linear Measure |
| Measure 53 | Liquid " |
| Avoirdupois Weight 55-54 | Longitudes, Table of |
| Books, Sizes of 61 | Metric System, various Tables 415-423 |
| Calendar Months, Recking Leap | Monoy Common Motols and |
| | Money, Currency, Metals and |
| | Precious Stones |
| Circular Measure | Packers' Measure 61 |
| Compound Interest, figured for 40 | Paper " 61 |
| years | Percentage |
| Cubie Measure 57-58 | Saw-logs, Measurement of 396-397 |
| Decimals, Relation to Integers 40 | Square Measure 56-57 |
| Dry Measure 55 | Standard Time |
| Foreign Money, Value In Cana- | Taxes, @ 3 mills 139 |
| dian Currency 283 | Time Measure 58 |
| Grain Measure | Weights, Comparative Table of., 54 |
| | in organe, comparative rabio or 04 |

INDEX TO ILLUSTRATIONS.

| | Page | Rectangle | 365 |
|---------------------------------|------|--------------------------------|-----|
| Circle, showing bases of Meas't | 372 | RectanglePage | 366 |
| Cone | 382 | Rhomboid | 365 |
| " Frustrum of | 382 | Rhombus | 365 |
| Cube | 379 | Right Angle | 365 |
| Cylinder | 379 | Sphere | 383 |
| Decimetre-Metric System | 415 | Square | 365 |
| Heptagon | 364 | Trapezium. | 365 |
| Hexagon | 364 | Trapezium. "divided | 370 |
| Institute of Chartered Account- | | Trapezoid | 365 |
| ants-Seal41 | | Triangle. "Equilateral | 364 |
| Kilo-Metric System | 420 | " Equilateral | 368 |
| Octagon | 364 | " Isosceles | 368 |
| Parallelogram | 365 | " Right-angled | 368 |
| Pentagon | 864 | | |
| Prism, Hexagonal | 879 | base, perpendicular and hypo- | |
| " Pentagonal | 379 | tenuse | 369 |
| " Rectangular | 379 | Triangle, Sealene | 368 |
| " Trlangular | 379 | " showing Altitude in- | 100 |
| Pyramid | 382 | ternal | 368 |
| " Frustrum of | 382 | Triangle, showing Altitude ex- | |
| Quadrilateral. | 301 | ternal | 368 |

iv.

INDEX TO CONTENTS.

ARRANGED ALPHABETICALLY AND TOPICALLY.

Black-faced figures indicate page numbers. Light-faced figures indicate numbers of sections or paragraphs, of which there are 745 in the Book. The titles in SMALL CAPITALS indicate general headings of sections, of which there are 64.

Do manager

| ABBREVIATIONS used in Business | vii. |
|---|-------|
| ACCOUNTS Averaging on Faus | ×11* |
| ABBREVIATIONS used in Business Accounts, Averaging or Equa- tion of | |
| Account (1.1 | 5-233 |
| Account Sales | 3-398 |
| Accounts Current | 9.402 |
| ADDITION, Short Methods in | 4.6 |
| ALIQUOT PARIS | 1-0 |
| ANNITTER | 10-11 |
| Definition | 9-336 |
| ANUTTIES | 3-551 |
| Value at Simple Interest | 2.559 |
| " " Compound " 55 | 1.559 |
| " of Perpetual Annuity | 1-000 |
| Tables of Appuilting at () | 998 |
| anotes of Annuities at Com- | |
| pound 1nt. for 40 years | -333 |
| Assignment (see Bankruptey) 326 | -326 |
| AVERAGING ACCOUNTS | 022 |
| BANK Discourse | |
| BANKRUPICY | -3(8 |
| Ding Martorici | -328 |
| Dins, Measurement of | 666 |
| Brick-work, Measurem't of | 5.711 |
| BROKERAGE AND COMMISSION 114 | 100 |
| Bulis and Bears on Stool, Frain | -140 |
| Bulis and Bears on Stock Exch. 412 BUSINESS ABBREVIATIONS | •440 |
| Competition ABBREVIATIONS | vii. |
| Carpenng, Measurement of 670 | -673 |
| Casks, Gauging of | -669 |
| Casks, Ganging of | 1111 |
| Circle, Measurement of | ¥11. |
| Cisterns. " | .039 |
| Codes for Marking Goods | 665 |
| Codes for Marking Goods | -110 |
| COMMISSION AND BROKERAGE 114 | 120 |
| Commission and Ring Goulds | 149 |
| COMPOIND INT'ST (with Dalies) int | 140 |
| Cupy Door | -1.18 |
| CUBE ROOT | -604 |
| CUSTOM HOUSE BUSINESS | 127 |
| Ad Valorem Duty, to Find | 278 |
| Ad Valorem Duty, to Find | |
| DECIMALE | 277 |
| Defaultione and the second state |)-50 |
| Decina L8 | 5-92 |
| Table showing relation of Deci- | |
| mais to Integers | 80 |
| Reduction of Frac to Desimals of | 201 |
| Addition of Decimals | 94 |
| Subtraction " | 0-96 |
| Sultraction 9 | 7-98 |
| Subtraction "99 Multiplication "99 Division "(contracted)101 | 100 |
| | 109 |
| Division " | 100 |
| Division " (contracted) 107- | 100 |
| Poposting Olyan Lation Pacted) 107- | 108 |
| Repeating, Circulating or Inter- | |
| | 112 |
| minate | -78 |
| Addition. | - 10 |
| Division | 09 |
| Division. Multiplication | 73 |
| multiplication | 72 |
| | 71 |
| | |
| DISCOUNT | 107 |
| Definitions. | 101 |
| Tmp Dissount | 506 |
| | |
| Bank " | 378 |
| DIVISION, Short Methods in 44 | .91 |
| Domestic or Inland Exchange | 100 |
| Bank | 102 |
| Fuderation and Au valorem. 277-2 | 78 |
| -mowment Insurance-Table of | |
| Rates | 585 L |
| | |

.7. 34

| | EQUATION OF ACCOUNTS | ceo. 300 |
|---|---|-------------|
| | Definitions and Principles | 389.980 |
| | Definitions and Principles Solutions by Interest Method. "Product " | 206-217 |
| | " " Product " | 207-218 |
| | Exchange, Stock - "Margins," | , |
| | Exchange, Stock — "Margina," "Collaterals," Hypothec'n, etc. Excutanor, Bills of. Definitions Foreign Exchange. "Creutous Exchange. Inland or Domestic Exchange. Expectation of Life (Table of). FartronHING. | 412-440 |
| | EXCHANGE, Bills of | 268-293 |
| | Demittions | 442-456 |
| | Foreign Exchange. | 463-482 |
| | Inland or Domestic Exchange. | 483-484 |
| | Expectation of Life (Table of) | 404-462 |
| | FACTORING. | 00 00 |
| | Highest Common Factor | 49.45 |
| | Least Common Multiple | 46-48 |
| | Least Common Multiple Fencing, Measurement of (Exer- | 10-10 |
| 1 | cises) | 06-406 |
| ł | Fire Insurance | 293-299 |
| | cises) | |
| 1 | | |
| | FRACTIONS. | |
| 1 | Definitions General Principles | 49-56 |
| ł | Kinds of Fractions | 57 |
| L | Reduction of " | 58-61 62 |
| 1 | Reduction of " " Integers | 63 |
| 1 | | 63 |
| Ł | " " Improper Frac's. " " Fract'n to Higher | 64 |
| L | " " Fract'n to Higher | |
| L | Reduction of Fraction to Low- est Terms. | 65 |
| | Reduction of Fraction to Low- | |
| L | est Terms | 66 |
| | Reduction of Fr. to Decimais. | 93-94 |
| L | Reduction to Common Denom- | |
| Ł | Addition of Fractions | 67 |
| | Subtraction " | 68 |
| | Subtraction " Multiplication " | 69 70 |
| | Division of Frac'ns (by Integer) | 71 |
| L | " (by Fract'n) | 79 |
| | Greatest Common Measure | 73-78 |
| | Least " Multiple | 79-84 |
| | Funds, Sinking | 37-339 |
| | Gain or Loss in Partnership5 | 29-534 |
| | Subtraction " Multiplication " Division of Frac'ns (by Integer) Greatest Common Measure… Least " Multiple… Funds, Sinking | 9-110 |
| | (Integers) Measure | 10.11 |
| | Greatest Common Mannun | 43-45 |
| | (Fractions) | 79 70 |
| | GROUND RENTS | 10-10 |
| | HIGHEST COMMON FACTOR (In. | 0-011 |
| | tegers) | 49-45 |
| | HIGHEST COMMON FACTOR (Fr.) | 73-78 |
| - | niand or Doniestic Exchange45 | 7-462 |
| | INSTITUTE OF CHARTERED AC- COUNTANTS | |
| 1 | INSULANCE | 4-427 |
| | NSUHANCE | 8-136 |
| | Fire | 3-299 |
| | Marine. | 0.911 |
| 1 | Marine | 8.470 |
| | Accurate Interest | 9.950 |
| | " Reckoning | 336 |
| | Definitions | 6-333 |
| | | |

Definitions. Expectation of Life (Table of). Whole Life Insurance (Table 588 584

MULTIPLICATION, Short Methods

in.... Painting and Kalsomining, Meas-6-15

Definitions... Division of Gain or Loss, equal

time.....

Cube

| | PROPERTION LOSS 90-93 |
|---|---|
| | PROPORTION |
| | Simple Proportion |
| | Compound 4 |
| 1 | Distributine # |
| 1 | "Dutell and UG-11-11 |
| | Our and Calls" on Stock Ex.412-440 |
| | Compound 500-500 Distributive 500-500 Plats and "Calls" on Stock EX.412-440 Quantities, Reduction of |
| | RATIO, Definitions of |
| 1 | TREDUCTION OF FRECHOIS. |
| | |
| | Cending and Descending 160 to |
| 1 | |
| I | Saw-logs, Measurement of (with |
| 1 | Table) |
| L | Table) |
| ł | Suction by measurement of 691-693 |
| L | SHORT METHODS in Addition 1-8 |
| L | " Division 16-21 |
| Ł | "Multiplicat'n 6-16 |
| L | |
| 1 | |
| E | SINKING FUNDS |
| | Sphere, Measuroment of |
| | SOHARE ROOT |
| | SQUARE ROOT |
| | |
| | |
| | oned |
| | STOCKS, BONDS, DEBENTURES, &C. 248-267 |
| ş | |
| | |
| | Turchase and Sale |
| | Stock Exchange, Rules to Find |
| | Value of Shares, Dividend, |
| | Income, etc |
| | Stocks |
| | STOCK EXCHANGE |
| | Showt Mothada I. D. 1 |
| | STOCK EXCHANGE |
| | |
| | |
| | |
| | |
| 1 | |
| | |
| 1 | |
| | |
| 1 | Time, Standard, how Reckoned 183-188 TBADE DISCOUNT, with Problems 94-108 |
| 4 | TRADE DISCOUNT nich Buckland |
| | Definitions |
| | Definitions |
| , | Tax Table at 5 mills |
| - | RUE DISCOUNT, now Reckon'd . 357-360 |
| | Wall Paper, Measurement of 674 679 |

| informediaties weight anni Mea., 135-138 |
|--|
| Avoirdupois _ " (with Tab.) 139-142 |
| Comparative Table of Worts 100 |
| Grain Measure(Table) |
| Dry |
| |
| Linear " includ. Survey- |
| orig (Tables) |
| or's (Tables)155-158 |
| Square Measure, inclu. Survey- |
| or's (Tables)159-164 |

| Cubic Measure (Table)16 | 5-168 |
|--------------------------------|-------|
| Time " (Tables). 16 | 0-179 |
| Miscell, Tables-Counting | 180 |
| " Paper | 181 |
| - Books | 182 |
| Whole Life Insurance (Table of | |
| | |

Rates).... 584

vi.

CHARACTERS AND ABBREVIATIONS

USED IN BUSINESS.

1 4 1

a, At.

a/c Account.

Cents. %

Per cent.

1-Number.

One and one-quarter.

12 One and one-half.

13 One and three-quarters.

 $\sqrt{}$ Check mark.

By, as 14 × 18 inches. ×

\$ Dollars.

Pound sterling. £

6/3. English shillings and pence are frequently written in this manner, the shillings on the left of the sloping line, and the pence on the right, the above meaning, 6 shillings and 3 pence. May 18/21. The day of maturity, as

expressed in a note, and the last day of grace are indicated by writing the first on the left and the second on the right of the sloping line.

15 doz. \$157, \$15, \$18. Fifteen doz., 5 of which are \$12 per doz., 5 doz. @ \$15, and 5 doz. at \$18 per doz.

¹ hhd. Sugar. 1100 pounds gross weight, 155 lbs. tare, 100 155 945 lbs., 945 lbs., net weight. 42) The numbers in 4 ps. 36 138 yds. the bracket are the number of yards in 32)

each piece respec-tively.

10 doz. ‡ @ 2/. ²/₈ @ 3/6. 4 doz. No. 5 @ 2 shillings per doz. : 6 doz. No. 8 @ 3s. 6d. per doz. W. W. and similar characters

and letters, are placed on packages to designate a particular lot or shipment.

(Goods are numbered and marked, that they may be distinguished without minute description.)

7×9, or 7 by 9 in. 7 in. wide, 9 in. long.

| | A I First class. |
|---|--|
| | Acct. Account |
| | Adventance Adventance |
| | Agent |
| | Amt. Amount |
| | Ass'dAssorted. |
| | |
| | B.BBill-book. |
| | DB Dalamas |
| | Bbl Barrel. |
| | BdlsBundles. |
| | Bgs Bags. |
| e | BktsBaskets. |
| 8 | BlkBlack. |
| t | Blg D-1 |
| ě | Bot Bales. |
| | BotBales. BotBought. B.L. or B. of I. Bill of Lading. Bills Pay Bills |
| , | Bills Den Bill of Lading. |
| 3 | |
| | Bills RecBills receivable. |
| 1 | BnkBank. |
| | BrotBrought. |
| | Dyue |
| | Dr. Brig |
| 1 | BusBushels. |
| 1 | BxsBoxes. |
| I | |
| I | C Cents. |
| l | |
| L | C.BCash-book. CkCheck. |
| | Ck Check. |
| L | U&D Canital |
| | UQ Course |
| | UULL Collect on Jalan |
| (| Col'dColored. |
| (| Or |

Cr. Creditor. Com. Commission. Cons't Consignment. Cs Cases. Cwt Hundredweight. C/o Care of.

d ····· Pence. DftDraft. DivDividend. DisctDiscount.

CHARACTERS AND ABBREVIATIONS.

Do. or Ditto. . The same. Doz.Dozen. Dr.....Debtor. Ds. Days. Ea Each. E. E..... Errors expected. E. & O. E. .. Errors and omissions excepted. Eng. English. Ent'd Entered. Ex......Without, as ex-dividend. Exch..... Exchange. Exps.Expenses. Emb'd.....Embroidercd. Fig'd Figured. Fir Firkin. F. o. b. Free on board. Fol Folio. F'wd or for'wd.Forward. Fr..... From or French. Fc. Franc. Fr'tFreight. Gal.Gallon. Gro.Gross. Guar Guarantee. Hhd. Hogshead. Hund......Hundred. I. B.Invoice-book. In. or ".....Inches. Ins. Insurance. Insol..... Insolvency. Inst. (Instant). This month. Int.....Interest. Inv. Invoice. Invt'yInventory. I. O. U.....I owe you.

Lbs.Pounds.

M. Thousand. Mdse..... Merchandise. Mo..... Month. Mols..... Molasses. M.'t Empty.

Net......Without deduction.

 O. I. B.....Outward invoice-book

 Oz
 Ounces.

 Payn't....Payment.

 P'd.
 Paid.

 Pkgs.....Packages.

 Pr. or Per...By.

 Per cent...By the hundred.

 Pp.....Pages.

 Pr....Pair.

 Parem....Premium.

 Prox. (Proximo) The next month

 Ps......Pints.

25 4

No. Number.

N. P. Notary public.

Qr. Quarter. Qts. Quarts. Qtls. Quintals.

s.....Shilling. Shipt....Shipment. Shs...Shares. Sohr...Schooner. S.S...Steamship. Sq...Square. Stor...Storage. Stb't...Storage. Sub't...Sundries. Super...Superfine. Str...Steamer.

Tes.....Tierces

Ult. (Ultimo) The last month.

Wt.....Weight. W. I.West Indies.

Yds.....Yards. Yr.Year.

viii

1. Rapidity and accuracy in addition are of the first importance to the commercial student.

These can be acquired only by a thorough familiarity with the simple combinations of numbers, and a proper practice with these combinations.

The following Tables exhibit all the combinations of numbers, and the attention of the student is especially directed to the endings, that is the right-hand figure in such combinations:

Combinations ending with o.

20

| | | | | ACAL U. | | |
|-----------|---------------|------------------|-------------------------------|--------------|---------------|--------------|
| | 1 9 10 | 10 | 7 | 6 | 5 5 10 | |
| Combinat | ions | endi | ng w | ith I. | | |
| | 1 0 | 2 9 | | 4 7 | 5 6 11 | |
| Combinat | ions | endir | | | 11 | |
| • | $\frac{1}{1}$ | $\frac{2}{0}{2}$ | $\frac{3}{9}$ $\overline{12}$ | 4 8 12 | $\frac{5}{7}$ | 6 6 12 |
| Combinati | ons e | endin | g wi | th 3. | | |
| | 21 | 80 | 4 9 | ő 8 | 6 7 | |

18

13

10

| Combinatio | on | s en | ding | ; w | ith 4 | 4 | |
|-------------|--------|--------|--------|---------------------------------------|--------|--------|--------|
| | 2 2 | 3 1 | 41 | | 5 9 | 6 8 | 77 |
| | 4 | 4 | _ | 4 | 14 | 14 | 14 |
| Combinatio | ns | s end | ling | wi | th 5 | | |
| | | 3 2 | 4 | 1 | | 6 9 | 7 8 |
| Combinatio | | 5. | 5 | đ | | | 15 |
| Combinatio | ns | end | ing | wi | th 6 | • | |
| | 3 | 4 2 | 5 1 | | 6 0 | 7 9 | 8 8 |
| 6 | 5 | 6 | 6 | | 6 | 16 | 18 |
| Combination | ns | end | ing | wit | :h 7. | | |
| | | 4 3 | 5 2 | $\begin{array}{c} 6 \\ 1 \end{array}$ | 7 0 | 8 9 | |
| | | 7 | 7 | 7 | 7 | 17 | |
| Combination | IS | endi | ng | wit | h 8. | | |

| 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|----|
| 4 | 3 | 2 | 1 | 0 | |
| 8 | 8 | 8 | 8 | 8 | 18 |

Combinations ending with 9.

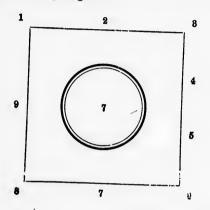
| 5 | 6 | $\frac{7}{2}$ | 8 | 9 |
|---|---|---------------|---|---|
| 4 | 3 | | 1 | 0 |
| 9 | 9 | 9 | 9 | 9 |

After the student becomes familiar with the foregoing combinations his attention is directed to the use of the endings. For example:

7 & 6 = 13, 17 & 6 = 23, 27 & 6 = 33, 37 & 6 = 43, & 0.6 & 7 = 13, 16 & 7 = 23, 26 & 7 = 33, 36 & 7 = 43, & 0.

i.e., the sum of any two numbers, one of which ends with 6 and the other with 7, produces a number ending with 3. A thorough drill of this kind should be given with all the combinations.

2. An effective drill may be given to the student by the use of the following diagram :



The teacher places any number within the circle and requires the pupils to add to it any number or succession of numbers to which he may point.

Rapidity and accuracy in addition can be gained only by adding columns of figures.

3. In adding ledger columns, accountants frequently use the following devices :

EXAMPLE 1.— \$926.42 49.98 67.84 876.55 4867.89 946 74 6487.45 \$14222.87 4454 3

The figure to be carried is placed under the column to which it belonge so that in case of interruption or mistake it may be used for reference. EXAMPLE 2.-

| 93746 | |
|-------|--------|
| 2385 | |
| 91642 | |
| 28735 | |
| 82614 | |
| 79186 | |
| - | 328308 |
| 25738 | |
| 87264 | |
| 19285 | |
| 63127 | |
| 58432 | |
| | 203846 |
| 82691 | |
| 85417 | |
| 63529 | |
| 48763 | |
| 21734 | 252134 |
| | 784288 |
| | 101400 |

The column to be added is divided into several parts. These parts are added and the sum of the results then taken.

5. Addition of two or more columns at the same time. EXAMPLE 8-

| 35 |
|-----|
| 89 |
| 76 |
| 47 |
| |
| 247 |

METHOD OF ADDITION-

47 & 6 make 53, 53 & 70 make 123, 123 & 9 make 182, 132 & 80 make 212, 212 & 5 make 217, 217 & 30 make 247.

Columns of three or four figures may be added in the same way, or by adding two columns at a time.

The methods 'employed in Examples 2 and 3 are excellent tests of the correctness of addition performed in the ordinary way.

6. To find the sum of any series of numbers which have a common difference.

RULE.

Multiply the sum of the first and last terms by the number of terms and divide the result by 2.

| EXAMPLE 1 Add, 16, 17 | , 18, 19, 20, 21, 22, 23, 24, 25, 26, 27. |
|-----------------------|---|
| OPERATION | . Common difference is 1. |
| | irst term. |
| | ast term. |
| | |
| 43 | |
| 12 n | umber of terms. |
| 2) 516 | |
| 258 | |
| | 64, 72, 80, 88, 96, 104, 112. |
| 48 | |
| 112 | Common difference is a. |
| 160 | - |
| 9 | |
| 3 | |
| \$) 1440 | |
| 720 | |

ts. n.

e.

е

4

5

à

MULTIPLICATION.

SHORT METHODS IN MULTIPLICATION.

7. To multiply by any of the numbers from II to 19 inclusive.

Multiply 4625 by 14.

FIRST METHOD.

| 4625 | 5 x 4 |
|-------|---|
| 14 | |
| | $2 \times 4 + 2$ (carried) + 5 = 15 " 1 |
| 64750 | $6 \times 4 + 1 ($ " $) + 2 = 27$ " 2 |
| | $4 \times 4 + 2($ " $) + 6 = 24$ " 2 |
| | 2(")+4=6 |

The student will observe that we multiply by 4 in the ordinary way, but in addition to the ordinary number to be carried we also carry the figure to the right of the figure

> SECOND METHOD. 4625 × 14 18500 64750

Multiply by 4, placing the product one place to the right and add.

Nore.—This method may be applied when the multiplier has one or more ciphers between the two figures, by writing the product two or more places to the right, and adding.

EXERCISE I.

Multiply-

1. 79526 by 11, 12, 13, 14, 15, 16, 17, 18, 19.

2. 37295 by 102, 104, 105, 107.

3. 49273 by 1003, 1006, 1008, 1009.

8. To multiply by any number of two figures ending with 1.

7

Multiply 846 by 41.

| | FIRST METHOD. | |
|-------|----------------------------|-----------------|
| 846 | 6×1 | = 6 |
| 41 | 6×4 | +4 = 28 carry 2 |
| 34686 | $4 \times 4 + 2$ (carried) | + 8 = 26 " 2 |
| | 8 × 4 + 2 " | = 34 |

The student will observe that we place the units figure of the multiplicand as the units figure of the product. Then multiply by 4, and in addition to the ordinary number to be carried, we carry the figure to the left of the figure multiplied.

| 846 × 41 3384 | SECOND METHOD. |
|------------------|----------------|
| 34686 | |

Multiply by 4, placing the product one place to the left and add.

Norg.—This method may be applied when the multiplier has one or more ciphers between the two figures by writing the product two or more places to the left.

EXERCISE 2.

1. 64278 by 21, 81, 41, 51, 61, 71, 81, 91.

2. 87396 by 301, 501, 601, 801.

Multiply-

8. 93254 by 2001, 3001, 7001, 9001.

9. To multiply two numbers in which the units figures added make 10, the other figures being the same in each.

EXAMPLE 1.-Multiply 74 by 76.

| 74 | | | |
|-----------|----------------------------|--|--|
| 74 | METHOD. | | |
| 76 | $4 \times 6 = 24$ | | |
| 5624 | $(7 + 1) \times 7 = 56$ | | |
| Example 2 | Multiply 123 by 127. | | |
| 123 | METHOD. | | |
| 127 | $8 \times 7 = 21$ | | |
| 15621 | $(12 + 1) \times 12 = 156$ | | |

19

to to

EXERCISE 3.

| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | 6. 14. 123 \times 118. 5. 15. 104 \times 106. 3. 16. 105 \times 105. | 19. $153 \times 157.$ 20. $491 \times 499.$ 21. $694 \times 696.$ 22. $225 \times 225.$ |
|--|--|---|
| 6. 81×39 . 12. 91×99 | | $\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$ |

10. To multiply two numbers in which the units figures are the same.

Multiply 46 by 66.

| 46 66 | 6×6 |
|---|---|
| | = 36 carry 3 |
| 8036 | $(4 + 6) \times 6 + 3 \text{ (carried)} = 63 \text{ carry } 6$ $4 \times 6 + 6 (") = 30$ |
| | EXERCISE 4. |
| 1. 21×51 . 2. 53×53 . 3. 45×25 . 4. 67×57 . 5. 28×38 . 6. 92×72 . | 7. $64 \times 54.$ $13.$ $19 \times 29.$ $19.$ $105 \times 125.$ 8. $86 \times 36.$ $14.$ $27 \times 47.$ $20.$ $113 \times 183.$ 9. $47 \times 87.$ $15.$ $36 \times 56.$ $21.$ $114 \times 144.$ 10. $58 \times 48.$ $16.$ $84 \times 84.$ $22.$ $136 \times 126.$ 11. $81 \times 91.$ $17.$ $83 \times 73.$ $23.$ $125 \times 135.$ 12. $42 \times 72.$ $18.$ 116×146 $24.$ $145 \times 136.$ |

24. 117 × 197. II. To multiply two numbers in which the units figures are unlike, the remaining figures being alike.

18. 116 × 146.

| | - martine 1 MIC | iltiply 78 by | 72. |
|----------------|--|---------------|---|
| * | 78 72 | | $\begin{array}{r} \text{Method.} \\ 8 \times 2 \\ 3 + 2 \\ 7 \times 7 + 1 \text{ (carried)} = 71 \text{ carry 7} \end{array}$ |
| | 5616 EXAMPLE 2Mu | | A 1 + 7 (Carmod) FO |
| | 126 122 | | METHOD. 6 × 2 - 10 |
| | 15372 | | $12 \times 12 + 1$ (carried) = 97 carry 9 $12 \times 12 + 9$ (carried) = 153 |
| 1 | 97 | | RCISE 5. |
| 2. 8. 4. | $54 \times 52.$ 8. $75 \times 76.$ 9. $83 \times 82.$ 10. $27 \times 29.$ 11. | 85 × 84. | 18. 48 \times 43. 19. 116 \times 113. 14. 26 \times 27. 20. 124 \times 125. 15. 57 \times 59. 21. 136 \times 134. 16. 38 \times 37. 22. 147 \times 141. 17. 61 \times 69. 23. 157 \times 159. 18. 78 \times 74. 24. 323 \times 322. |

а

12. To multiply by means of cross multiplication. EXAMPLE 1.-Multiply 56 by 63.

| | 56 | METHOD. |
|------|------------------|--|
| | 63 | $6 \times 3 = 18$, carry 1 |
| | | $5 \times 3 + 1$ (carried) + $6 \times 6 = 52$, " 5 |
| | 3528 | $5 \times 6 + 5($ ") 85 |
| EXAN | MPLE 2Mul | tiply 346 by 23. |
| | 846 | METHOD. |
| | 2 3 | $6 \times 3 = 18$, carry 1 |
| | | $4 \times 3 + 1$ (carried) + $6 \times 2 = 25$, "2 |
| | 7958 | $8 \times 3 + 2$ (") + 4 × 2 = 19, " 1 |
| | | $3 \times 2 + 1$ (") = 7 |
| | | EXERCISE 6. |
| 1. | 86 × 82. | 6. 45×62 . 11. 846×43 . |
| 2. | 94×24 . | 7. 39×74 . 12. 608×37 . |
| 8. | 79 × 45. | 8. 82×51 . 18. 543×23 . |
| 4. | 87 × 36. | 9. 37×22 . 14. 760×48 . |
| 5. | 28 × 51. | 10. 46×25 . 15. 3268×79 . |
| | - | |

13. To multiply by a number ending with 9.

RULE.

Multiply by 1 more than the given multiplier and substract the multiplicand.

Multiply 263 by 69.

| | | 0 | PERA | TION. | | |
|----|------------------|----|------|----------|----------|-----------------|
| | 18410 | (p | rodu | ot by 70 |)) | |
| | 263 | Ē | ** | " 1 | L) | |
| | 18147 | | " | " 6 | 9) | |
| • | | EX | ERC | SE 7. | | |
| | Multiply- | | | | | |
| 1. | 8764 by 79, 49. | | | 5. | 13256 bv | 119, 899, 169. |
| 2. | 46251 by 39, 59. | | | | | 290, 999, 799. |
| 8. | 87284 by 99, 69. | | | | | 149, 249, 189. |
| | 29635 by 89, 29. | | | | | 9999, 499, 189. |

14. To multiply by a number which is a little less than 100, 200, 300, 400, etc.

RULE.

Multiply the multiplicand by the difference between the multiplier and 100, 200, 300, or etc., and substract the product from the product of the multiplicand by 100, 200, 300. or etc.

157. 499. 596. 225. 398. 77.

nits

3. 4. 6. 5. 7.

15.

ts

Multiply 675 by 97.

OPERATION. 67500 (product by 100) 2025 (" 66 3) 65475 (" " 97) EXERCISE 8.

Multiply-

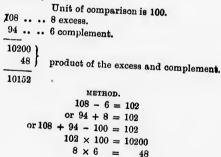
| 2. 3. 4. | 3684 by 41523 by 27136 by 8124 by | 93, 296, 4 794, 8 | 95, 195. 397. | 97. | o. 7. | 36092 by 998, 14613 by 988, 30257 by 989, 17824 by 992, | 991, 791. 995 9993 | |
|----------------|--|-------------------------|---------------------|-----|----------|--|-----------------------|--|
|----------------|--|-------------------------|---------------------|-----|----------|--|-----------------------|--|

15. To multiply two numbers, one of which is more and the other less than 100, 1000, etc.

The complement of a number is the difference between that number and the unit of the next higher order.

, RULE.

Multiply the sum of the numbers less the unit of comparison by the unit of comparison, and from the product substract the product of the excess and the complement. Multiply 108 by 94.



10152 EXERCISE 9.

| | $107 \times 97.$ | 6. 112 × 91. | |
|-----------|------------------|-----------------------|-------------------------|
| 2. | $105 \times 95.$ | | 11. 1012×994 . |
| | | 7. 115×93 . | 12. 1015×988 . |
| ð. | $113 \times 88.$ | 8. 108×96 . | 12. 1015 × 988. |
| 4. | $103 \times 94.$ | | 18. 1032×998 . |
| | 105 X 94. | 9. 114×95 . | 14 1004 |
| 5. | 106 × 92. | 10 104 | 14. 1064×993 . |
| | | 10. 104×87 . | 15. 1025×989 . |
| | | | +020 X 989. |

16. To multiply two numbers of the same number of figures over and near 100, 1000, etc.

RULE.

From the sum of the numbers substract the unit of comparison, and to the right of the result write the product of the excesses.

NOTES.

1. When there are fewer figures in the product of the excesses than ciphers in the unit of comparison, write ciphers in the result to supply the deficiency.

2. When there are more figures in the product of the excesses than eighers in the unit of comparison, add the excess on the left hand to the first part of the result.

8. After practice, the writing of the complements or the excesses in examples where they are used may be omitted.

Multiply 112 by 106.

| | | ME | THOD. | | |
|----|-------------------|-------------|----------|------------|----------------------|
| | 1 12 12 ex | | | 112 + | 6 = 118 |
| | 106 6 | 66 | | or 106 + 3 | |
| | 11872 | | or 112 + | - 106 - 10 | 00 = 118 |
| | Unit of con | aparison is | | | 6 = 72 |
| | | | CISE 10. | | |
| 1. | $112 \times 108.$ | 6. 114 | × 108. | 11. | 1006 × 1003. |
| 2. | $108 \times 103.$ | 7. 107 | × 115. | | $1017 \times 1003.$ |
| | $115 \times 105.$ | 8. 109 | × 107. | | $1125 \times 1009.$ |
| 4. | $113 \times 104.$ | 9. 116 | × 108. | | $1034 \times 1005.$ |
| 5. | $105 \times 106.$ | 10. 112 | × 109. | | 1075×1012 . |
| 7. | To multiply | hy mean | s of con | malama | |

7. To multiply by means of complements.

RULE.

From either number substract the complement of the other, and to the right of the result write the product of the complements.

Norz.—The notes of Art 16 apply in these problems if we substitute the word "complements" in place of "excesses."

EXAMPLE 1 .--- Multiply 94 by 98.

94 6 complement. 98 2

9212

METHOD. 94 - 2 = 92or 98 - 6 = 92or 94 + 98 = 192, omit the 1

en

on he

EXAMPLE 2-EXAMPLE 8-997 3 685 815 992 8 996 989024 (see Note 1.) 682260 (see Note 2.) EXERCISE 11. 1. 97 × 96. 6. 88 × 93. 11. 993 × 995. 2. 95 × 93. 7. 87 × 88. 12. 997 × 992. 8. 94 × 95. 8. 84 × 92. 13. 995 × 993. 4. 99 × 94. 9. 75 × 96. 5. 98 × 92. 14. 989 × 788. 10. 93 × 85. 15. 991 × 885.

18. To multiply by means of factors.

The factors of a number are the numbers whose product is equal to that number. Multiply 865 by 35.

| | | $35 = 7 \times 10^{-10}$ | 5 | | | |
|----------------|--|--|----------------------|---|------------|---|
| | 865 7 6055 5 | produced by 7 | | MRTHOD ON | 865 | MULTIPLIERS. product by 7 |
| 1. | 80275 | E | times 7) XERCISE. | | 30275 | " " 85 |
| 2. 3. 4. | 626 × 36. 827 × 54. 495 × 48. 378 × 77. | 5. 296×99 . 6. 343×72 . 7. 764×56 . 8. 827×45 . | 10. 4164 | 1 × 42. 1 × 35. 1 × 126. 1 × 64. | 14. 15. | $30687 \times 105.$ $20956 \times 121.$ $41378 \times 154.$ 36254×295 |

19. To multiply when one part of the multiplier is a factor of the other.

RULE.

Multiply by the part of the multiplier which is a factor of another part, placing the first figure of each partial product under the right hand figure of the multiplier which produced it. EXAMPLE 1-Multinly 467 by 248

| 467 | ampiy | 407 by 248. |
|---------------|--------------|---|
| 248 | | |
| 3736 11208 | product " | t by 8. " 24 (3 times the product by 8). |
| 115816 | | produce by 8). |

| Example 2-Mu 643 436 | ultiply 643 by 436. |
|----------------------------|--|
| | product by 4. " " 86 (9 times the product by 4). |
| Example 3Mu 3247 842 | ltiply 3247 by 842. |
| • 6494 12988 25976 | product by 2. " " 4 (2 times the product by 2). " " 8 (2 " " 4). |

2733974

.

EXERCISE 12.

| 1. | 364 × 126. | 8. | 8164×427 . | 15. | 37281 × 8 | 29 |
|----|-------------|-----|---------------------|-----|--------------------|----|
| 2. | 475 × 279. | 9. | 4275 × 246. | | 41325 × 7 | |
| 8. | 896 × 142. | 10. | 8137 × 189. | | 63587 × 6 | |
| 4. | 857 × 557. | 11. | 2956 × 284. | | 49126 × 4 | |
| 5. | 943 × .426. | 12. | 4765 × 927. | | 64273 × 5 | |
| 6. | 854 × 369. | 18. | 8259 × 936. | | 47821×168 | |
| 7. | 875 × 632. | 14. | 4371 × 183. | | 45314 × 240 | |

20. To multiply by a mixed number.

EXAMPLE 1-Multiply 363 by 61.

863 61 903 product by $\frac{1}{4} = 363 \div 4 = 90$ 178 " " 6. 2178 22683 EXAMPLE 2-Multiply 3426 by 53. 3426 $5\frac{2}{3}$ **1370**²/₅ product by $\frac{2}{5} = 3426 \times 2 + b$ 17130 61 185003

uct

Å

ŧ.

7 35

5. ۱.

E. .

18

.

EXERCISE 13.

Multiply-

| 2. 9. 4. | 8126 by 4371 by 2137 by 4645 by 1316 by | 157, 413, 22.3 | 148, 211, 255 | 361, | 4711. | 11 1 , | 10] . | |
|----------------|---|----------------------|---------------------|--------|-------|-------------------|-------------------|--|
| | | | 16; | 11017, | 90 T. | | | |

21. In multiplying by a mixed number, it is often a shorter method to reduce the mixed number to an improper fraction and to multiply as in fractions. The following exercise contains multipliers of this kind.

Multiply 689 by 881.

$$689 \times 83\frac{1}{3} = 689 \times \frac{100}{3} = \frac{68900}{8} = 22966\frac{1}{8}$$

EXERCISE 14.

Multiply_

| 1. | 3964 by | 11. | 18, | 91 | | | |
|----|----------|-------|--------|---------|-------|--------------------|--|
| 2. | 1375 by | 142 | 331. | 10 1 | 91, | | |
| 3. | 4137 by | 664. | 424, | 1021 | 223, | 284. | |
| 4. | 8164 by | 444. | | 1831, | | | |
| 5. | 227 by | | 54 e., | | | 45 8. | |
| 6. | 383 by 2 | 2662. | | | 778, | 63 ₇₇ . | |
| 7. | 752 by | 81.9 | | 888, | 7211, | 1284. | |
| | | II, | an.3. | 1424, 1 | 117, | 99.1 | |

22. To multiply by a number which is a convenient aliquot part of 10, 100, 200, 300, etc.

Multiply 638 by 21.

Since $10 \div 4 = 2\frac{1}{2}$, therefore to multiply by $2\frac{1}{2}$ we multiply by 10 and divide the result by 4. $636 \times 10 \div 4 = 1595$.

The following list comp. As some of the multipliers that may be used in this way. As the multipliers used in the preceding exercise are examples of this class.

| | $1\frac{1}{4} = 10 + 8.$ | 12. $62\frac{1}{2} = 500 + 8.$ |
|-----|----------------------------------|-------------------------------------|
| | $1\frac{2}{3} = 10 + 6.$ | 13. $58\frac{1}{3} = 700 \div 12$. |
| | $2\frac{1}{2} = 10 + 4.$ | 14. $87\frac{1}{2} = 700 + 8$. |
| | $5 = 10 \div 2.$ | 15. $116\frac{2}{3} = 700 + 6$. |
| 5. | $8\frac{1}{3} = 100 \div 13.$ | 16. $175 = 700 \div 4$. |
| | $12\frac{1}{2} = 100 \div 8.$ | 17. $112\frac{1}{2} = 900 \div 8$. |
| | $16? = 100 \div 6.$ | $18. \ 225 = 900 \div 4.$ |
| 8. | $25 = 100 \div 4.$ | 19. $83\frac{1}{3} = 1000 + 12.$ |
| 9. | $87_{\frac{1}{2}} = 300 \div 8.$ | 20. $125 = 1000 \div 8$. |
| 10. | $75 = 800 \div 4.$ | 21. $166_3^2 = 1000 \div 6$. |
| 11. | $41\frac{2}{3} = 500 \div 12.$ | 22. 8331 - 1000 + 9. |

EXERCISE 15.

Multiply-

| 1. | 346 by | 11, | 12, | 21, | 5, | 81. |
|----|----------|------|--------|-------|-------|-----|
| 2. | 258 by | 121, | 162, | 25, | 871. | 75. |
| 8. | 512 by | 412, | 621, | 581, | 871. | |
| 4. | 545 by) | 162, | 175, 1 | 121, | 225. | |
| 5. | 357 by | 831, | 125, 1 | 1663, | 8833. | |

23. To multiply by 75.

Multiply by 100 and subtract one quarter of the product.

Example-Multiply 863427 by 75.

75 == 100 - 25 (one-fourth of 100)

OFFRATION-86342700 - product by 100. 21585675 - one-fourth of the product. 64757025

24. To multiply by 125.

125 = 100 + 25 (one-fourth of 100)

Multiply by 100 and add one-fourth of the product.

EXAMPLE-Multiply 1234769 by 125.

OPERATION-124376900 - product by 100. 31094225 - one-fourth of the product by 100.

155471125

EXERCISE 16.

| 1. | 367258 | × | 66 3 . | 5. | 36254 | × | 105. |
|----|--------|---|-------------------|----|--------|---|------|
| 2. | 43729 | × | 95. | | 27936 | | |
| 8. | 27364 | × | 975. | | 478256 | | |
| 4. | 376298 | × | 950. | | 236471 | | |

1 a per ing

15

3.

16

DIVISION.

DIVISION.

DIVISIBILITY OF NUMBERS.

25. A number is said to be divisible by another number when the latter will divide the former without a remainder.

26. An even number is a number of which 2 is an exact livisor.

27. An odd number is a number of which 2 is not an exact divisor.

28. Any number is divisible-

1. By 2, if it is an even number as 2, 4, 8, 26.

2. By 3, if the sum of its digits is divisible by 3, as 744, 7 + 4 + 4 = 15, 15 is divisible by 8.

3. By 4, if the two right hand figures are ciphers, or express a number divisible by 4, as 1500,

4. By 5, if the right hand figure is 0 or 5, as 60, 95. 5. By 6, if it is an even number and has the sum of its digits divisible by 3, as 348.

6. By 8, if the three right hand figures are ciphers, or express a number divisible by 8, as 4000,

DIVISION.

7. By 9, if the sum of its digits is divisible by 9, as 45387.

17

- 8. By 11, if the difference of the sum of the digits in the even places, and the sum of the digits in the odd places is 0, or is divisible by 11, as 43263, 459173.
- 9. By 25, if the two right hand figures are ciphers or express a number divisible by 25, as 4700, 8675.
- 10. By 75, the same as for 25, providing also that the sum of the digits is divisible by 3, as 8900, 41475.

29. To divide one number by another leaving out the products.

RULE.

Subtract the several products from the next number greater ending with the corresponding figure in the dividend, and carry each time the left hand figure of the minuend to the next product.

> Divide 42343014 by 973. ORDINARY METHOD.

| 978) 42343014 (43518 3892 | LEAVING OUT THE 42343014 | PRODUCTS. |
|-------------------------------|-----------------------------|-----------|
| 3423 2919 | 3423 | 43518 |
| 5040 | 5040 | |
| 4865 | 1751 | |
| 1751 973 | 7784 | |
| 7784 7784 | 0000 | |
| 0000 | | |

METHOD.

The first quotient figure is 4, by which we multiply. 4 times 8 are 12, which, subtracted from 14 (the next number greater ending with 4), leaves 2. Write 2 in the remainder and carry 1. 4 times 7 are 26, and 1 carried makes 29, which, subtracted from 38 (the next number greater

aber der. Kact

an

as 8. or),

f

DIVISION.

ending with 3), leaves 4. Write 4 in the remainder and carry 3. 4 times 9 are 36 and 3 carried makes 39, which, subtracted from 42 (the next number greater ending with 2), leaves 4. 4 subtracted from 4 leaves 0. Bring down 3 the next figure in the dividend. So proceed until the division is completed.

| 1. | 743297 ÷ | 527 | EXERC | ISE 17. | | | | |
|----|--------------|--------|---------|------------|--------------|---------|--------|--|
| 2. | $14839 \div$ | 869 | | | 4. | 36287 . | ÷ 567. | |
| 3. | 87654 ÷ | 743. | | | 5. | 64925 - | - 784 | |
| | 7. | Divide | 3642789 | by 625, 43 | 6. 6 8179 | 34681 | 429. | |
| T | A | | | , | ·, ·1/0, | 4106. | | |

30. To divide by a mixed number.

PRINCIPLE.

Multiplying both divisor and dividend by the same number does not alter the quotient.

Divide 786 by 52.

| | v ~ g. |
|---------------------|---|
| | . ⁵ 3) 736 (|
| | 3 3 |
| | |
| | 17) 2208 (12914 |
| | 17 |
| | |
| | 50 |
| | 34 |
| | - |
| | 168 |
| | 153 |
| | |
| | 15 |
| Divide- | EXERCISE 18. |
| 475 by 3624 by 1 | 3 ¹ / ₂ , 4 ¹ / ₂ , 7 ¹ / ₃ , 3 ¹ / ₈ , 4 ¹ / ₄ , 5 ¹ / ₆ , 3 ¹ / ₃ , 4 ¹ / ₃ , 9 ¹ / ₁ , 31 ¹ / ₂ , 4 ¹ / ₄ , 4 ¹ / ₄ , 7 ¹ / ₁ , 11 ¹ / ₈ , 2 ¹ / ₁ , 4 ¹ / ₂ . |
| 6712 by | $7_{\frac{1}{2}}, 11_{\frac{3}{2}}, 2_{1\frac{1}{2}}, 6_{1\frac{1}{2}}, 10_{\frac{3}{2}}.$ |
| -, | ^{6,114,2} 13, 6 ₁₃ , 103. |
| | |

31. To divide when all the figures in the divisor except the first on the left hand can be changed to ciphers by using a convenient multiplier. EXAMPLE 1-Divide 624395 by 35.

35) ,624395 (2 2 70) 1248790 17839 - 48

18

1. 2, 3. (ry 3. 4 times 42 (the next m 4 leaves 0. ed until the

- 567. - 784. - 429.

number

visor d to

DIVISION.

Example 2-Divide 13476 bv 163. 163) 13476 (6 6 109) 80855 808555 808555

Norz.--If the true remainder is required it may be obtained by dividing the remainder found by the number by which we multiply the divisor.

EXERCISE 19.

| 2. 8. 4. 5. | $\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$ | 8. 9. 10. 11. | $\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$ | 13. $21396 \div 413$. 14. $9201 \div 3671$. 15. $7345 \div 573$. 16. $6287 \div 125$. 17. $31264 \div 871$ |
|----------------------|--|-------------------------------|--|--|
| | 3798 ÷ 225. 8306 ÷ 45. | 11. | 4932 3 ÷ 33 1 . 9306 ÷ 621. | 17. $31264 \div 87\frac{1}{2}$. 18. $31907 \div 142\frac{6}{7}$. |

32. To divide by any number that can be changed to a convenient divisor by increasing or diminishing it by an aliquot part of itself.

ROLE. ' After dividing by the divisor so increased or diminished, increase or diminish the quotient in the same proportion.

Divide 1920 by 24.

| OPERATION. |
|---|
| 8Ø) 192Ø |
| $4 \overline{)} 64 $, 16 |
| 80 the quotient. EXPLANATION. |
| |
| $\frac{1}{2}$ of $24 = 6$ $24 + 6 = 30$ |
| = 1920 ÷ 30 = 64 |
| $\frac{1}{2}$ of $64 = 16$ |
| |
| 80 the quotien |
| EXERCISE 20. |

| | | | | -w. | | | |
|----|-------------|----|----------|-----|----|----------|------|
| 1. | 1845 + 45. | 5. | 7704 ÷ | 24. | 9. | 24300 ÷ | 109 |
| 2. | 8640 + 35. | 6. | 8343 ÷ | 27. | 10 | 24500 + | 101. |
| | | 7. | 41472 + | | | 887500 + | |
| 4. | 15216 ÷ 48. | | 141120 ÷ | | | 425100 + | |

DIVISION.

33. To divide by means of factors of the divisor.

Example 1.-Divide 25380 by 108. ~

100

| $108 = 9 \times 108$) 25380 (235 216 | 4 × 3 or 6 × 6 | × 8 or 9 × | 6 × 2 |
|--|----------------|------------|----------|
| 378 | 8) 25380 | 8) 25380 | 9) 25380 |
| 324 | 4) 8460 | 6) 8460 | 6) 2820 |
| 540 | 9) 2115 | 6) 1410 | 2) 470 |
| 540 | 285 | 235 | 235 |

EXAMPLE 2 .- Divide 6326 by 75.

75 = 3 × 5 × 5, 8) 6326 5) 2108 .. 21 1 × 5 + 8 5) 421 .. 8 $3 \times 3 = 9$ or $8 \times 3 + 2 = 26$ 84 .. 1 1 × 5 × 8 = 15 26 true remainder.

Nors 1.-To find the true remainder, take the product of each remainder by all the divisors preceding the one that produced it. The sum of these products with the first remainder will be the true remainder.

2. Take the product of the last remainder by the divisor preceding the one that produced it. To this product add the preceding remainder. Multiply this result by the next divisor and add the next remainder. Continue this process until the first divisor has been used as a multiplier.

EXERCISE 21.

| 1. | 25380 + | 86. | K | 81279 - | - | | | | |
|----|----------|-----|----|---------|-------|-----|---------|--------|--|
| 2 | 178584 ÷ | 10 | | 01218 - | • 72. | 9. | 43716 - | 100 | |
| - | 110004 - | 48. | 6. | 43827 + | . 84 | 10 | | r 168. | |
| 8. | 23741 ÷ | 42. | 7 | 19875 + | 101 | | 29378 - | + 81. | |
| 4. | 43165 + | 84 | •• | 14010 + | 125. | 11. | 41658 - | 44 | |
| | 10100 - | 04. | 8. | 41643 + | 185 | 10 | 28795 | - 40, | |
| | | | | | | | 2179E . | | |

34. To divide by cancellation.

35. Cancellation is the process of shortening operations by rejecting equal factors from both dividend and divisor.

36. The sign of cancellation is an oblique mark (/) drawn through the number from which the factor is

livisor.

2

8 26

h remain-The sum inder.

eding the mainder. mainder. ultiplier.

168. 81. 45. 96.

ations visor. k (/) or is

DIVISION.

Divide 18 \times 16 \times 28 by 12 \times 7 \times 14.

| 8 18 × 12 × 2 | | 2 28 14 | <u>R × 10</u> 7 | 3 = | 64 | or | 2 12 7 14 | 3 18 16 28 2 |
|------------------------|--|---------------|--------------------|-----|-----|----|--------------------|-----------------------|
| | | | | | | | 7 | 48 |
| | | | | RU | LE. | | | 6# |

Cancel the factors common to the divisor and dividend, and divide the product of those remaining in the dividend by the product of those remaining in the divisor.

EXERCISE 22.

| Divide | | | | | | | | | | | | | | | |
|--------|----|-----|---|----|---|-----|---|----|----|----|---|----|---|------|-----|
| | 1. | 5 | × | 9 | x | 7 | × | 11 | by | 7 | x | 5 | × | 3 x | 11 |
| | 2. | 80 | x | 56 | × | 18 | | | by | 2 | × | 3 | x | 4 x | 6. |
| : | 8. | 70 | x | 39 | × | 13 | | | by | 26 | × | 21 | - | 7 | |
| | 4. | 28 | × | 49 | × | 75 | | | bv | 7 | × | 15 | × | 84 | |
| | 5. | - 3 | х | 6 | х | 8 | × | 72 | bv | 2 | x | 3 | ¥ | 4 ~ | 18. |
| | j, | 74 | × | 12 | × | 14 | × | 16 | by | 28 | × | 72 | × | 24. | |
| 1 | 7. | 112 | × | 27 | × | 178 | | | by | 54 | x | 63 | x | 89. | |
| | | | | | | 72 | | | by | 44 | × | 32 | × | 18. | • |
| | | | | | | 29 | | | by | 27 | x | 18 | × | 154. | |
| 10 | L | 45 | × | 63 | x | 144 | | | by | 72 | × | 24 | × | 1. | |

FACTORING.

FACTORING.

37. A Factor, a Measure, or an Exact Divisor of a given number is an integral number that will divide the given number without a remainder.

38. A Prime Number is a number that has no factors except itself and 1, as 3, 7, 13, 19.

39. A Prime Factor is a prime number used as a factor.

40. A Composite Number is a number that has other factors besides itself and 1, as 24, 32, 70.

41. Factoring is the process of finding the factors of a composite number.

42. To resolve a number into its prime factors.

Divide the number by the least prime number which will divide it exactly. In like manner divide the resulting quotient. Continue this process until a quotient which is a prime number is reached. The several divisors and the last quotient are the prime factors.

Find the prime factors of 420.

| 2 | 420 | |
|----|------|--|
| 2 | 210 | |
| 3j | 105 | |
| 5 |) 35 | |

2, 3, 5 and 7 are the prime factors.

 $420 = 2 \times 2 \times 3 \times 5 \times 7$

EXERCISE 23.

| Find the p | orime factors | of- |
|------------|---------------|-----|
|------------|---------------|-----|

| | 2. 3. 4. | 1050, 2625, 1820, 1485, 1155, | 7. 8. 9. | 5985. 4620. 4802. 5432. 7000. | 12. 13. 14. | 8140. 8712. 1320. 1768. 1848. | 17. 18. 19. | 1906. 1858. 1478. 2956. 2406. | 22. 23. 24. | 2526. 2978. 2992. 3936. 8480. | |
|--|----------------|---|----------------|---|-------------------|---|-------------------|---|-------------------|---|--|
|--|----------------|---|----------------|---|-------------------|---|-------------------|---|-------------------|---|--|

 $\mathbf{22}$

isor of a livide the

o factors

sed as a

as other

ors of a

s.

ich will ng quon prime ruotient

2526. 2978. 2992. 3936. 3430.

HIGHEST COMMON FACTOR.

HIGHEST COMMON FACTOR.

43. A Common Factor of two or more numbers is a number that will exactly divide each of them; thus 2, 4, 6, or 12 is a common factor of 24 and 36.

44. The Highest Common Factor, also called the Greatest Common Divisor or Greatest Common Measure, of two or more numbers, is the greatest number that will exactly divide each of them, thus 12 is the H. C. F. of 24 and 36.

45. To find the H. C. F. of two or more numbers :

Divide the greater number by the less, and the less number by the remainder, if any, and so continue to divide the last divisor by the last remainder until there is no remainder. The last divisor will be the H. C. F.

If more than two numbers are given, find the H. C. F. of two of them, then of this factor and the third number and so on.

Find the H. C. F. of 1386 and 2268.

| FIRST METHOD. 1386) 2268 (1 | SEC | OND METHOD. | |
|---------------------------------|-------|-------------|--------------------|
| 1386 | 1886 | QUOTIENTS | 2268 |
| 882) 1386 (1 | 882 | 1 | $\frac{1386}{882}$ |
| 882 | 504 | 1 | 504 |
| 504) 882 (1 H. C. F | 378 | 1 3 | 378 |
| 504 | . 120 | Э | 378 |
| 378) 504 (1 378 | | | |
| H. C. F. 126) 378 (3 378 | | | |

Norg.—Observe that the second method is the same as the first, the work being arranged so as not to necessitate the writing of the divisor more than once.

The column for quotients may be omitted.

HIGHEST COMMON FACTOR.

| | | THIRD MI | THOD. | |
|------------------------------------|---------------------|----------------------------|-------|---------------------|
| subtract downwards. H. C. F. | 1386 1512 126 | MULTIPLIERS 2 8 4 | | subtract downwards. |
| In this math - 1 | | METHO | DD. | |

In this method we use such a multiplier for 1386 as will give a product nearest to 2268, that is 2. From the product 2772 take 2268, which leaves a remainder 504. Next take as a multiplier of 504 such a number as will give a product nearest to 1386, that is 3, etc.

FOURTH METHOD.

By means of prime factors. PRIME FACTORS FOUND.

| $ \begin{array}{c} 2 \\ 3 \\ 693 \\ 3 \\ 231 \\ 7 \\ 7 \\ 11 \end{array} $ | $\begin{array}{c} 2 \\ 2 \\ 2 \\ 1134 \\ 3 \\ 567 \\ 8 \\ 63 \\ 8 \\ -21 \end{array}$ | PRIME FACTORS ABRANGED. $1386 = 2 \times 3 \times 3 \times 7 \times 11$ $2268 = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 7$ Common prime factors multiplied. $2 \times 3 \times 3 \times 7 = 126 = H. C. F.$ |
|--|---|---|
|--|---|---|

RULE.

Resolve the given numbers into their prime factors; the product of all the prime factors common to them is the H. C. F.

FIFTH METHOD.

| Бу | means | of common | nrime | factors |
|------|--------|-----------|--------|----------|
| 1138 | 6 0000 | | Printe | lactors. |

| * | 1386 | 2268 |
|---|------|------|
| 8 | 693 | 1134 |
| 8 | 231 | 878 |
| 7 | 77 | 126 |
| 1 | 11 | 18 |

D.

2 × 3 × 3 × 7 = 126 H.C.F.

BULE.

Divide the given numbers by the prime factors common to each : the product of these prime factors will be the H. C. F.

EXERCISE 24. Find the H. C. F. of

| | | U. F. UI | |
|----|------------|------------------|---------------------|
| 1. | 323, 425. | 8. 961, 1178. | |
| 2. | 228, 399. | 9. 5355, 6545. | 15. 45, 57, 81. |
| | 615, 735. | 10. 4155, 24720, | 16. 63, 99, 90. |
| | 819, 945. | 11. 7568, 3784. | 17. 72, 84, 96. |
| | 949, 871. | 12. 3876, 1983. | 18. 306, 408, 510. |
| | 825, 960. | 18. 7956, 7668. | 19. 420, 462, 84. |
| 7. | 689, 1575. | 14. 9864, 9528. | 20. 546, 462, 882. |
| | | | 21. 900, 936, 2520. |

LEAST COMMON MULTIPLE.

25

LEAST COMMON MULTIPLE.

46. A Multiple of a number is one that is exactly divisible by that number, thus 36 is a multiple of 6.

47. A Common Multiple of two or more numbers is a number which is exactly divisible by each of them, thus 18, 36, 72, are common multiples of 2, 3, 6 and 9.

48. The Least Common Multiple of two or more numbers is the least number which is exactly divisible by each of them, thus 18 is the least common multiple of 2, 3, 6, and 9.

Find the L. C. M. of 18, 28, 42.

FIRST METHOD.

By means of prime factors.

 $\begin{array}{l} 18 = 2 \times 3 \times 8 \\ 28 = 2 \times 2 \times 7 \\ 42 = 2 \times 8 \times 7 \end{array} \quad \text{L. C. M. = } 2 \times 2 \times 8 \times 3 \times 7 = 252 \\ \end{array}$

RULE.

Resolve the given numbers into their prime factors; the product of the different prime factors taking each the greatest number of times it appears in any of the numbers will be the L. C. M.

SECOND METHOD.

Find the L. C. M. of 9, 15, 18, 16, 12, 30, 45.

ards.

give a pro-2268, which h a number

H.O.F.

•.

non to C. F.

81. 90. 96. 10. 34. 32.

LEAST COMMON MULTIPLE.

RULE.

Write the numbers in a horizontal line, cancelling such of the smaller numbers as are factors of the larger, and divide by any prime factor or prime factors that will exactly divide two or more of the given numbers. Write the quotients and the undivided numbers, if any, in a line heneath.

Continue this process until the results are prime to each other.

The product of all the divisors and the numbers in the last line will be the L. C. M.

EXERCISE 25.

| 12. 13. 14. 15. 16. 17. 18. 19. | 63, 12, 35, 9, 60, 54, 19, 22, | 27, 51, 63, 12, 15, 81, 27, 27, | 84. 68. 72. 14, 24, 63, 86, 54. | 210. 25. 14. 63. 108. |
|--|--|--|--|--|
| | 12. 13. 14. 15. 16. 17. 18. 19. | 12. 63, 13. 12, 14. 35, 15. 9, 16. 60, 17. 54, 18. 19, 19. 22, | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$ |

g such of divide by divide two and the

to each

the last

210. 25. 14. 63.

FRACTIONS.

FRACTIONS.

49. A Fraction is one or more of the equal parts of a unit, or anything regarded as a whole; thus, one-half, two-thirds, three-fourths, are fractions.

50. The unit of the fraction is the unit which is divided. One of the equal parts is the fractional unit.

51. Fractions obtained by the division of the unit into tenths, hundredths, thousandths, etc., are called Decimal Fractions. All other fractions are called Common Fractions.

52. A Common Fraction is expressed by two numbers, called the Numerator and the Denominator, the former written over the latter, with a line between them, thus:

| One-third is | written | - | Five-sixths is | written | 5 |
|---------------|---------|----|-------------------|---------|--------------|
| Three-fourths | ** | \$ | Seven-thirteenths | | 6 7 18 |
| Three-eighths | " | 8 | Eleven-twentieths | | 18 |

53. The numerator and the denominator are called the terms of a fraction.

54. The Denominator of a fraction, written below the line, shows the number of equal parts into which the unit is divided and also names the unit : thus in $\frac{7}{8}$, 8 is the denominator and shows that the unit is divided into eight equal parts, named eighths.

55. The Numerator of a fraction, written above the line, shows the number of equal parts taken to form the fraction; thus in $\frac{2}{5}$, 7 is the numerator, and shows that seven of the eight equal parts are taken or expressed by the fraction.

56. Since the denominator of a fraction shows how many fractional units in the numerator are equal to one integral unit, it follows

FRACTIONS.

That a fraction is an expression of unperformed division. The numerator is the dividend, the denominator is the divisor, and the value of the fraction is the quotient.

57. GENERAL PRINCIPLES OF FRACTIONS.

I. Multiplying the numerator or dividing the denominator by any number multiplies the value of the fraction by that number.

If we multiply the numerator of the fraction $\frac{1}{2}$ by 3, the result is $\frac{3}{2}$, which is three times as great as $\frac{1}{2}$. If we divide the denominator of $\frac{1}{2}$ by 2, the result is $\frac{1}{2}$, which is twice as great as $\frac{1}{2}$.

II. Dividing the numerator or multiplying the denominator by any number divides the fraction by that number.

If we divide the numerator of the fraction $\frac{2}{3}$ by 2, the result is $\frac{1}{4}$, which is $\frac{1}{2}$ as great as $\frac{2}{3}$. If the denominator of $\frac{1}{2}$ is multiplied by 2, the result is $\frac{1}{4}$, which is $\frac{1}{2}$ as great as $\frac{1}{4}$.

III. Multiplying or dividing both numerator and denominator of a fraction by the same number does not change the value of the fraction.

If we multiply both the numerator and the denominator of $\frac{1}{2}$ by 2, the result is $\frac{2}{4}$, which has the same value as $\frac{1}{2}$. If we divide both numerator and denominator of $\frac{2}{4}$ by 2, the result is $\frac{1}{2}$, which has the same value as $\frac{2}{4}$.

58. A Simple Fraction is one whose terms are both integers, as $\frac{7}{9}, \frac{14}{14}$.

59. A Proper Fraction is one whose numerator is less than its denominator; hence its value is less than 1, as $\frac{4}{16}$.

60. An Improper Fraction is one whose numerator equals or exceeds its denominator, as §, $\frac{1}{2}$, $\frac{3}{2}$.

61. A Mixed Number is a number composed of an integer and a fraction, as $3\frac{1}{2}$, $5\frac{3}{2}$.

ed division. the divisor,

enominator ion by that

by 3, the . If we , which is

nominator

by 2, the ninator of great as $\frac{1}{2}$.

hange the

ominator lue as]. f **]** by 2,

are both

r is less 1, as 4,

merator

l of an

FRACTIONS.

EXERCISE 26.

1. Read the following fractions, and tell what each numerator and each denominator shows:

to, In 14, 14, 15, 165, 168, 148, 148, 188881, 4 of 4. 2. Express the following in figures: one third; ten twentieths; thirty one hundred and eighths; twelve hundred ninety-thousandths; three sevenths of nineteen forty-fifths.

8. Write: three and a half; sixty-five and twenty-three forty-eighths: eighteen and eleven eighty-fourths.

REDUCTION.

62. Reduction of Fractions is the changing of their form without changing their value.

63. To reduce integers or mixed numbers to improper fractions.

EXAMPLE 1.—In 18 units how many fifths? SOLUTION. In 1 unit there are 5 fifths " 18 units " 18 times 5 fifths ar 90 fifths (90) Hence 18 = 90 EXAMPLE 2.—Reduce 183 to an improper fraction.

| 109 | EXPLANATION. | | | | |
|-------------------|--------------|----------------------------------|--|--|--|
| 18 <u>8</u> 93 | (Example 1) | 18 = 90 fifths | | | |
| 5 | | $\frac{3}{5} = 3$ fifths | | | |
| • | | $18\frac{3}{5} = 93$ fifths (23) | | | |
| | RULE. | - (87 | | | |

Multiply the whole number by the denominator of the fraction, to the product add the numerator, and set their sum over the denominator.

FRACTIONS.

EXERCISE 27.

Reduce to improper fractions-

| I. | 11. | 111. | IV. | V. |
|-----|--------------------|---------------------|----------------|--------------------|
| 71. | 2 ; . | 193. | 27 <u>7</u> 2. | 83. |
| 23. | 3 ₁₇₁ . | 18 14 . | 58275. | 5 3 . |
| 31. | 8 <u>9</u> 0. | 37 ₁ 3. | 9533. | 19 18 . |
| 41. | 7 <u>6</u> 3. | 33 ₁ 57. | 4149. | 11247 |

64. To reduce an improper fraction to an integer or a mixed number.

Example.-Reduce 48 to a mixed number. So

| OLUTION. | EXPLANATION. |
|-------------------|---|
| <u>) 48</u> 93 | Since 48 expresses an unperformed division (Art. 56), therefore by performing the division we obtain 93 for quotient. |

EXERCISE 28.

Reduce to mixed numbers-

| 1. * 25 25 124 | II. 149 1284 229 | III. 549 850 1628 | IV. 216 878 |
|-------------------------|---------------------------|----------------------------|------------------------------|
| 124 4264 12 | 8276 104 13 | 1337 1337 478 | 974 2140 784 |

65. To reduce a fraction to higher terms.

EXAMPLE.-Reduce 2 to sixteenths.

SOLUTION.

EXPLANATION.

 $\frac{3}{4} = \frac{3 \times 4}{4 \times 4} = \frac{3}{4} \times \frac{4}{4} = \frac{12}{16}$

Since it is required to change # to sixteenths, (i.e) a fraction whose denominator is 16, we must multiply the denominator 4 by 4; then by Art. 57, III., so as not to change the value of the fraction, we must multiply the numerator 3 by 4.

RULE.

To reduce a fraction to higher terms, divide the required denominator by the denominator of the given fraction and multiply both terms by the quotient.

V. 83. 53. 1918. 12<u>1</u>3.

iteger or

performed performing ptient.

7. 4 a 4, 0 ±

to six. ominator ominator s not to we must

quired n and

FRACTIONS.

EXERCISE 29.

| 2. 3. 4. 5. 6. 7. 8. | 3 5 5 5 7 <th7< th=""> <th7< th=""> <th7< th=""> <th7< th=""></th7<></th7<></th7<></th7<> | to twelfths. to eighteenths. to eighths. to twenty-fourths. to seventy-seconds. to sixteenths. to fifty-fourths. to forty-fifths. |
|--|---|--|
| 9. | 8, 1, 18, 17, 17 | to forty-eighths. |
| 10. | 7, 3, 7, 11, 17 | to thister a sta |
| | 0, 4, 12, 3, 18 | to thirty-sixths. |

66. To reduce a fraction to its lowest terms.

Solution. $\frac{12}{16} = \frac{12 \div 4}{16 \div 4} = \frac{3}{4}$ or $4 \left| \frac{12}{16} = \frac{3}{4} \right|$

Reduce-

EXPLANATION. By Art. 57, III., we may divide both numerator and denominator by 4 without changing the value of the fraction.

RULE.

Divide both terms of the fraction successively by all the prime factors common to the two, or by the continued product of all the prime factors, (i.e) their highest common factor. (H. C. F.)

Norz.--A fraction is in its lowest terms when the numerator and denominator have no common factor.

EXERCISE 30.

Reduce to lowest terms--

| I. | II. | III. | IV. | - |
|----------------|---------------|------|----------------|-------|
| 11 | 340 | | | ▼. |
| ++ | | ++ | 188 | 1888 |
| | 124 | ** | 118 | 1932 |
| 7 1 | 18 | 194 | 193 | |
| - | 18 | | | 1988 |
| * | | 105 | 111 | 10991 |
| 10 | # # | 207 | *** | 1849 |
| # | # | 121 | | |
| - | | | 788 | 4823 |

67. To reduce two or more fractions which have different denominators to equivalent fractions having a least common denominator.

Norz.-Since the common denominator must be the same for each fraction, and fractions can be changed to equivalent fractions having a

FRACTIONS.

different denominator (Art. 65), therefore the common denominator must contain each of the denominators of the given fractions exactly. The least number that will contain each of the given denominators is their L.C.M. Therefore the least common denominator of the fractions must be the L. C. M. of their denominators.

EXAMPLE. - Change 1, 1, 1 to equivalent fractions having a least common denominator. SOLUTION.

EXPLANATION.

The least common denominator = L. C. M. of 2, 3 ,8 = 24. 1 = 11

- 1 = 11
- 1 = 2 (Art. 65)

We first find the L. C. M. of the given denominators which is 24. This must be the least common denominator to which the given fractions can be reduced (Note Art. 67.) Reducing each fraction to the denominator 24 (Art. 65), we obtain 12, 10, 9, as pesults.

BULE.

I. Find the L. C. M. of the given denominators for the least common denominator.

II. Divide the common denominator by each of the given denominators, and multiply the numerator and denominator of each fraction by the corresponding quotient.

EXERCISE 81

Reduce to their least common denominator.

| I, 8, 7. | |
|--------------------|-----------------------------|
| 2. 2, 1, 1, 10. | 8. 1, 1, 1, 1, 1, |
| 3. 1, 1, 7. | · + + + + + |
| 4. 1, 15, 10. | 10. 22, 7, 2, 27 7 |
| 5. 3, 1, 4. | 11. 02, 21, 10fl 9 .4 . |
| 6. 3 of 3, 13, 42. | TTT, ###, ++++. |
| 7. 1, 23, 11. | 13. 1829, 5787. 4188 |
| ······ | 14. 4, 11, 10, 1, 1, 1, 14. |

ADDITION.

68. EXAMPLE 1 .- Find the sum of \$, 5, 4. SOLUTION.

24ths.

18

21

A 10

EXPLANATION.

In order that fractions may be added they must have like denominators and be parts of like units. # = 18 twenty-fourths. 12 = 21 Ans.

I = 21 twenty-fourths.

 $\frac{5}{12} = 10$ twenty-fourths.

49 twenty-fourths = # = 2 + Ans.

ominator must exactly. The nators is their fractions must

having a least

N.

C. M. of the which is 24. east common oh the given bed (Note Art. raction to the 15), we obtain

rs for the

the given nominator

.

₩. • of **.**

t, H.

be added

21 Ans.

FRACTIONS.

EXAMPLE 2.—Find the sum of 23, 137, 47. Solution.

| 23 137 4 <u>5</u> | 21 10 | EXPLANATION. The sum of the integers, 2, 13 & 4 = 19 The sum of the fractions = $\frac{49}{24}$ = $\frac{2}{234}$ |
|-------------------------|----------|---|
| 21 1 A | ns. 49 = | 21 1 Ans. |
| | | · RULE. |

I. To add Fractions.—When necessary reduce the fractions to their least common denominator : then add the numerators and place the sum over the common denominator.

II. To add Mixed Fractions.— Add the integers and fractions separately, and then add their sums.

Note.-All fractions should be reduced to their lowest terms, and if improper, to whole or mixed numbers.

EXERCISE 32.

Find the arm of

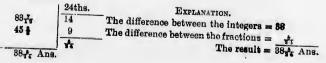
| rind the sum oi- | |
|----------------------------------|---|
| 1. 1, 2, 3. | 8. 31, 43, 218. |
| 2. 8, 12, 18. | 9. 11. 23, 34, 44, 54, 64. |
| 3. 3, 4, 4. | 10. 75, 108, 41, 77, 08, 08, 08, |
| 4. 8, 4, 19, 78. | 11. $4\frac{7}{15}$, $8\frac{5}{21}$, $2\frac{3}{25}$. |
| 5. 8, 11, 18, 82, 39. | 12. 41, 21, 11, 2, 5, 5, 5, 7. |
| 6. 1, 3, 1, 1, 18, 3. | 18. 248, 181, 48, 70. |
| 7. 1, 1, 1, 1, 1, 1, 1, 1, 1, 1. | 14. 21, 153,58, 438, 65, |

SUBTRACTION.

69. EXAMPLE 1.—Find the difference between $\frac{7}{19}$ and $\frac{3}{5}$.

| 14 | SOLUTION. 24ths. 14 | parts of the same unit. | In order that fractions may be subtracted, they must have like denominators and be parts of the same unit. | | | | |
|----|---------------------------|---|--|--|--|--|--|
| | Ans. | $\frac{\mathbf{T}_{T}}{\mathbf{T}_{T}} = 14 \text{ twenty-fourths (Art. 65.)}$ $\frac{\frac{3}{2}}{\frac{3}{2}} = \frac{9 \text{ twenty-fourths.}}{5 \text{ twenty-fourths}} = \frac{3}{24} \text{ Ans.}$ | | | | | |

EXAMPLE 2.-Find the difference between 837 and 453.



FRACTIONS.

EXAMPLE 3.-Find the difference between 363 and 193.

SOLUTION. 18ths 362 4 194 15 167 Ans. 1

EXPLANATION. You can't take 15 from 18. Borrow unity from 36. Reduce it to eighteenths, and then add result to 15 which makes # 18 from 22 leaves Tr. 19 from 35 leaves 16. Result, 16-

RULE I.

To subtract fractions.-When necessary, reduce the fractions to their least common denominator. Subtract the numerator of the subtrahend from the numerator of the minuend, and place the difference over the common denominator.

RULE II.

To subtract mixed numbers.-Reduce the fractions, if necessary, to a common denominator, and if the fraction in the subtrahend is smaller than that in the minuend, subtract one fraction from the other, and the smaller whole number from the larger whole number. But if the fraction in the subtrahend is larger than that in the minuend, borrow 1 from the whole number. After changing it to the same denominator as the fraction, add it to the fraction in the minuend. Then subtract as before.

EXERCISE 33.

Find the difference between-

| 1. # and | 8 0 | | |
|-------------|---------|-------------|----------------------|
| | - | | 15. 84 and 54. |
| 2. # and : | 2. 9. | de and 13. | and 03. |
| 8. # and | • • • • | 64 and 110. | 16. 37 and 14. |
| | | 35 and 2. | 17 547 |
| 4. 17 and | 4. 11 | 164 and 71 | 17. 547 and 3113. |
| | | TOS and 74. | 18. 19 and 43. |
| 5. # and | 1. 12. | 84 and 14. | 10 1100 |
| 6. 1 and | 10 10 | 01 | 19. 118# and 75#. |
| - 14 and 4 | | 21 and 11. | 20. 3815 and 23, Pr. |
| 7. 14 and 1 | £. 14. | 61 and 211. | ol 0083 and 23 p. |
| | | og and are. | 21. 18# and 54 |

MULTIPLICATION.

70. EXAMPLE 1.-Multiply & by 8.

6

12

SOLUTION.

X 2

EXPLANATION. The numerators are multiplied for a new numerator and the denominators for a new denominator.

row unity s, and then

luce the ract the he minninator.

ions, if tion in ubtract number in the 1 from ominanuend.

iplied e de. ator.

FRACTIONS.

Example 2 .- Multiply 1 by 2 by s by 8. SOLUTION.

EXPLANATION. $\frac{1}{2} \times \frac{\cancel{2}}{\cancel{3}} \times \frac{\cancel{3}}{\cancel{3}} \times \frac{\cancel{3}}{\cancel{3}} = \frac{2}{\cancel{3}}$ See Art. 36.

RULE.

Reduce integers and mixed numbers to improper fractions. Multiply the numerators together for a new numerator, and the denominators for a new denominator. Reduce the result to its simplest form.

Norz.-Cancellation often shortens the operation.

EXERCISE 34.

Find the product of-

| 1. 1 | ׳ | × | 3. | 8. | 2 | × | 12 | × | 8 | ~ | 16 | ~ | 4 | of | 90 |
|-------------------|------|---|----------------|-------|-----|---|-----|---------|----|---------|----|---|-----|---------|--------|
| 2. 3 | × # | × | 2 . | 9. | 3 | ¥ | 15 | 0 | 4 | | | | - | | 20. |
| 3. 🛔 | | | | 10 | 4 | 0 | 10 | <u></u> | * | × | 18 | × | 7 | × | 21. |
| | | | | 10. | 8 | × | 19 | × | 흉 | × | 20 | х | ŧ | х | 27. |
| 2. 8 | ×¥ | × | \$. | 11. 9 | 21 | × | 33 | × | 18 | × | 2 | x | 41 | x | 1 |
| . 7 | ~ * | ~ | 13. | 12. (| 58 | × | 3 | х | 42 | x | 3 | × | 32 | ~ | 22 |
| 6. $\frac{1}{13}$ | × 13 | × | ŧ. | 13. 8 | 34 | × | 19 | × | 34 | 0 | 18 | 0 | 41 | <u></u> | |
| 7. 8 | × H | x | Z. | 14 | ā . | Ĵ | 3 | 0 | | <u></u> | TS | × | 42 | × | \$· |
| 0 | | | 30. | | 7 | ^ | TT. | × | TT | × | 11 | × | - 4 | × | A x 91 |

DIVISION.

71. To divide a fraction by an integer.

EXAMPLE 1.-Divide # by 3.

| | | | So | LUI | TON | ſ. | | | | |
|----|-----|-----|----|-----|-----|-----|----|----------------|--|--|
| 21 | | 2 | _ | 21 | ÷ | 8 | | $\frac{7}{25}$ | | |
| 25 | Ŧ | 0 | - | | 25 | | = | 25 | | |
| Ex | AM) | PLE | 2. | 1 | Div | ide | 21 | by 2 | | |

| SOLUTION. | |
|-----------|---|
| 8 | 8 |
| 4 x 2 = | 8 |

Ans.

EXPLANATION. Art. 57, 2,

EXPLANATION. Art. 57, 2.

Example 3.-Divide 343 by 11.

SOLUTION.

84 + 11 = 3, rem. 1 5 ā 83 8<mark>5</mark> 33

EXPLANATION.

Divide the integer by 11, quotient 8, rem. 1. This rem. prefixed to the fraction makes 13, or 5, yet to be divided. Divide this improper fraction and combine the results.

FRACTIONS.

 $\begin{array}{r} \text{or} \\ 34\frac{2}{3} \div 11 \end{array}$ $\begin{array}{r} 3 + \overline{3} \div 11 \\ = \frac{104}{3} \div 11 = \frac{104}{3 \times 11} \\ = \frac{104}{33} = 3\frac{5}{33} \quad \text{Ans.} \end{array}$

EXPLANATION. Reduce the mixed number to an improper fraction and proceed as in example 2.

Divide_

| 1. 12 by 4. 2. 3 by 6. 3. 17 by 8. 4. 5 by 7. 5. 17 by 3. | | by 7. | 11. 12. 13. 14. | 19 3 16 4 11 ₁ 1 | by by by 1 | 8. 7. 11. |
|---|---|--------|--------------------------|---|------------------|-----------------|
| | - | - , 0, | 10. 3 | 2.1.0 | 6 | 0 |

EXERCISE 35.

72. To divide a fraction by a fraction.

Example .- Divide # by #.

| | | | | LIAPLANATION. |
|---|---|---|---|---|
| ł | ÷ | 3 | SOLUTION. = $\frac{3}{5} \times \frac{3}{2} = \frac{9}{10}$ (<i>i.e.</i> | $\frac{3}{5} \div \frac{3}{2} =$ 3 fifths ÷ 2 thirds $= 9 \text{ fifteenths} \div 10 \text{ fifteenths Art. 65}$ $= \frac{9}{10} = \frac{3 \times 3}{5 \times 2} = \frac{3}{5} \times \frac{3}{2} = \frac{9}{10} \text{ Ans.}$ e) $\frac{3}{5} \text{ multiplied by } \frac{3}{5}, \text{ (the divisor inverted).}$ |

RULE.

Invert the divisor and proceed as in multiplication of fractions.

| | Divide- | EXERCISE 36. |
|--|--|--|
| 1. 2. 3. 4. 5. 6. 7. 8. 2. 9. 10. 11. 12. 13. | \$ by \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ |
| | | |

ber to an ceed as in

Art. 65 Ans. verted).

on of

× ##

21. 8.

FRACTIONS.

GREATEST COMMON MEASURE.

78. A Measure of a fraction is any number that is contained in the fraction an exact integral number of times ; thus $\frac{1}{12}$ is a measure of $\frac{1}{4}$, being contained in it 8 times. Hence.

74. A fraction is a measure of a given fraction when its numerator is a measure of the given numerator, and its denominator is a multiple of the given denominator,

75. A Common Measure of two or more fractions is any number that is contained in each an exact integral number of times; thus, $\frac{1}{24}$ is a common measure of $\frac{1}{3}$ and $\frac{1}{2}$, being contained in $\frac{1}{2}$ 8 times, and in $\frac{1}{2}$ 6 times.

Hence.

76. A fraction is a common measure of two or more given fractions when its numerator is a common measure of the given numerators, and its denominator is a common multiple of the given denominators.

77. The Greatest Common Measure of two or more given fractions is the greatest number that is contained in each an exact integral number of times; thus, $\frac{1}{12}$ is the greatest common measure of $\frac{1}{3}$ and $\frac{1}{4}$.

Hence,

78. A fraction is the greatest common measure of two or more given fractions when its numerator is the greatest common measure of the given numerators and its denominator is the least common multiple of the given denominators.

Example .-- Find the greatest common measure of §, 1, and 18.

SOLUTION.

The G. C. M. of 5, 5 and 15 = 5The L. C. M. of 6, 12 and 16 = 48

Therefore the G. C. M. of the given fractions is $\frac{1}{18}$ Ans.

$$\frac{1}{6} \div \frac{5}{48} = 8$$

- $r_2 \div r_3 = 4$
- $\frac{18}{18} \div \frac{4}{18} = 9$

The quotients 8, 4 and 9 are prime to each other.

FRACTIONS.

From these principles and illustrations we derive the following rule :

BULE

I. Reduce whole and mixed numbers to improper fractions and all fractions to their lowest terms.

II. Find the greatest common measure of the given numerators for a new numerator, and the least common multiple of the given denominators for a new denominator. will be the greatest common measure sought. This fraction

EXERCISE 37.

Find the greatest common measure of-

| ~ | | 4, | T. |
|----|-----------------|-------------------|-----------------|
| 2. | | 34. | 28 |
| 8. | 19 , | 28 , | |
| 4. | | 137, | |
| 5 | | | 63 V- |
| ~ | -10, | 218, | 328, 108. |
| 0. | 1 197. | 1 93 , | 432, 528, 1221. |
| 7. | +, | £, | |
| 8. | 8, | ÷, | |
| | -, | 7, | 9, 11. 9, 18 |

LEAST COMMON MULTIPLE.

79. A Multiple of a fraction is any number that contains the fraction an exact integral number of times; thus, 1 is a multiple of 1, since 1 contains 1 3 times.

Hence.

SO. A fraction is a multiple of a given fraction when its numerator is a multiple of the given numerator, and its denominator a measure of the given denominator.

S1. A Common Multiple of two or more given fractions is any number that contains each an exact integral number of times; thus, $\frac{2}{3}$ is a common multiple of $\frac{1}{12}$ and

 $\frac{1}{5}$, containing $\frac{1}{15}$ 8 times, and $\frac{1}{5}$ 6 times. Hence,

82. A fraction is a common multiple of two or more given fractions when its numerator is a common multiple of the given numerators, and its denominator is a common measure of the given denominators.

ive the

actions

numertiple of raction

conhus,

its its

ons ral nd

le n

FRACTIONS.

83. The Least Common Multiple of two or more given fractions is the least number that contains each an exact integral number of times; thus, $\frac{1}{3}$ is the least common multiple of $\frac{1}{12}$ and $\frac{1}{3}$.

Hence,

84. A fraction is the least common multiple of two or more given fractions when its numerator is the least common multiple of the given numerators and its denominator the greatest common measure of the given denominators.

EXAMPLE.-Find the least common multiple of 3, 4, and 45.

SOLUTION. L. C. M. of 3, 5 and 15 = 15 G. C. M. of 4, 12 and 16 = 4 Therefore the L. C. M. of the given fractions = $\frac{14}{3}$

> PROOF. $\frac{15}{7} \div \frac{3}{7} = 5$

 $\frac{15}{4} \div \frac{5}{12} = 9$

 $\frac{15}{4} \div \frac{15}{18} = 4$

The quotients 5, 9 and 4 are prime to each other.

From these principles and illustrations we derive the following rule:

RULE.

I. Reduce whole and mixed numbers to improper fractions and all fractions to their lowest terms.

II. Find the least common multiple of the given numerators for a new numerator, and the greatest common measure of the given denominators for a new denominator. This fraction will be the least common multiple sought.

EXERCISE 38.

Find the least common multiple of-

| 1. | 8 , | 7 10, | 18, | - | k . | • | |
|----|----------------|-------------|------------------|-----|------------|-----|---|
| 2. | 7 24, | 35, | \$8 , | 1 | 8. | | |
| 8. | 10, | 38, | 18 | , 2 | | | |
| 4. | 233, | 137, | | • | | | |
| 5. | | 210 221, | 1 28 | 80, | 17. | | |
| 6. | 11, | 21, | | 41, | 51. | | |
| 7. | 4, | 8, | \$, | Ar. | 81, | 18, | 讣 |

DECIMALS.

DECIMALS.

85. A Decimal Fraction, commonly called Decimal, is one whose denominator is 1 followed by one or more

As 10, 100, 1000, 18000.

86. Since the denominators of decimal fractions increase or decrease by the uniform scale of 10 (the same scale as that used in expressing integers), a system of notation similar to that of integers is employed to express them, thus saving the trouble of writing the denominators.

87. The Decimal Sign (.) or decimal point determines, by its position, the denominator of the fraction, and, in a number composed of an integer and a decimal, it shows where the decimal part begins.

SS. This system of notation will be best explained by the following examples :

ŵ is written .3, and is read 3 tenths. 180 .03, " ** 3 hundredths. 1000 .003. " " 3 thousandths.

The numerator alone is written, and there must be as many figures to the right of the decimal point as there are ciphers in the denominator of the fraction. The vacant orders, if any, must be filled with ciphers.

S9. The relation of decimals and integers to each other is clearly shown in the following table : TABLE.

| Nates. | etc. Hundred mill ions . Millions. | Hundred thousands. Ten thousands. Thousands. | Hundreda, Tens. Units. Tentha. Hundredtha. | Thousandths. Ten-thousandths. Hundred-thousandths. | Milliontha. Ten-milliontha. Hundred-milliontha. etc. |
|-------------------|---|--|---|--|--|
| Units. Orders. | 9th. 5 Ha 8th. 5 Ha 7th. 5 Mil | 6th. 7 Han 5th. 7 Hen 4th. 8 Tho | 2nd. & Hundre 3rd. & Tens. 1st. & Units. 2nd. & Tenths. 3rd. & Hundre | ith. & Thou 5th. & Ten-t 6th. & Hund | 7th. & Milliontha. 8th. & Ten-millior 9th. & Hundred-m etc. |

ecimal, or more

ncrease cale as otation them, mines. l, in a shows

by the

many ers in any,

ther

DECIMALS.

From this it appears that

 $2222.222 = 2000 + 200 + 20 + 2 + \frac{2}{10} + \frac{2}{100} + \frac{2}{1000}$

90. The method of representing decimal fractions is merely an extension of the method by which integers are represented, since the local value of each digit increases tenfold as we advance from right to left, and also decreases in the same proportion as we advance from left to right.

From the foregoing we derive the following principles :

PRINCIPLES.

91. 1. Decimals are governed by the same law of local value that governs the notation of integers.

2. The different orders of decimal units decrease from left to right and increase from right to left in a tenfold ratio.

3. The value of any decimal figure depends upon the place it occupies at the right of the decimal point.

4. Each removal of a decimal order one place to the left increases its value tenfold.

5. Each removal of a decimal order one place to the right decreases its value tenfold.

6. Prefixing a cipher to a decimal diminishes its value tenfold, since it removes every decimal figure one place to the right.

7. Annexing a cipher to a decimal does not alter its value. since it does not change the place of any figure in the decimal.

| | | EXERCISE 3 | 39. | |
|---------|--------------|-------------|---------------|-----------------|
| Expres | s in decima | al form and | read- | |
| I. | II. | III. | IV. | v. |
| 10 | 125 | 1880 | 215 1000 | 200 |
| 10 | 1000 | 1000 | 8274 10000 | 10000 |
| 12 | 1030 | 1000 | 4965 100 | 100000 |
| 160 | 100 | 783 | 10000 | 1187 |
| Express | s in the for | m of a frac | tion and r | ead— |
| VI. | VII. | VIII. | IX. | х. |
| .9 | .27 | 8.7 | .0005 | .0304 |
| .06 | .006 | 4.05 | .81600 | .00001 |
| .25 | .450 .003 | .005 | .0404 | .15000 |
| .007 | .010 | .186 | .912 | 85.003 |

DECIMALS.

Express as decimals-

XI. Five-tenths,

ninety-seven-hundredths, eleven ten-thousandths.

Thirty, and seven-tenths, XII.

fourteen, and nine-hundredthe. XIII Seventy-four ten-millionths, thirty-six ten-thousandths.

92. A Complex Decimal has a fraction in its right hand place, as .12; which is read 12; hundredths, the fraction not being counted as a decimal place.

Express as common fractions in their lowest terms-X1V. .75, .72, .625, .024, .0032, .12, XV. .131, .163, .571, .663, .4445, .0248.

93. To reduce a common fraction to a decimal.

Reduce & to its equivalent decimal.

| OPERATION. | | | | REASON | 1. | | |
|---------------------|----------|--------------|---|-------------------|----|-------------|------|
| $8) 5.000 \\ 6.25$ | 5 8 = | 5000 8000 | = | 5000 8 1000 | - | 625 1000 | .625 |

94. From this and similar examples we derive the following rule :

RULE.

Annex ciphers to the numerator and divide by the denominator.

Point off as many decimal places in the quotient as there are ciphers annexed.

Nore 1.-If the division is not exact, when a sufficient number of decimal places has been obtained, the sign + may be annexed to show that the division is not complete, or it may be expressed as a complex decimal.

2. A fraction in its lowest terms can be reduced to a pure decimal only when its denominator contains no prime factors but 2 and 5. If the denominator contain any other prime factor the division will not end. The decimals thus produced are called Repeating Decimals, and the figures repeated, Repetends.

EXERCISE 40.

Reduce to equivalent decimals-

| 1. | | 5. | 11 | 9. | 1 | 10 | |
|----|----|----|----|-----|-----|------|------|
| 2. | 18 | 6. | 12 | | | 15. | 12# |
| 3. | 1 | | | 10. | | 14, | 16% |
| | - | 7. | | 11. | 8 | | 25 7 |
| 4. | 8 | 8. | | 12. | 17 | | |
| | | | | | * 0 | J.O. | 314 |

edthe.

undredthe. indthe. ts right hs. the

rms-

1.

= .625

ve the

enomi-

there

ber of o show mplex

eoimal 5. If ill not s, and

DECIMALS.

ADDITION.

95. Since integers and decimals increase and decrease uniformly by the scale of 10, it is evident that decimals may be added, subtracted, multiplied and divided in the same manner as integers.

Add 18.6, 5.034, .8172, 14.52.

EXPLANATION.

| 13.6 | If the decimal points are in the same |
|---------|---|
| 5.034 | vertical line it will necessarily bring |
| .3172 | tenths under tenths, hundredths under |
| 14.52 | hundredths, etc., and the numbers may |
| 33.4712 | therefore be added as in integers, |

BULE.

96. Write the numbers so that their decimal points are in the same vertical line. Add as in integers, and place the decimal point in the result directly under the points in the numbers added.

EXERCISE 41.

| Add- | | | |
|------|------|----|----|
| 1 | 3649 | 90 | 03 |

| 1. | .3642, | 26.035, | .0037, | 3.4, | .017. |
|----|---------|---------|---------|--------|-----------------|
| 2. | 41.234, | 17.015, | 3.3, | 400.2 | .0045. |
| 8. | .0126, | 40.371, | .7251, | .0021, | |
| 4. | .063, | 3.8053, | 40.036, | .00313 | |
| 5. | .0044, | 36.023, | 7.34. | .371. | |
| | | | | | ed and three th |

d three thousand ths. thirteen ten-thousandths, sixteen, and fifteen hundredths, forty-seven, three hundred and twelve, and sixty-four thousand the.

SUBTRACTION.

97. From 13.65 take 9.3652.

| 18.6500 | |
|---------|--|
| 9.3652 | |
| 4.2848 | |

Note .- The affixing of ciphers to right of the decimal does not alter its value. In practice we omit the decimals, and merely conceive them to be annexed, subtracting as otherwise.

RULE.

98. Write the numbers so that the decimal places shall stand directly under each other. Subtract as in whole numbers, and place the decimal point in the result directly under the points in the given numbers.

DECIMALS.

EXERCISE 42.

Find the difference between-

| 2. 3. | 17.205 and 4.037 and 37.004 and 400.7 and | .2735. 16.39253 | 6. 7. | From From Subtrac | .3074 ct 30.3 | take 65 | .2965 | 30.3782. |
|----------|--|--------------------|----------|-------------------------|------------------|------------|-------|----------|
|----------|--|--------------------|----------|-------------------------|------------------|------------|-------|----------|

MULTIPLICATION.

99. In multiplication of decimals, the position of the decimal point in the product depends upon the following principles :

1. The number of ciphers in the denominator of a decimal is equal to the number of decimal places.

2. If two decimals in the fractional form be multiplied together, the denominator of the product must contain as many ciphers as there are decimal places in both factors. Therefore,

8. The product of two decimals expressed in the decimal form must contain as many decimal places as there are decimals in both factors.

Multiply .314 by .23.

| .314 | |
|-------|--|
| .23 | |
| 942 | |
| 628 | |
| 07222 | |

Norz.—The number of decimal places in both factors is 5. The number of figures in the product is only 4, and therefore a cipher must be prefixed.

Multiply-

EXERCISE 43.

| 175 by .4. 2410 by .32. 3. 5.75 by .38. 4741 by .025. 5. 3.26 by 40.4. | 6015 by .003. 7. 2.371 by .018 8435 by 1.203. 9. 03 × .05 × .016 × .54. 10304 × .2 × .03 × .25. |
|--|---|
|--|---|

100. Multiply as in whole numbers and from the right hand of the product point off as many figures for decimals as there are decimal places in both factors.

0127. 29653. and 30.3782. and .0126.

on of the following

tor of a

nultiplied Intain as factors.

decimal here are

nal places number of ly 4, and ixed.

16 × .54. 3 × .25.

right as

DECIMALS.

CONTRACTIONS IN MULTIPLICATION.

101. Multiply 62.87416 by 2.84169 so as to retain only 4 places of decimals.

| ORDINARY ME | THOD. | CONTRACTED METHOD. | | | | | | |
|-------------|-------|--------------------|---|-------|---|---|---|---|
| 62.3 | 7416 | 62.37416 | | | | | | |
| 2.34 | | 96143.2 | | | | | | |
| 56 130 | 6744 | 1247483 | = | 62374 | × | 2 | + | 1 |
| 874 244 | | 187122 | = | 62374 | × | 3 | | |
| 623 74 | | 24950 | Ŧ | 6237 | × | 4 | + | 2 |
| 24949 664 | 4 | 624 | = | 623 | × | 1 | + | 1 |
| 187122 48 | | 374 | = | 62 | × | 6 | + | 2 |
| 1247483 2 | | 56 | = | 6 | × | 9 | + | 2 |
| 146.0609 46 | 7304 | 146.0609 | | | | | | |

102. It frequently happens in multiplication that a greater number of decimal figures is obtained in the product than is necessary for practical accuracy. This may be avoided by contracting each partial product to the required number of decimal places.

103. From this principle and illustrations similar to the foregoing example we derive the following:

RULE.

Write the multiplier with the order of the figures reversed, and with the units place under that figure of the multiplicand which is the lowest decimal to be retained in the product.

Find the product of each figure of the multiplier by the figures above and to the left of it in the multiplicand, increasing each partial product by as many units as would have been carried from the rejected part of the multiplicand, and one more when the highest figure in the rejected part of any product is 5 or greater than 5; and write these partial products with the lowest figure of each in the same column.

Add the partial products, and from the right hand point off the required number of decimal figures.

NOTE 1.—In obtaining the number to be carried it is generally necessary to multiply (mentally) only one figure at the right of the figure above the

DECIMALS.

multiplying figure; but when the figures are large the multiplication should commence at least two places to the right.

2. There is always a liability to an error of one or two units in the last place.

3. When the number of places in the multiplicand is less than the number to be retained in the product, supply the deficiency by annexing ciphers.

EXERCISE 44.

| 1. | 36.275 | × | 4.3678 | retaining | 2 | decimal | nlagon |
|----|---------|---|---------|-----------|---|---------|---------|
| 2. | | × | 467.32 | " | 3 | " | praces. |
| 3. | 17.0036 | × | .08245 | ** | 4 | " | |
| 4. | .43261 | × | .73158 | 66 | 3 | ** | |
| 5. | .003647 | × | .12739 | ** | 4 | ** | |
| | 700.375 | × | .02736 | ** | 3 | ** | " |
| 7. | .374825 | × | .693847 | ** | 5 | " | " |

DIVISION.

PRINCIPLE.

104. Multiplying both divisor and dividend by the same number does not alter the quotient.

105. Multiplying a decimal expression by 10, moves the decimal point one place to the right; by 100, two places to the right; by 1000, three places to the right, etc. Therefore, moving the decimal point in divisor and dividend the same number of places to the right, multiplies each of them by the same number.

EXAMPLE 1.-Divide 16.578 by 5.4.

| 0.3) 10.010 (| EXPLANATION. |
|-----------------------|--|
| 878 | Multiply the divisor and dividend by 10 and we obtain 54 as divisor and 165.78. Now 54 will divide into 165, 3 times, and therefore 8 is the integral part of the quotient |
| AMPLE 2Divide .786644 | br 024 0 |
| | by 254.0 |

234.6) .736644 (

Ex

2346) 7.36644 (.00314

Here in dividing we use as the first partial dividend 7.366 or 7366 thousandths, and hence our first quotient figure 3 thousandths which expressed as a decimal is .003.

ultiplication

inits in the

s than the y annexing

laces.

66 66 66

**

**

he same

oves the laces to Thereand the of them

dividend divisor vide into 8 is the

as the or 7366 ir first which

DECIMALS.

RULE.

106. Move the decimal point to the right of the divisor, and the same number of places to the right in the dividend. Divide as in simple division, placing the decimal point in the quotient as soon as the tenths figure is used or brought down.

Norm.—If the dividend does not contain as many decimal places as the divisor, annex eiphers to the right of the decimal before removing the points.

EXERCISE 45.

| 1. | 48.591 | ÷ | .96. | 5. | .0 | 774 ÷ | 480. | 9. | 10.66 | ÷ 1.3. |
|----|--------|------|----------|-----|-------|-------|---------|---------|--------|---------|
| 2. | 2.56 | ÷ | .0032. | 6. | 21.3 | ÷ | 37.5. | 10. | 15.77 | ± 10 |
| 3. | 3.1 | ÷ | .025. | 7. | 202 | ÷ | .01 | . 11. | 134.25 | + 75 |
| 4. | .0012 | ÷ | 1.6. | 8. | 406.8 | ÷ | .01 | 8. 12. | .7332 | 26 + 33 |
| | 13. I | Div | ide 1.21 | 25 | 11, | 1.1, | .11, .0 | 011, .0 | 011000 | 011. |
| | 14, I | Divi | ide .03" | 393 | 00. | 180. | 18. | 18 | 018 | |

CONTRACTED DIVISION.

107. Divide 763.14163 by 21.3642, correct to four places of decimals.

| ORDINARY METHOD. | CONTRACTED METHOD. | | | | | | | |
|---|---|--|--|--|--|--|--|--|
| 213642) 7631416.3 (35.7205 640926 122215 6 1068210 | 218642) 76314163 (35.72 05 640926 122215 | | | | | | | |
| 15394 14954 439 590 | $ 106821 \\ \overline{15394} \\ \underline{14955} \\ \overline{489} $ | | | | | | | |
| $ \begin{array}{r} \underline{427} \\ \underline{12} \\ \underline{40600} \\ \underline{10} \\ \underline{68210} \\ \underline{172390} \\ \end{array} $ | $ \frac{427}{12} \frac{11}{1} $ | | | | | | | |

RULE.

108. Compare the highest or left hand figure of the divisor with the units of like order in the dividend, and determinc how many figures will be required in the quotient.

For the first contracted divisor take as many significant figures from the left of the given divisor, as there are places

47

12 Jar

DECIMALS

required in the quotient, and, at each subsequent division reject one place from the right of the last preceding divisor.

In multiplying by the several quotient figures, carry from the rejected figures of the divisor as in contracted multiplica-

Norg.-Before commencing the work, supply ciphers at the right of either divisor or dividend, when necessary.

EXERCISE 46. 1. 27.3782

| 2 | 487.24 | 5 | 4.3267 | correct | to a | decimal | | |
|----|----------|----|----------|---------|------|-----------|---------|--|
| 3, | P.47326 | by | | " | | uecimal | places. | |
| 4. | · •=1040 | by | 75.43 | | 4 | ** | 44 | |
| | •0=07004 | by | .075637 | " | 5 | 66 | ** | |
| 5. | 478.325 | by | | | 3 | ** | ** | |
| 6. | 8972.436 | | 756.3452 | ** | 3 | ** | " | |
| 7. | 1 | by | 100.3452 | 44 | 4 | •• | | |
| з. | 059700 | by | 1.007633 | 44 | 6 | | | |
| | .003728 | bу | 44.73654 | 44 | | | "" | |
| | | | | | | ** | | |

REPEATING, CIRCULATING OR INTERMI-NATE DECIMALS.

109. In reducing common fractions to equivalent decimals, reference was made in Article 94, Note 1, to the methods of expressing the decimals in cases where the division does not terminate. But if the division were carried far enough (never to number of places in the quotient greater than the number represented by the divisor) a remainder would be obtained which had occurred before, and hence a figure or set of figures in the quotient would be repeated in the same order in a never-ending succession. A decimal of this kind is called a repeating or circulating decimal, or simply a repetend.

110. When a repetend consists of a single figure it is indicated by a point placed over it; when it consists of more than one figure a point is placed over the first and one over the last figure repeated. Thus the circulating

48

Divide-

division reiect

, carry from d multiplica-

t the right of

places.

**

**

"

..

"

ERMI-

ent deci-, to the here the on were in the by the ccurred uotient ending eating

e it is sts of t and ating DECIMALS.

decimals .4444 + and .324324324 + are written .4 and .324.

111. If we take any fractions whose denominator consists of any number of 9's, as $\frac{4}{5}$, $\frac{324}{526}$, and we reduce each of them to decimals, we obtain

 $s = .444 + = .\dot{4}; \ s = .2424 + = .\dot{2}\dot{4}; \ s = .324324 + = .\dot{3}2\dot{4}.$ From these and similar examples we infer that all possible repetends can thus be derived from fractions whose numerators are the repeating figures, and whose denominators are as many 9's as there are repeating figures.

EXAMPLE 1.—Express $\frac{5}{4}$ as a repeating decimal. 7) 5 (.714285714285 + = .714285 EXAMPLE 2.—Express $\frac{1}{28}$ as a repeating decimal. 28) 18 (.46428571428571 + = 46428571.

112. Decimals in which all the figures do not repeat are called Mixed Circulating Decimals.

EXAMPLE 3.-Express .25 as a common fraction.

From similar examples to this we derive the following rule :

RULE.

Omit the points and decimal sign and write the figures of the repetend for a numerator and as many 9's as there are places in the repetend for a denominator.

EXAMPLE 4.-Fxpress .2456 as a common fraction.

| BOL | JTION. | |
|------|---------------|-----|
| 2456 | | |
| 24 | | |
| 2432 | 3488 | Ane |

DECIMALS.

EXPLANATION.

From examples similar to the preceding, we derive the following rule for reducing mixed circulating decimals (those in which only a portion of the figures in the decimal repeat) to common fractions.

RULE.

Subtract the part of the decimal which does not repeat from the whole decimal as if each were whole numbers, and place the remainder as a numerator, and for a denominator as many 9's as there are figures repeating, followed by as many 0's as there are figures in the part which does not repeat.

EXERCISE 47.

Express as circulating decimals-

2. 18, 13, 11, 17, 18, 18, 18, 18, 18.

Express as fractions in their lowest terms-

| 3. | .7, | .57, | .306, | .45, | .369, | .162. | .2635. |
|----|-------|---------|--------|--------|-------|-------|--------|
| 4. | 27, | .47, | .31, | .235. | .245 | 31724 | 71.0 |
| 5. | .036, | .00247, | .0356, | .2516. | .0357 | .7152 | |

WEIGHTS AND MEASURES.

CANADIAN CURRENCY.

113. Money is the measure of value.

114. Currency is the money employed in trade.

115. Coins or Specie are species of metal of known purity and weight, stamped at the Mint, and authorized by the Government to be used as money at fixed value.

116. Bullion is uncoined gold or silver, and includes bars, gold-dust, etc.

117. Paper Money is a substitute for metallic currency. It consists of Dominion Notes issued by the Government and Bank Notes issued by Chartered Banks.

118. Gauada money is the legal currency of the Dominion of Canada. It is founded on the Decimal Notation, and its denominations are, Dollars, Cents and Mills.

119. The Silver coins are the fifty-cent piece, the twentyfive-cent piece, the twenty-cent piece, the ten-cent piece and the five-cent piece.

The Copper coin is the cent.

There are no Canadian gold coins; those of England and the United States are a legal tender.

 TABLE,

 10 Mills = 1 Cent
 - ct. or #.

 100 Cents = 1 Dollar
 - dol. or \$.

656 + + + - 24

we derive the decimals (those lecimal repeat)

not repeat from bers, and place lenominator as ed by as many tot repeat.

.2635. .71271.

UNITED STATES MONEY.

121. U. S. Money is the legal currency of the United States, and is often called Federal Money. Its denominations are Eagles, Dollars, Dimes, Cents and Mills.

122. The Gold coins are the double eagle, eagle, half-eagle, quartereagle, three-dollar piece, and dollar.

123. The Silver coins are the dollar, half-dollar, quarter-dollar, and dime.

The Nickel coins are the one-cent and three-cent pieces. The Bronze coin is the one-cent piece.

| 124. | | BLE. | |
|------|-----------------------------------|--|---|
| 124. | 10 Cents 10 Dimes or 100 Cents | = 1 Cent $= 1 Dime$ $= 1 Dollar$ $= 1 Eagle$ | - ct. - d. - dol. or 8 - E. |

ENGLISH MONEY.

125. English or Sterling money is the currency of Great Britain.

126. The unit is the Pound Sterling, which is represented by a gold sovereign, is equal in value to \$4.8665.

| 127. | | | | BLE | | | | |
|-------|-------|--------------|----------|-----|----|------------|----------|----|
| 1.57. | 4 Fa | rthings (qr. | Or far) | _ | а. | D . | | |
| | 12 Pe | 0.11.1 | | | | | - | d. |
| | | | • | = | 1 | Shilling | | |
| | 20 Sh | llings . | | | | Pound or S | overeign | |
| | 41 0m | llings . | | = | 1 | Guines | or or gr | æ. |

128. The gold coins are the sovereign, and the half-sovereign.

129. The silver coins are the crown (= 5s.), the half-orown (2s. 6d.), the shilling, and the sixpenny piece.

130. The copper coins are the penny, half-penny, and farthing.

131. The standard purity of the gold coins of Great Britain is 22 carats fine; that is $\frac{1}{12}$ pure gold and $\frac{1}{12}$ alloy. That of the silver coins is $\frac{1}{12}$ pure silver and $\frac{1}{12}$ alloy.

TROY WEIGHT.

182. Troy Weight is used in weighing gold, silver and jewels; in philosophical experiments.

The measuring unit is the pound.

ed States, and is Eagles, Dollars,

f-eagle, quarter-

rter-dollar, and

6.

or 8

cy of Great

h is repre-\$4.8665.

gn £.

f-sovereign.

half-orown

nd farthing.

ritain is 22 lver coins is

ilver and

TABLR.

| 133. | 24 Grains (gr.) | = | 1 | Pennyweight | dut. |
|------|-----------------|---|---|-------------|------|
| | 20 Pennyweights | = | 1 | Ounce . | 02. |
| | 12 Ounces | = | 1 | Pound . | lb. |

134. The value of diamonds and other jewels is estimated by carats.

A carat is the weight of four grains.

APOTHECARIES WEIGHT.

135. Apothecaries Weight is used by druggists and physicians in compounding medicines, but drugs and medicines are bought and sold by avoirdupois weight.

The measuring unit is the pound.

The pound, ounce, and grain are the same as in troy weight.

| | TABLE. | | | | | | | |
|------|------------|-------------|---------------|--|--|--|--|--|
| 136. | 20 Grains | = 1 Scruple | • 8c. or 5 | | | | | |
| | 3 Scruples | = 1 Dram | - dr. or 3 | | | | | |
| | | = 1 Ounce | - 02. or 3 | | | | | |
| | 12 Ounces | = 1 Pound | - <i>lb</i> . | | | | | |

APOTHECARIES' FLUID MEASURE.

137. Apothecaries' Fluid Measure is used in mixing liquid medicines.

| 138. 60 Minims, or Drops $(m.) = 1$ Fluid Draohm $f3$ | |
|--|--|
| 8 Fluid Drachms - = 1 Fluid Drachm 73 20 Fluid Ounces - = 1 Fluid Ounce - 73 20 Fluid Ounces - = 1 Pint - 0 8 Pints = 1 Gallon - Conv | |

AVOIRDUPOIS WEIGHT.

139. Avoirdupois Weight is used for all the ordinary purposes of weighing.

The measuring unit is the pound.

1

TABLE.

| | TABLE. | |
|------|--|-------------|
| 140. | 16 Ounces (oz.) = 1 Pound 100 Pounds = 1 Hundredweight 2000 Pounds, or 20 cwt. = 1 Ton | lb. cwt. |
| | 2000 ± 00000 , or $20 \ cwt. = 1 \ Ton$ | T |

LONG TON TABLE.

| 141. | 16 | Ounces (| oz.) | = | 1 | Pound | đ | - | - | lb. | |
|------|------|----------|------|---|---|-------|-----|------|-----|-------|--|
| | 112 | Pounds | | - | 1 | Hund | red | lwei | wht | cont. | |
| | 2240 | Pounds | | = | 1 | Ton | | - | | T. | |

SPECIAL AVOIRDUPOIS WEIGHTS.

| 142. | 100 lbs. Nails . = 1 Keg. |
|------|------------------------------------|
| | 100 lbs. Dry Fish = 1 Quintal. |
| | 196 lbs. Flour $\cdot = 1$ Barrel. |
| | 200 lbs. Beef or Pork = 1 Barrel. |

COMPARATIVE TABLE OF WEIGHTS.

| 4.0 | | | | | TROY. | | AVOI | RDUPOIS. | | APOTHECARIES. | |
|-----|---|-------|---|------|--------|---|------|----------|---|---------------|--|
| | 1 | Pound | = | 5760 | Grains | = | 7000 | Grains | = | 5760 Grains. | |
| | 1 | Ounce | = | 480 | " | = | 4371 | 44 | = | 480 | |
| | | | | 175 | Pounds | = | 144 | Pounds | = | 175 Pounds | |

GRAIN MEASURE.

TABLE.

| .4 | | . 1 | ł |
|----|---|-----|---|
| ч | e | ٠. | |
| | | | |

4 0

| t. | 14 lbs. Blue Grass Seed | = | 1 Bushel. |
|----|-------------------------|----|-----------|
| | 34 lbs. Oats | = | 46 |
| | 36 lbs. Malt | = | ** |
| | 40 lbs. Castor Beans | = | ** |
| | 44 lbs. Hemp Seed - | = | ** |
| | 48 lbs. Barley | = | *6 |
| | 48 lbs. Buckwheat . | == | " |
| | 48 lbs. Timothy Seed | = | " |
| | 50 lbs. Flax Seed | = | " |
| | 56 lbs. Indian Corn - | = | 26 |
| | 56 lbs. Rye | - | 4 |
| | 60 lbs. Wheat - | = | 63 |
| | 60 lbs. Beans | = | 60 |
| | 60 lbs. Red Clover Seed | - | 4 |
| | 60 lbs. Potatoes . | = | ** |
| | 60 lbs. Turnips | = | -4 |
| | 60 lbs. Carrots | - | 44 |
| | 60 lbs. Parsnips | - | ** |
| | 60 lbs. Beets | - | |
| | 60 lbs. Onions | | 11 |
| | 70 lbs. Bituminous Coal | - | 4 |

54

er- n.

DRY MEASURE.

145. Dry measure is used in measuring substances not hquid, as grain, fruit, salt, roots, etc.

TABLE.

| 2 Pints (pt.) | = | 1 | Quart | at. | |
|---------------|---|---|--------|------|--|
| 4 Quarts | = | 1 | Gallon | gal. | |
| | | | Peck | | |
| | | | Jushel | | |

146.

147. The Imperial Standard Gallon, for liquids and all dry substances, is a measure that will contain 10 pounds avoirdupois of distilled water, weighed in air at 62° Fahrenheit, the barometer at 30 inches.

148. The Imperial Gallon contains 277.274 cubic inches.

149. The Imperial Standard Bushel is equal to 8 gallons or 80 pounds of distilled water, weighed in a manner above described.

150. The Standard Bushel contains 2218.192 cubic inches.

LIQUID MEASURE.

151. Liquid Measure is used in measuring liquids; as liquors, molasses, water, etc.

TABLE.

 152.
 4 Gills (gi.)
 = 1 Pint
 pt.

 2 Pints
 = 1 Quart
 qt.

 4 Quarts
 = 1 Gallon
 gal.

 31½ Gallons
 = 1 Barrel
 bbl.

 2 Barrels, or 63 gallons
 = 1 Hogshead
 hhd.

153. The following denominations are also in use :

42 Gallons . . . = 1 Tierce.

- 2 Hogsheads, or 126 Gallons = 1 Pipe, or Butt.
- 2 Pipes, or 4 Hogsheads = 1 Tun.

Nore.—The tierce, hogshead, pipe, butt, and tun, are the names of casks, and do not express any fixed definite measures. They are usually gauged, and have their capacities in gallons marked on them.

154. A Measure is a standard unit established by law or custom, by which extent, dimension, capacity, amount, or value is estimated.

ries. ins.

nds

MEASURES OF EXTENSION.

155. Measures of Extension are those used to ascertain how long a line is, or in calculating the size (extent) of a surface or solid.

A line has only one dimension-length.

LINEAR OR LINE MEASURE.

In measuring length, linear or line measure is used.

TABLE. 156. 12 Inches (in.) . = 1 Foot - ft. 8 Feet . . = 1 Yard . yd. 51 Yards, or $16\frac{1}{2} ft_{-1} = 1 \text{ Rod } - rd$. 320 Rods . . = 1 Mile . mi. EQUIVALENTS.

1 Mile = \$20 Rods = 1760 Yards = 5280 Feet = 63360 Inches.

SURVEYORS' MEASURE.

157. Gunter's Chain, used by land surveyors, is 4 rods, or 66 feet long, and consists of 100 links, each 7.92 inches long.

| | | | AnDL | 14. | | | |
|------|------------|----|------|-----|---------|---|-----|
| 158. | | | | | 1 Link | | |
| | 25 Links | • | • | = | 1 Rod | - | rd. |
| | 4 Rods, or | 66 | Feet | = | 1 Chain | | ch. |
| | 80 Chains | | | = | 1 Mile | | mi |

SQUARE MEASURE.

159. Square Mensure is used in measuring surfaces ; as of land, boards, painting, plastering, etc.

160. Area or Surface has length and breadth only, and is the space or surface included within any given lines.

161. A square inch, square foot or square yard, is a square, each side of which is respectively, 1 inch, 1 foot, or 1 yard in length.

WEIGHTS AND MEASURES. TABLE.

| 162. | 144 | Square | Inches | (89. | in.) | = | 1 | Square Foot | | |
|------|------|--------|--------|------|------|---|----|-------------|---|----------|
| | 9 | Sanoro | Faat | | ., | | | Square Yard | - | #y . JE. |
| | 0.01 | adate | 1.000 | • | • | = | T | Square Yard | - | 89. vd. |
| | 001 | oquare | rards | | | - | 1 | Square Rod | | |
| | 160 | Square | Rode | | | - | - | Acre | • | sy. ra. |
| | 0.40 | Addito | TANTA | • | • | = | T. | Acre | | A. |
| | 040 | Acres | • • | • | | - | 1 | Square Mile | | an. mi |

Artificers estimate their work as follows :

By the square foot : glazing and stone-cutting.

By the square yard : painting, plaster $\mathbf{n}_{i,i}$ paving, ceiling, and paper-hanging.

By the square of 100 square feet: flooring, partitioning, roofing, slating, and tiling.

Bricklaying is estimated by the thousand bricks, by the square yard, and by the square of 100 square feet.

Nores 1.—In estimating the painting of moldings, cornices, etc., the measuring-line is carried into all the moldings and cornices.

2. In estimating brick-laying by either the square yard or the square pf 100 feet, the work is understood to be 12 inches or $1\frac{1}{2}$ bricks thick.

3. A thousand shingles are estimated to cover 1 square, being laid inches to the weather.

SURVEYORS' SQUARE MEASURE.

63. This measure is used by surveyors in computing therea of land.

TABLE.

| 625 | Square Links | = | 1 | Pole | _ | P . |
|-----|---------------|---|---|--------------|---|---------------|
| 16 | Poles | = | 1 | Square Chain | | E. |
| 10 | Square Chains | = | 1 | Acre - | | sy. cn. A. |
| 640 | Acres | = | 1 | Square Mile | | 8a. mi. |

CUBIC MEASURE.

14.

165 Jubic Measure is used in measuring solids or volume

166. solid is that which has length, breadth, and thickness

of a

•

hes.

rods, ches

; as

and

sa, or

167. A Cube is a regular solid bounded by six equal squares called faces. Hence length, breadth, and thickness are equal to each other.

TABLE.

| 68. | 1728 | Cubic Inches (cu. in.) | = | 1 Cubic Foot . cu. ft. |
|-----|-----------------|--|---|---------------------------------|
| | 27 | Cubic Feet | = | 1 Cubic Yard - cu.ud. |
| | 40 | Cubic Feet of Round Timber, or Cubic Feet of Hewn " | | 1 m |
| | 50 | Cubic Feet of Hewn " | = | $1 \text{ ton} \cdot \cdot T$. |
| | 16 | Cubic Feet | - | 1 Cord Foot - cd. ft. |
| | 8 | Cord Feet, or 128 Cubic Feet | = | 1 Cord of Wood Cd. |
| | $24\frac{8}{4}$ | Cubic Feet | = | 1 Perch of Stone Pch. |

Notes .--- 1. A cubic yard of earth is called a load.

2. Railroad and transportation companies estimate light freight by the space it occupies in cubic feet, and heavy freight by weight.

3. A pile of wood 8 feet long, 4 feet wide, and 4 feet high, contains 1 cord; and a cord foot is 1 foot in length of such a pile.

4. A perch of stone or of masonry is $16\frac{1}{2}$ feet long, $1\frac{1}{2}$ feet wide, and 1 foot high.

5. Joiners, bricklayers, and masons, make an allowance for window doors, etc., of one half the openings or vacant spaces. Bricklayers and masons, in estimating their work by cubic measure, make no allowage for the corners of the walls of houses, cellars, etc., but estimate their to be by the girt, that is, the entire length of the wall on the outside.

MEASURE OF TIME.

169. Time is the measure of duration. The measuring unit is the day.

170. Time is naturally divided into days and years. Thormer are measured by the revolution of the earth on its axis; the late by its revolution around the sun.

TABLE

| 171. 60 Seconds (sec.) = 1 Minute 60 Minutes = 1 Hour 24 Hours = 1 Day 7 Days = 1 Week 365 Days = 1 Common Ye 366 Days = 1 Leap Year | |
|--|--------|
| 60 Minutes . = 1 Hour . 24 Hours . = 1 Day . 7 Days . . = 1 Week 365 Days . . = 1 Common Ye | . nin. |
| 24 Hours . = 1 Day . 7 Days . = 1 Week . 365 Days . = 1 Common Ye | I hr. |
| 7 Days = 1 Week . 365 Days = 1 Common Ye | da. |
| 365 Days = 1 Common Ye | wk. |
| 366 Davs - 1 Lean Voor | |
| | l. yr. |
| 12 Calendar Months . = ! Civil Year | yr. |
| 100 Years = 1 Century / - | О. |

ual

ck-

.ft. .yd. T. . ft. Cd.

ch.

the

s 1

11

y H

e

10

59

172. The Civil Year includes both common and leap years, and is divided into 12 Calendar Months, viz. :

| January (Jan. |) | • | • | | 31 | Days. | July (July) | 31 | D v · |
|---------------|----|------|---|---|-----------|-------|-------------------|----|---------|
| February (Fel | y) | • • | | | 28 | | August (Aug.) | | - · · · |
| | | Leap | | | | | September (Sept.) | | |
| March (Mar.) | | • | • | • | 31 | ** | October (Oct.) | | |
| April (Apr.) | • | • • | | • | 80 | ů. | November (Nov.) | 30 | ** |
| May (May) | | | | | | | December (Dec.) | 31 | ** |
| June (June) | • | • | | | 30 | ** | | | |

173. The numbers of days in each month may be easily remembered from the following lines :

> "Thirty days hath September, April, June and November; February, twenty-eight alone, All the rest have thirty-one, But in leap year, then is the time When February has twenty-nine."

LEAP YEAR.

174. The period of time required by the sun to pass from one vernal equinx to another, called the vernal or tropical year, is exactly 365 da. 5 hr. 8 min. 49.7 sec.

174. If 365 days be reckoned as one year, the time lost in the calendar willbe.

In 1 Year - 5 hr. 48 min. 49.7 sec. In 4 " - - 23 hr. 15 min. 18.8 sec.

The tim thus lost in 4 years will lack only 44 min. 41.2 sec. of 1 entire day. Hene, .

If every furth year be reckoned as leap year, the time gained in the calendar will be.

> 4 Years - - - 44 min. 41.2 sec.

I 100 " (= 25×4) 18 hr. 37 min. 10 sec.

The time the gained in 100 years will lack only 5 hr. 22 min. 50 sec. of 1 day. Hence,

If every fourd year be reckoned as leap year, the centennial years excepted, the tim lost in the oalendar will be,

In 10 Years 5 hr. 22 min. 50 sec. In 400, " - 21 hr. 31 min. 20 sec.

The time thus lost n 400 years lacks only 2 hr. 28 min. 40 sec. of 1 day. Hence,

WEIGHTS AND MEASURES.

It every fourth year be reckoned as leap year, 3 of every 4 centennial years excepted, the time gained in the calendar will be,

| In | 400 | Years | - | 2 hr. | 28 min. | 40 | |
|----|------|-------|---|-------|------------|----------------|--|
| In | 4000 | ** | • | | 46 min. | | |
| | | | | | - nec / c. | SU SEC. | |

176. The following rule for leap year will therefore render the calendar correct to within 1 day for a period of 4000 years.

RULE.

I. Every year that is exactly divisible by 4 is a leap year, the centennial years excepted : the other years are common years.

II. Every centennial year that is exactly divisible by 400 is a leap year; the other centennial years are common year.

177. Circular Measure is used principally in surveying, navigation, astronomy, and geography, for reckoning latitude and longitude, determining locations of places and of vessels, and in computing difer-

178. Every circle, great or small, is divided into the same nimber of equal parts; as quarters, called quadrants; twelfths, called signs; three hundred and sixtieths, called degrees, etc. Consequently the parts of different circles, although having the same names, are of liferent lengths.

The unit is the degree, which is $\frac{1}{2} \frac{1}{2} \frac{1$

179.

TABLE.

| 60 Seconds (") | | = | 1 Minute | - 1 |
|-------------------|---|-----|----------|------|
| 60 Minutes | • | = | 1 Degree | - / |
| 80 Degrees | • | = 1 | 1 Sign - | · S. |
| 12 Signs, or 860° | • | = | 1 Circle | . 0. |

WEIGHTS AND MEASURES.

MISCELLANEOUS TABLES.

COUNTING.

| 12 | Things | = | 1 | Dozen. |
|----|--------|---|---|--------------|
| | Dozen | | | |
| 12 | Gross | = | 1 | Great Gross. |
| | Things | | | |

PAPER.

| 81. | 24 Sheets $= 1$ Quire. | |
|-----|------------------------|----|
| | 20 Quires $= 1$ Ream. | |
| | 2 Reams = 1 Bundle | ð. |
| | 5 Bundles = 1 Bale. | |

180.

BOOKS.

182. 2 Leaves = 1 Folio.
4 Leaves = 1 Quarto, or 4to.
8 Leaves = 1 Octavo, or 8vo.
12 Leaves = 1 Duodecimo, or 12mo.

The terms folio, quarto, octavo, denote: the number of leaves into which a sheet of paper is folded in making books.

......

ennial

ofore of of

ear, mon 401

ari. in, de, fer.

ber 1s; rts ent

ny

LONGITUDE AND TIME.

STANDARD TIME.

183. During the year 1888 the principal railroads of Canada and the United States adopted what is known as the "Standard Time System." This system divides Canada and the United States into four sections or timebelts, each covering 15 degrees of longitude, $7\frac{1}{2}^{\circ}$ of which are east and $7\frac{1}{2}^{\circ}$ are west of the governing or standard meridian, and the time throughout each belt is the same as the astronomical or local time of the governing meridian of that belt.

The governing meridians are the 75th, the 90th, the 105th, and the 120th, west of the Greenwich Observatory, London, England, and as these meridians are just 15-apart, there is a difference in time of exactly one hour between any one of them and the one next on the east, or the one next on the west; the standard meridian next on the east being one hour faster, and the one next on the west one hour slower. Hence, the 60° of longitude is four hours, the 75° five hours, the 90° six hours, the 105° seven hours, and the 120° eight hours slower than Greenwich time, making five different standards of time between the Atlantic and the Pacific Oceans, viz. : Intercoionial, Eastern, Central, Mountain, and Pacific.

184. Since every circle may be divided into 360 equal parts called degrees, and since the time in which the earth makes one revolution on its axis may be divided into 24

equal parts called hours, it follows that the earth on revolving on its axis passes through $\frac{1}{24}$ of 360° or 15° of longitude in one hour; through 1° of longitude in $\frac{1}{16}$ of an hour, or 4 minutes, and through 1' of longitude in $\frac{1}{16}$ of 4 minutes or 4 seconds.

| | | | | ABLE. | | |
|------|---------|-----------|---|---------------------------|---|------|
| 185. | 360° of | Longitude | = | 24 Hours or 1 Day of time | | da. |
| | 15° | 44 | = | 1 Hour of time | - | |
| | 1° | 66 | - | 4 Minuton of times | | |
| | 1' | | | 4 Seconds of time | - | min. |
| | | | - | 4 Seconds of time . | - | sec. |

186. To find the difference in time between two places or meridians when the difference of longitude is known.

EXAMPLE-

1

If the difference in longitude of two places be 7° 18', what must be their difference in time?

EXPLANATION.

SOLUTION. 7° 18' <u>4</u> 29 min. 12 sec. Since each minute of distance equals 4 seconds of time, 18 minutes of distance will equal 72 seconds, or 1 minute 12 seconds of time.

Since each degree of distance equal 4 minutes of time, 7 degrees will equal 28 minutes, plus 1 minute, gives 29 minutes.

RULE.

Multiply the distance between the two places expressed in degrees and minutes by 4, and the result is the difference in time expressed in minutes and seconds.

Norms.-1. If one place be in east and the other in west longitude, the difference of longitude is found by **adding** their longitudes, and if the sum be greater than 180 degrees, it must be subtracted from 360°.

2. Since the sun appears to move from east to west, when it is exactly 12 o'clock at one place, it will be **past** 12 o'clock at all places east, and **before** 12 at all places west. Hence, if the difference of time between two places be **subtracted** from the time at the easterly place, the result will be the time at the westerly place; and if the difference be added to the time at the westerly place the result will be the time at the easterly place

as les neich and ne an he y, 5ir or n

е

r

n

h

2

of

187. To find the difference of longitude between two places or meridians, when the difference of time is known.

EXAMPLE-

SOLUTION.

4) 28 min. 20 sec.

5'

7.

If the difference of time between two places be 28 minutes, 20 seconds, find the difference in longitude.

EXPLANATION.

Since 4 minutes of time equal 1 degree of longitude, 28 minutes of time equal 7° of longitude.

Since 4 seconds of time equal 1 minute of longitude, 20 seconds of time equal 5' of longitude.

BULE.

Divide the difference in time between the places expressed in minutes and seconds by 4 and the quotient is the difference in longitude expressed in degrees and minutes.

TABLE OF LONGITUDES.

| 33. | Toronto, | | 79° | 21' | 15" | W. | Belleville, . 77° 26 2″ W. |
|-----|------------|-----|-----|---------------|-----|-----|-----------------------------|
| | Kingston, | | 76° | 28' | 26" | W. | Quebeo 719 01/ 27 W. |
| | Ottawa, | | 75° | 40' | 35" | w | Quebeo, 71° 31' .5" W. |
| | Winnipeg, | | 97° | 30' | 42" | w | Berlin, 13° 23' 45" E. |
| | Chicago, | ÷ | 87° | 37 | 45" | w. | Philadelphia, 75° 10' W. |
| | Calcutta, | ÷ | 88. | 10/ | 0// | 17 | Victoria, . 123° 12' 15" W. |
| | Montreal, | • | 759 | 10 | 12/ | E4. | Hamilton, . 79° 52' 30" W. |
| | London (Ca | ۳. | 019 | 40 | 10. | w. | London (Eng.) 0° 5' 38" W. |
| | New York, | ц., | 01 | 19. | 0" | w. | Regina, 105° 2' 26" W. |
| | Dania | • | 14 | 0 | 3" | w. | Brantford, . 80° 28' 38" W. |
| | Paris, . | • | 2. | 20^{\prime} | 22" | Е. | Halifax, . 63° 36' 42" W. |

EXERCISE 48.

Find the difference in longitude between-

- 1. Toronto and London (Eng.)
- 2. Quebec and Calcutta.
- 3. Ottawa and Victoria.
- 4. Hamilton and Berlin.
- 5. Brantford and Winnipeg.
- 6. Kingston and Paris.

Find the difference in solar time between-

wo is

28

ree of

of

of

ed

ce

V.

V.

E.

V. V.

٧.

7.

V. 7.

7.

- 7. Toronto and Greenwich.
- 8. Kingston and Winnipeg.
- 9. Ottawa and Viotoria.
- 10. Montreal and Regina.
- 11. London (Can.) and London (Eng.)
- 12. Philadelphia and Calcutta.

Find the difference in standard time between-

- 13. Quebec and Ottawa.
- 14. Montreal and Victoria.
- 15. Toronto and Winnipeg.
- 16. Kingston and Regina.
- 17. Montreal and Winnipeg.
- 18. Halifax and Victoria.

Find the difference between the standard time and the solar time in the following cities :

| 19. | Toronto, | Ottawa. |
|-----|-----------|-----------|
| 20. | Montreal, | Victoria. |
| 21. | Winnipeg, | Halifax. |

- 22. A navigator finds that when it is noon at his place of observation it is 16 min. 34 sec. past 10 p.m. by his chronometer, Greenwich time; what is his longitude?
- 23. When it is 6:40 a.m. at Halifax, what is the time at Victoria ?
- 24. If the difference of solar time between two places is 1 hr. 18 min. 4 sec., what is the difference of longitude?
- 25. When it is Monday 10 p.m., solar time, at Toronto, what day and time is it in London (Eng.) (Greenwich time) ?

REDUCTION.

189. Reduction is the process of changing the denomination of a quantity without changing its value. It is of two kinds, Descending and Ascending.

190. Reduction Descending is changing a number of one denomination to another denomination of less unit value.

191. Reduction Ascending is changing a number of one denomination to another denomination of greater unit value.

192. To reduce Higher denominations to Lower.

EXAMPLE. .- Reduce 26 bbl. 8 gal. 8 gt. to quarts.

SOLUTION.

3311 gts. Ans.

817

927

EXPLANATION. 26 bbl. 8 gal. 8 gt.. Since 311 gal. make 1 bbl., there are 311 times as many gallons as barrels, and 819 + 8 = 827 gallons. Likewise, there are 4 times as many quarts as gallons, and (827 × 4) + 3 = 3311 quarts.

BULE.

Multiply the highest denomination by the number required of the next lower to make a unit of the higher, and to the product add the lower denomination.

Proceed in this manner with the successive denominations, till the one required is reached.

· 66

EXERCISE 49.

1. In 17 dys. 18 hrs. 27 min., how many seconds?

2. Reduce 12 mi. 8 rd. 3 yd. 2 ft, to inches.

3. Reduce 243 lb. 3 oz. 6 dwt. to grains.

4. In 83 c. yds. how many cubic inches?

£133 6s. 8d., how many farthings? 5.

6. How many pence are there in £164 8s. 01d.?

7. In 481 sovereigns how many pence?

8. In 4mi. 120 rd. 2 yd. 1 ft. 6 in., how many rods? yards? feet?

9. Reduce 16 T. 8 cwt. 86 lb. to pounds.

10. Reduce 18 A. 22 sq. rd. 25 sq. yd. to square feet.

11. How many grains in 16 lb. Avoirdupois?

12. In 2 mi., in 34 mi., in 4 mi., how many rods? yards? feet? inches?

13. In 47 guineas how many pounds and shillings?

14. In 12 1b., Troy, how many drams, Apothecaries?

15. Find the cost of 2 bl. 3 bun. 1 rm. 4 qr. 21 sheets of paper, at

193. To reduce Lower denominations to Higher.

EXAMPLE. - Reduce 157540 minutes to weeks.

EXPLANATION.

Dividing the given number of minutes by 60, because there are $\frac{1}{30}$ as many hours as minutes, we obtain 2625 hours plus a remainder of 40 minutes.

We next divide the 2625 hours by 24, because there are 1 as many days as hours, and we find that 2625 hours = 109 days plus a remainder of 9 hours. Lastly, we divide the 109 days by 7, because there are } as many weeks as days, and we find that 109 days = 15 weeks plus a remainder of 4 days. The last quotient and the several remainders arranged in the order of the succeeding denominations form the answer.

SOLUTION. 60) 157540 min. 24) 2625 hr. + 40 min. 7) 109 da. + 9 hr. 15 wk. + 4 da.

15 wk. 4 da. 9 hr. 40 min. Ans.

EXERCISE 50.

| | • | | |
|-------|----------|------------------|----------------------|
| 1 | . 191355 | 1 ounces | ' to tons. |
| 2 | . 97920 | grains | to lbs. |
| 8 | . 43769 | inches | to miles. |
| 4 | 27150 | pounds | to long tons. |
| 5. | 3276 | pints | to gallons. |
| 6. | 184760 | seconds | to days. |
| 7. | 278648 | cubic inches | to onbic yards. |
| 8. | 32459 | | to £ |
| 9. | 478960 | | to oords. |
| 10. | 283546 | sheets of paper | |
| 11. | 2468 | pence | to half-crowns. |
| 12. | 23750 | grains, Troy, | to lbs. |
| 13. | 15630 | mills | to dollars. |
| 14. | 1800356 | links | to miles. |
| 15. | 4562 | pints | to bushels. |
| 16. | 20436 | rods | to miles. |
| 17. | 1020300 | " | to S. |
| 18. | 70 | lbs. Avoirdupois | |
| 19. | 350 | oz. Troy | |
| 20. | | - | to oz. Avoirdupois. |
| d the | | Dollar in a | to lbs. Avoirdupois. |

. 1

21. Find the value of 921640 lbs. of coal at \$4.75 per long ton.

22. Find the price of 462 bush. 23 lbs. of wheat at 950. a bushel. 23. How many bushels are there in 5160 lbs. of timothy seed?

24. What is the freight on 528 bushels of corn at 32c. a cwt.?

25. What is the freight on 16 T. 17 cwt. 20 lb. of coal at \$1.20 per ton of 2240 lbs. ?

26. Find the amount of the following bill of grain:

| 1360 lbs. | of oats | <i>(a)</i> | | bushel, |
|-----------|-----------|------------|--------|---------|
| 1216 lbs. | of barley | a | 680. | ousnel. |
| 5160 lbs. | of beans | a | \$1.00 | 44 |
| 2130 lbs. | of rye | æ | 560. | |
| 2468 lbs. | of wheat | õ | 980. | 44 |

68

Reduce-

DENOMINATE NUMBERS.

194. The process of adding, subtracting, multiplying and dividing denominate numbers is based on the same principles that govern similar operations in simple numbers; the principal difference being that denominate numbers have an irregular scale of increase and decrease, while simple numbers have a uniform decimal scale.

ADDITION.

Find the sum of 3 lb. 7 oz. 10 dwt. 12 gr.; 17 lb. 5 oz. 18 dwt. 4 gr.; and 12 lb. 11 oz. 9 dwt. 15 gr.

SOLUTION.

dwt.

10

18

9

0 oz. 18 divt. 7 gr.

gr.

12

4

15

0Z.

7

5

11

lb.

3

17

12

34 lb.

EXPLANATION.

Write the numbers of the same unit value in the same column. Beginning with the lowest denomination, add as in simple numbers, and reduce to higher denominations according to the scale.

| Ad | d | | LAL | RCISE | : 51. | | | | |
|--|---|-------------------------|---|---------------------------------------|---|------------------------------------|---|------------------------------------|-------------------------|
| bush. p 91 1 14 1 17 2 68 3 9 1 | 3 | pt. 1 1 0 1 | \pounds 145 169 175 166 1199 | (2) s. 0 17 14 15 5 | d. 9 1 8 7 <u>1</u> 83 10 | hhd. 79 3 61 159 66 | (1 <i>gal</i> , 62 59 13 4 27 | 3) qt. 3 2 2 1 0 | pt. 1 0 1 1 |

EVEDOIDE -

| | (4 | I) | | | (| 5) | | | (6) | |
|-----------------------------------|--------------------------------------|-------------------------------------|------------------------------|-----------------|------------------------------------|--|--------------------------------------|---|-----------------------------|-----------------------------------|
| gal. 49 71 6 16 68 | <i>qt</i> . 2 3 1 3 3 | <i>pt.</i> 1 0 1 1 1 | gi. 3 2 1 3 2 | 50 791 87 | A. 75 11 345 473 29 | <i>sq.p.</i> 30 15 31 29 18 | \$q.yd 15 11 16 30 26 | <i>T</i> . 55 14 63 919 89 | cwt. 16 11 19 6 | <i>lb.</i> 17 5 24 20 |

- Add 236 lb. 4 oz. 15 dwt., 83 lb. 11 oz. 21 gr., 46 lb. 16 dwt., 105 lb. 9 oz. 11 gr.
- Add 7 T. 14 cwt. 25 lb., 14 T. 9 cwt. 16 lb. 8 os., 36 cwt. 17 lb., 14 T. 12 cwt., and 5 cwt. 10 lb. 14 oz.
- Find the sum of 12 wk. 3 da. 5 hr. 20 min. 42 sec., 4 da. 12 hr. 80 min., Swk. 1 da. 10 hr. 40 min., and 16 hr. 36 min. 30 sec.
- 10. Add 6 cd. 5 cd. ft., 3 cd. 6 cd ft. 9 cu. ft., 4 cd. ft. 14 cu. ft., and 5 cd. 24 cu. ft.
- 11. Off of one field of wheat were raised 37 bush. 1 pk. 3 qt.; of a second field, 41 bush. 2 pk. 5 qt.; of a third, 35 bush. 1 pk. 3 qt.; of a fourth, 43 bush. 3 pk. 1 qt. How much was the whole?
- 12. A grocer received an invoice of 7 hhd. of sugar; the first weighed 11 cwt. 15 lb.; the second, 12 cwt. 15 lb.; the third, 9 cwt. 16 lb.; the fourth, 12 cwt.; the fifth, 11 cwt. 24 lb.; the sixth, 9 cwt. 24 lb.; the seventh, 13 cwt. How much did the seven hogsheads contain?
- 13. A person has 5 pieces of ground; the first contains 16 A. 8 rd.; the second, 17 A. 1 sq. p. 45 sq. ft.; the third, 11 A. 14 sq. p. 62 sq. ft.; the fourth, 2 A. 120 sq. ft.; and the fifth, 41 A. 7 sq. p. What is the amount of the whole?
- 14. A person owes several sums of money; to one 17s. 6d.; to another, £3 5s. 8d.; to another, £25 11s. 10¹/₂d.; to another, £12 8d.; to another, 16s. 3³/₃d.; to another, £126 4s.; to another, £31 6s. 10¹/₂d.; to another, £50 4s. 4³/₃d. What is the whole amount?
- 15. A person travelling goes 26 mi. 12 rd., the first day; 28 mi. 5 fur. 9 rd. 9 ft., the second day; 31 mi. 15 rd. 14 ft., the third day; 26 mi. 12 ft., the fourth day; and 33 mi. 16 rd. 11 ft., the fifth day. How far does he go during the five days?
- 16. A jeweller receives on one day 11 lb. 6 oz. of gold; on another day, 10 lb. 5 oz. 20 gr.; on another, 6 oz. 3 dwt. 16 gr.; on another, 5 lb. 17 dwt. 1 gr.; on another, 16 lb. 4 oz. 15 dwt. 15 gr. How much does he receive in all?

70

Add-

SUBTRACTION.

ETAMPLE.-Subtract 12 tb. 9 oz. 11 dwt. 15 gr. from 27 lb. 5 oz. 16 dwt. 12 gr.

EXPLANATION.

| | Solt | TION. | |
|--------|-------|--------|--------|
| Ш. | 08. | dwt. | gr. |
| 27 | 5 | 16 | 12 |
| 12 | 9 | 11 | 15 |
| 14 26. | 8 05. | 4 dut. | 21 gr. |

Write the numbers as for simple subtraction; take each subtrahend term from its corresponding minnend term. In case any subtrahend term, be greater than the minnend term, borrow 1 as in simple subtraction, and reduce it to the denomination required, etc.

EXERCISE 52.

| £. | (1) s. | đ. | lb. | oz. (| 2) dwt. | | | | (8 |) | |
|-----------|---------------------------|----------|-----------|--------|------------|------------------------|----------|------------------|----------------|-----------|----------------|
| 186 98 | 4 11 | 01 23 | 114 91 | 3 4 | 16 12 | <i>gr.</i> 12 19 | | cwt. 58 27 | 16 16 20 | 08. 2 | dr. 5 6 |
| ₫. 75 | (4) <i>sq.p.</i> 14 | 8q.yd. | 1ь. | 3 | (5) 3 | Э | gr. | rd. | ((yd. | 5) ft. | |
| 78 | 14 | 11 16 | 68 15 | 1 0 | 7 7 | 2 2 | 12 15 | 16 14 | ga. 5 5 | 1 2 | in. 11 9 |

7. A person owes £78 3s. 2¹/₄d.; he pays £17 17s. 1³/₄d.; how much does he still owe?

- A. owes B. for 2 invoices of merchandise; one worth £17 16s.
 8id., the other £11 2s. 9d.; he pays £25 16s. 4d.; how much does he still owe?
- 9. A farmer has a farm consisting of 2000 acres. He gave his eldest son 109 *A*. 3 rd. 20 sq. p.; to his second son. 48 *A*. 1 rd.; the • remainder he gave to his third son. What was the remainder ?
- 10. How long is it from June 21st, 1886, to December 14th, 1888?

11. The latitude of Hamilton is 43° 12′ 40″, of Quebec, 46° 50′ 10″; how many degrees is Quebec north of Hamilton?

- 12. The latitude of Brantford is 42° 21' 22"; how far is Brantford from the North Pole?
- 13. A merchant bought 3 pieces of cloth; the first measured 47 yd. 3 qr.; the second, 43 yd.; the third, 41 yd. 3 qr.; when he came to examine it, he found 13 yd. worthless; how much good cloth was there?

MULTIPLICATION.

EXAMPLE .-- Each of seven bars of silver weighs 17 lb. 5 cs. 13 dwt. 16 gr. Find the total weight?

SOLUTION.

oz.

EXPLANATION.

dwt. gr. 17 5 13 16 7 122 lb. 3 oz. 15 dwt. 16 gr.

Write the multiplier under the lowest denomination of the multiplicand, and multiply as in simple numbers, thus :

 $16 gr. \times 7 = 112 gr. = 4 dwt. 16 gr.$ Put down 16 under gr. Carry

 $13 dwt. \times 7 + (4 dwt. carried) = 95 dwt. = 4 oz. 15 dwt.$ Put down 15 under dwt. Carry 4 to oz.

 $5 oz. \times 7 + (4 oz. carried) = 39 oz. = 3 lb. 3 oz.$ Put down 3 under oz. Carry 3 to lb.

17 lb. × 7 + (3 lb. carried) = 122 lb. Put down 122 under lb.

EXERCISE 53.

1. Multiply 38 lb. 6 oz. 17 dut. by 17.

2. Multiply 19 T. 13 cwt. 18 lb. by 19.

3. Multiply 31b. 43 23 1 D 17 gr. by 11.

4. Multiply 15 yd. 1 ft. 11 in. by 21.

o. Multiply 17 mi. 2 rd. 16 ft. by 23.

6. Multiply 15rd. 2 yd. 1 ft. by 29.

7. Multiply 144 A. 17 sq. p. 19 sq. yd. by 5.

8. Multiply 17 C. 59 cu. ft, 718 cu. in. by 13.

9. Mulciply 73 hhd. 61 gal. 3 qt. 1 pt. by 26.

10 If one coul of wood cost £1 16. 91d., what will 25 cords cost ;

11. If you can buy 3 bu. 3 pk. 3 qt. for \$1, how many bushels can be bought for \$79?

12. Bought 17 yards of lace, at £3 17s. 1d. per yard; 14 yards of ctape, at £2 10s. per yard. What is the value of both purchases?

13. If you can exchange one acre of wheat for 17 A. 7 sq. p. of pasture, how many acres of pasture can you get for 41 acres of wheat?

14. Bought 16 pieces of lace, each containing 62 yards, at £1 11s. 2d. per yard, and sold 7 pieces for £1 15s. per yard, and the rest at £1 13s. 10d. per yard; how much was gained?

72

lb.

DIVISION.

EXAMPLE. - If 122 lb. 3 oz. 15 dwt. 16 gr. of silver be made into 7 bars of equal weight, what will be the weight of one bar?

SOLUTION.

| 7 | <i>lb.</i> | 0Z. | divt. | gr. |
|---|------------|-------|----------|--------|
| ' | / | 3 | 15 | 16 |
| | 17 lb. | 5 oz. | 13 dwt. | 16 ar. |

EXPLANATION. Write the dividend and divisor as in short division, and divide as in simple numbers, thus :

 $\frac{1}{2}$ of 122 *lb.* = 17 *lb.* and an undivided remainder of 3 *lb.* Reduce this remainder to *oz.*; add the 3*oz* of dividend = 39 *oz.* $\frac{1}{2}$ of 39 *oz.* = 5 *oz.* and an undivided remainder of 4 *oz.* Reduce this remainder to *dwt.*; add the 15 *dwt.* of dividend = 95 *dwt.* $\frac{1}{2}$ of 95 *dwt.* = 13 *dwt.* and an undivided remainder of 4 *dwt.* Reduce this remainder to *gr.*; add the 16 *gr.* of dividend = 112 *gr.* $\frac{1}{2}$ of 112 *gr.* = 16 *gr.*

EXERCISE 54.

1. Divide £91 12s. 6d. by 6.

2. Divide 386 lb. 0 oz. 16 dwt. 23 gr. by 29.

3. Divide 9 T. 16 cwt. 16 lb. 3 oz. 4 dr. by 17.

4. Divide 61 lb. 10 3 43 0 D 16 gr. by 36.

5. Divide 78 mi. 14 p. by 31.

6. Divide 4yd. 1 ft. 11 in. by 15.

7. Divide 19861 sq. mi. 179 A. 20 sq. p. 11 sq. yd. by 61.

8. Divide 738 cu yd. 20 cu. ft. 1100 cu. in. by 399.

9. Divide 20 hhd. 16 gal. 3 qt. 1 gi. by 147.

10. Divide 175 bush. 3 pk. 1 qt. 1 pt. by 67.

11. Divide 1 circle by 128.

12. Divide 365 da. 6 hr. by 240.

13. If 16 bushels of oysters cost £75 17s. 4d., what will one bushel cost?

14. If one yard cost 2s. 6d., how many yards can be bought for £180?

15. If you can buy 15 square rods of land for £1, for how many pounds can you buy one acre?

16. Divide a square mile into 15 equal parts.

- 17. A man travelled 1249 mi. 36 rd. in 61 days; how far did he travel in a day?
- 18 A cartman carried 117 cd 110 cu. ft. in 100 loads; how much did he average a load?

DENOMINATE FRACTIONS.

DENOMINATE FRACTIONS.

195. A Denominate Fraction is a fraction whose integral unit is a denominate number.

Norz.—The principles, analyses, and rules of denominate fractions are essentially the same as those of denominate integers; therefore, no special rules are necessary for their reduction. A sufficient number of examples are given to fully explain the different cases that may arise.

196. To reduce a denominate fraction or decimal to integers of lower denominations.

EXAMPLE.—Reduce \pounds_{18}^{7} (.4375) to integers of lower denominations.

| BOLL FION. | achominations. |
|--|---|
| $\begin{array}{cccc} \pounds_{16}^{7} \times \frac{20}{1} \times \frac{1}{1^{2}} = & 105d. \\ & 105d. = & 8s. & 9d. \end{array}$ | $\pounds.4375 \times 20 \times 12 = 105d.$ 105d. = 8s. 9d. |
| $\pounds_{\overline{16}}^{7} \times \frac{2\Phi}{2} = \frac{85}{2} = 8\frac{3}{2}s.$ | or £.4375 |
| $\frac{3}{4}s. \times \frac{1}{1}a = 9d.$ | 20 1. 8.7500 12 |
| $\therefore \pounds_{\mathbf{TS}}^{\mathbf{T}} = 8s. 9d.$ or 7 20 | $\frac{12}{d.90000}$: £.4375 = 8s. 9d. |
| 16) 140 (8s. 128 | |
| 12 16) $\frac{12}{144}$ ($2d$. | |
| 144 | |
| 197. To change a fraction ation to a higher or lower de EXAMPLE 1.—Reduce + (025) of | or decimal of one denomi- enomination. |
| $ya. \times 4 \times 12 = 2$ in Ang | a yard to the fraction of an inch. OPERATION. $yd. \times 3 \times 12 = .9 = .9$ in Ans |
| EXAMPLE 2.—Change $\frac{9}{10}$ (.9) of an | inch to the fraction of a yard. |

| OPERATION. $\frac{1}{10}$ in. $\times \frac{1}{12} \times \frac{1}{8} = \frac{1}{40} yd$. Ans. | OPERATION. 12) .9 <i>in</i> . 3) .075 |
|--|---|
|--|---|

.025 or 10 yd.

74

na

æð

DENOMINATE FRACTIONS.

198. To change one denominate number to the fraction or to the decimal of another.

EXAMPLE 1.—Reduce 3 qt. pt. to (1) the fraction of a gallon (2), to the decimal of a gallon. Q

| SOLUTION. | SOLUTION. | | | |
|---|---------------------|--|--|--|
| TO A COMMON FRACTION. 3 qt. 1 pt. = 7 pt. | TO A DECIMAL. | | | |
| 1 gal. = 8 pt. | $\frac{2}{1.0} pt.$ | | | |
| $\therefore 7pt. = \frac{7}{5}$ of a gal. | 4) 3.5 qt. | | | |
| The second | = .875 gal. Ans. | | | |

EXAMPLE 2.—Reduce 15s. 6d. 3 far. (1) to the fraction of a \pounds (2), to the decimal of a £.

| SOLUTION. | Solution. |
|--|--|
| TO A COMMON FRACTION. $15s. 6_4^3d. = 747 \text{ far.}$ | TO A DECIMAL. $4 \ 3 far.$ |
| $\pounds 1 = 960 far.$ | $\begin{array}{c} 12 \\ 20 \\ \hline 15.5625 \ s. \end{array}$ |
| $\therefore 747 far. = \pounds_{\frac{7}{9}\frac{6}{7}}$ | = .778125 of a £. |

EXAMPLE 3.-Reduce £1 3s. 4d. (1) to the fraction (2), to the decimal of £1' 17s. 4d.

SOLUTION. £1 3s. 4d. = 380d. £1 178. 4d. = 448d. . £1 3s. 4d. = 280 of £1 17s. 4d. = § of ... = .625 of 66

EXERCISE 55.

1. Reduce give of a mile to the fraction of a yard.

2. What is the value of .8525 of a \pounds ?

зe

"A 0)f

2

3. Reduce # of a pennyweight to the fraction of a pound, Troy.

4. What part of 3 weeks is 4 da. 16 hr. 30 min.?

5. What part of 11 bushels is .45 of a peck?

6. Reduce .425 of a foot to the fraction of a mile.

7. Reduce £617 1s. 1d. to the decimal of a £.

8. What is the value of \$ of a mile ?

9. What part of an inch is fg of a yard?

10. What part of a lb. Troy is .75 of a grain ?

11. Reduce 3 bush. 1pk. 3 qt. to the decimal of a bushel.

12. Reduce 2.3331 years to integers of lower denominations

18. Reduce £14 15s. 9d. to the decimal of a £.

14. Reduce 3 of a hundredweight to the fraction of an ounce.

15. Reduce \$ of a mile to the fraction of 3 of a rod.

16. Reduce £2 10s. 01d. to the decimal of £2 17s. 2d.

ALIQUOT PARTS.

ALIQUOT PARTS.

199. An aliquot part of a number or quantity is an exact divisor of that number or quantity. Thus 5 is an aliquot part of 20; $33\frac{1}{3}$ of 100.

Many business calculations may be shortened by combining the values of convenient aliquot parts.

EXAMPLE 1.—What will 576 yards of cloth cost at \$1.87½ a yard ? Solution.

| At | \$1.00 | per yaı | rd, | | the price | would 1 | 0 | |
|----|---------|---------|------------------|------|--|---------|----------|-----|
| 44 | .50 | 44 | of s | 1 00 | ************************************** | | \$5.76 | |
| 66 | .25 | " | | | | 44 | 2.88 | |
| ** | .124 | ** | $\frac{1}{2}$ of | .50 | ** | 66 | 1.44 | |
| - | | | <u></u> ₁ of | .25 | 66 | 64 | .72 | |
| 41 | \$1.871 | 44 | | | ** | | | |
| | | | | | | | \$10.80. | Ang |

EXAMPLE 2.—What will 7 bush. 3pk. 6qt. of wheat cost at \$1.60 a bushel?

| SOLUTION. |
|-----------|
|-----------|

| 7 bushels @ \$1.60 | = | \$11.20 | |
|---|---|---------|-----|
| $2 \text{ pecks} = \frac{1}{2} \text{ bushel}$ 1 peck = $\frac{1}{4}$ bushel | = | .80 | |
| 4 quarts = $\frac{1}{2}$ peck | = | .40 | |
| $2 \text{ quarts} = \frac{1}{2} \text{ of } \frac{1}{2} \text{ peck}$ | = | .20 | |
| 7 bush. 3 pk. 6 qt. | = | .10 | |
| oush. opk. oqt. | | \$12.70 | Ans |

EXAMPLE 3.—Find the cost of 972 oz. of gold dust at £3 14s. 8¹/₄d. per oz. Solution.

| At | £3 | | | | | | | | |
|----|------------------|------|--|---------|-----------|----------|-------|------|----------|
| | | | 1 . 4 . 0 . | per oz. | the price | would be | £2916 | 0. | 0.1 |
| | | 222 | | 46 | 64 | ** | | | |
| " | 38. 4d. | = | 1 of 10s. | 64 | ** | | 486 | | 0 |
| ** | 10d. | - | 4 of 3s. 4d | | | 66 | 162 | 0 | 0 |
| | | | 4 01 38. 40 | | 44 | 66 | 40 | 10 | 0 |
| | oa. | = | 1 of 10d. | 64 | 68 | 66 | | | • |
| 66 | $1\frac{1}{2}d.$ | | 1 of 5d. | 66 | | | 20 | 5 | 0 |
| 66 | | | and the second sec | | 66 | 18 | 5 | 1 | 3 |
| | £3 | 14s. | 81d. | ** | đe | | | - | |
| | | | * | | | | 23629 | 16s. | 3d. Ans. |

ALIQUOT PARTS.

EXAMPLE 4.-What will 34 bush. 3 pk. 4 qt. of clover-seed cost at \$4 50 per bushel?

| | | | 5 | OLUTION. | | | |
|--|---|---|----------|----------|----------|-------|-------|
| 1 of \$4.50 2 of 2.25 1 of 1.121 | = | \$153.00 2.25 1.12 ¹ / ₂ .56 ¹ / ₂ | 11 11 11 | Cost of | | 2 pk. | |
| | | \$156.93 ⁴ | | " | 34 bush. | 8 pk. | 4 qt. |

EXERCISE 56.

What is the cost of-

1. 75 lbs. of coffee at 333c. a lb.

2. 120 lbs. of sugar at 1210. a lb. ?

3. 84 yards of carpet at \$1.333 a yard?

4. 144 bushels of wheat at \$1.163 a bushel ?

5. 5386 boxes of oranges at 15s. 91d. a box?

6. 886 pieces of silk at £9 6s. $7\frac{1}{4}d$. a piece?

7. 26 T. 18 cwt. 47 lbs. of copper at \$245.20 a ton \$

8. 615 A. 152 pr. of land at \$164.80 an acre?

9. 43 bush. 2 pk. 7 qt. of corn at 58c. a bushel?

10. 12 lb. 10 oz. 14 dwt. of gold at £63 12s. a pound ?

11. 270 yds. silk at £1 5s. 6d. per yd?

12. 326 bbls. flour at \$7.871 per bbl. ?

13. 15 A. 3 r. 20 rd. land at \$60 per acre?

14. 12 T. 17 cwt. freight at \$4 per ton?

15. 7 cwt. 3 qr. 12 lb. at \$61.50 per long ton r

16. 27 yds. of cloth at 3s. 93d. per yd.?

17. 84 cu. yds. 24 cu. ft. at \$2.50 per cu ud. ?

18. 13 gal. 1 qt. 1 pt. wine at \$3 per gat ?

19. 17 cwt. 2 qr. at \$7.50 per top ?

20. 3 daz. elbows at \$2.75 per daz. ?

MISCELLANEOUS PROBLEMS.

MISCELLANEOUS PROBLEMS.

EXERCISE 57.

I.

1. Find the total distance around a rectangular field at 1,728 feet long and 1,683 feet wide.

2. A manufacturer sells 2364 barrels of flour on Monday, 3,124 barrels on Tuesday, 463 barrels on Wodnesday, 3632 barrels on Thursday, 25.6 barrels on Friday, and 334 barrels on Saturday How many barrels did he sell during the week ?

3. A certain building contains 74 windows, each window containing 8 panes of glass. Find the cost of the glass at 14 cents per pane.

4. How many pounds of wire will it require to fence a field 304 feet square, the fence being 6 wires high, if 10 feet of the wire weigh one pound?

5. A man deposited in a bank \$8,752; he drew out at one time \$4,234, at another. \$1,700, at another, \$962, at another, \$49. How much had be remaining in the bank ?

6 A man invests in trade at one time \$680, at another time, \$820, at a third time, \$1,580, and on a fourth occasion, \$420. How much must he add to the sum of these that the amount may be \$5,000?

7. A merchant bought 240 barrels of flour for \$1,920, and sold it at \$10.50 a barrel. What did ne gain ?

8. A farmer exchanged 754 bushels of wheat, at \$1.25 a bushel, for 78 barrels of flour, at \$2 per barrel, and received the balance in money. How much money did he receive?

9. A man bought 45 acres of land at \$38 an acre, and 76 acros at \$47 an acre, and sold the whole at \$45 an acre. Did he gain or lose, and how much?

10. The cost of the Atlantic Telegraph Cable, as originally made. was se follows: 2,500 miles at \$485 per mile, 10 miles deep sea cable at \$1,450 per mile, and 25 miles shore ends at \$1,250 per mile. What was its total cost ?

MISCELLANEOUS PROBLEMS.

1. How many bags will be required to hold 108 bushels, if 4 bags hold 9 bushels?

2. If 5 barrels of flour cost \$60, how many cords of wood at \$4 a cord will pay for 3 barrels of flour?

3. If 12 yards of cloth cost \$60, for how much a yard must it be sold to gain \$20?

4. A man received \$50 for 5 barrels of pears, and paid all but \$14 for 4 chairs. What did each chair cost?

5. If a man received 16 pounds of sugar in exchange for 20 pounds of cheese at 8 cents a pound. What is the price of the sugar a pound?

6. If a woman pay 60 cents for some lemons at the rate of 10 cents for 6, and sell them at the rate of 9 for 20 cents, how many cents will she

ng

əls

5.6

id

8

et

ιe

e

7. What is the smallest sum of money with which I can purchase either sheep at \$3.50 a head, calves at \$10.50, cows at \$35, oxen at \$70, or

8. A coal dealer sold 5 tons of coal for \$57.50, which was § as much as he received for all he had left at \$7.663 per ton. How many tons did

9. How many times is the G. C. M. of 43, 63, 73, and $7\frac{7}{13}$ contained in the L. C. M. of the same numbers?

10. If $3\frac{2}{12}$ tons of coal will last as long as $4\frac{1}{12}$ cords of wood, how many tons of coal will last as long as 137 cords of wood ?

III.

1. What will 45 bush. 3 pk. 1 qt. of wheat cost at \$1.75 a bushel?

2. Wishing to travel in Great Britain, I exchanged \$1,500 for English money. How many pounds did I receive?

3. What will 25 T. 6 cut. 94 lbs. of coal cost at \$6.40 a long ton ?

4. From a pile of wood containing 960 cu.ft., was sold at one time 31 cd., at another, 25 cd. What was the remainder worth at \$41 a cord ?

5. How many acres of land can be bought for \$25,000, if a square foot costs 25c.?

6. A carriage wheel 12 ft. 8 in. in circumference will make how many revolutions in a distance of 65.5 miles?

7. If 51 lbs. of coffee cost \$115, what will 271 lbs. cost?

8. How many times can a vessel containing ‡ of a gallon be filled from i of a barrel containing 311 gallons?

MISCELLANEOUS PROBLEMS

9. $\frac{a}{11}$ of a certain number exceeds \ddagger of the same number by 156. What is the number?

10. A certain number multiplied by 2.5 and divided by 5.2 produces 1. What is the number?

IV.

1. Divide the sum of .075 and .0075 by the difference of 7.5 and .75.

2. Find the least common multiple of 3, 10, 18 and 18.

3. Divide \$2,000 between two persons so that one should have $\frac{2}{3}$ as much as the other.

4. Bought a cord of wood for \$4.625, a cheese for 7.56_{\pm} , and 14_{\pm} lbs. of butter at 25c. per lb. What was the cost of the whole?

5. At \$11 a bushel, how many bushels of wheat can be bought for \$37.683 ?

6. If a lb. of tea be worth \$.621, what is .8 of a lb. worth ?

7. What is the value of 720 pounds of hay at \$12.75 a ton, and 912 pounds of shorts at \$151 a ton?

8. Bought 12 yds. cloth at \$.37 $\frac{1}{2}$ per yd., and agreed to pay $\frac{1}{2}$ the cost in butter, at \$.163 per $lb.; \frac{1}{2}$ in money and the remainder in eggs, at $$.12\frac{1}{2}$ a dozen. How many pounds of butter and dozens of eggs were required ?

9. What is the value of 1,046 pounds of beef at \$45 per cwt. ? 10. How many pairs of pants can be made from 48.6 yds. of cloth, allowing 1.8 yd. per pair ?

V.

1. Sold 125 equal loads of wood, measuring 115 cd. 3 cd. ft. 7 cu. ft., for \$492.50. What is the quantity per load, and price per cord ?

2. If I buy 120 gallons of rum for \$75, how much water must be added to it that I may sell it at 60 cents a gallon, and gain \$15 on the sale of it ?

3. What part of a short ton is \$ of a long ton ?

4. I have a field 96 rods long and 50 rods wide. How much will it cost to build a fence around it at \$.121 per foot ?

5. A, owns $\frac{1}{2\pi}$ of a field, and B, the remainder; $\frac{3}{4}$ of the difference between their shares is 5 A. 3 rds. 161 pr. What is B.'s share?

6. What part of a cord of wood is a load $7\frac{1}{3}ft$. long, $2\frac{1}{3}ft$. high, $3\frac{1}{3}ft$. wide?

7. Reduce 33 of a long ton to the decimal of a short ton.

8. A farmer sold 8 loads of potatoes, averaging 27 bush. 3 pk. 5 qt. each, for \$.45 a bushel. How much did he receive ?

MISCELLANEOUS PROPERMS.

9. A merchant in selling groceries sells $14\frac{10}{16}$ oz. for a lb; how much does he cheat a customer who buys of him to the amount of \$38.40?

a fi

10. If the longitude of Belleville is 77° 26' 12" W., what will be the time ir that place when it is 3 hr. 35 min. a.m. in London, Eng.?

VI.

1. How many bricks, each containing 1211 cubic inches, can be packed in 3 cubic yards?

2. Telegraph posts are placed 66 yards apart; a train passes one every 3". Find at what rate per hour the train is travelling?

3. What is the cost per hour of lighting a room with 3 burners, each consuming 5 cubic inches of gas per second, the price of the gas being \$2 for 1000 cubic feet?

4. A man bought 35 bushels of barley, and sold the whole for \$30. He made \$5.50 in the trade. What did he give per bushel?

5. A tailor has 673 yards of cloth, from which he wishes to cut an equal number of coats, pants and vests. What number of each can he cut if they contain respectively 33, 23, 14 yards?

6. Bought 12 T. 3 cwt. 70 lbs. of sugar at \$8.25 per cwt. What was the cost?

7. How many bales of cotton, of 400 lb. each, at 36 cents per lb., are equal in value to 18 hhd. of sugar, of 1,500 lb. each, at 8 cents per lb.?

8. What part of 5 da. 23 hr. 58 min. is 4 da. 6 hr. 50 min.?

9. Thirty-two men agree to build 14 mi. 284 rd. 6 ft. of road. When the work is done, they employ 8 more men. What distance does each man construct?

10. I wish to put 111 bush. 2 pk. 4 qt. of grain into bags that should contain 2 bush. 1 pk. 4 qt. each. How many bags will be required?

VII.

1. If a man travel at the rate of a minute of distance in 10 minutes of . time, how long will he be in travelling around the world?

2. St. Thomas is 81° 15', and Halifax 63° 36' West Longitude. When it is 12 o'clock noon at St. Thomas, what is the time at Halifax ?

3. The ice on a pond, whose area is $\frac{1}{2}$ an acre, is 10 inches thick. How many tons of ice may be taken from the pond, supposing a cubic foot of ice to weigh 56 pounds?

MISCELLANEOUS PROBLEMS.

4. If the regular fare on a railway is 3 cents a mile, but $\frac{1}{6}$ is allowed off full fare when return tickets are bought, find the distance between two places if a return ticket costs \$1.80.

5. 450 leaves of a certain kind of paper make an inch of thickness. Find the thickness of a book 6 inches by 4 inches, in which 10 square yards of the paper are used.

6. It costs \$23.10 to fence a square field at $3\frac{1}{2}$ cents per yard. How many acres in the field ?

7. From 10 acres take 8 A. 159 pr. 30 yd. 6 ft. 108 in.

8. What is the result, when 500 is divided by .25, the quotient by .025, the second quotient by 50?

9. Express 3.74976 minutes as the decimal of a week.

10. What is the least number from which 1,224 and 1,656 may each be taken an exact number of times ?

VIII.

1. If water in freezing expands $\frac{1}{10}$, find the weight of a cubic foot of ice, a cubic foot of water weighing 1,000 ounces.

2. Find the difference between 9A. 159 pr. 30 yd. 3ph. 36 in. and <math>10A.?

3. Divide \$760 among A. B. and C., so that R may have \$160 more than A., but \$50 less than C.

4. How far may a person ride in a carriage $goin_{s_1}$ at the rate of 8 miles per hour, so that if he walked back at the rate of 3 miles per hour he may be gone $5\frac{1}{2}$ hours?

5. What will it cost to dig a ditch on each side of a road 4 miles 80 chains long at 40 cents a rod ?

6. Walking 41 miles an hour, I start after a friend whose pace is 3 miles an hour; how long shall I be in overtaking him?

7. How many square rods are there in 100 square chains?

8. A man owns .1875 of a mine; he sells .17 of his share. What fractional part has he left?

9. Reduce $\frac{2}{3}$ of an hour to the decimal of $\frac{3}{4}$ of 48 minutes.

10. What will it cost to fence a square 10 acre field at 80 cents a rod ?

IX.

1. At \$2.40 per rod, what will it cost to fence a piece of land 84.5 rods long by 24.75 rods wide?

2. A ship with its cargo is worth \$340,000, $\frac{3}{2}$ of the value of the cargo is worth $\frac{3}{3}$ the value of the ship. Find the value of each?

 $\mathbf{82}$

MISCELLANEOUS PROBLEMS.

3. Divide 6 dy. 17 hr. 11 min. by \int_{1}^{p}

4. How many reams of paper will be required to supply 7,500 subscribers with a weekly newspaper for a year, allowing a sheet for one copy?

5. Telegraph poles are placed 8 rods apart, and a train passes one every 4¹/₂ seconds. How many miles an hour is the train travelling ?

6. A man charged me 15 cents for a scuttle of coal, when coal we selling at 87 per ton. How many pounds ought the scuttle to hold?

7. Divide \$82.60 among 27 men and 37 boys, so that each man may have three times as much as each boy.

8. By selling my oloth at \$1.26 a yard, I gain 11 cents more than I lose by selling it at \$1.05 a yard. What would I gain by selling 800 yards at \$1.40 a yard?

9. If 3 of an estate be worth £320, find the value of $\frac{3}{10}$ of the estate.

10. If a railway train goes 45 miles an hour, how many yards will it go in a second ?

X.

1. How many times will the seconds hand of a watch go around in 12 wk. 2 hr. 15 min.?

2. Divide \$600 between two persons, so that one shall have $\frac{7}{6}$ as much as the other.

3. A regiment marching 31 miles an hour makes 110 steps in a minute. What is the length of the step?

4. I bought 20 pounds of opium by Avoirdupois weight, at 55 cents an ounce, and sold by Troy weight at 60 cents an ounce. Did I gain or lose, and how much ?

5. The G. C. M. of two numbers is 12; their L. C. M. is 72; one of the numbers is 24; find the other?

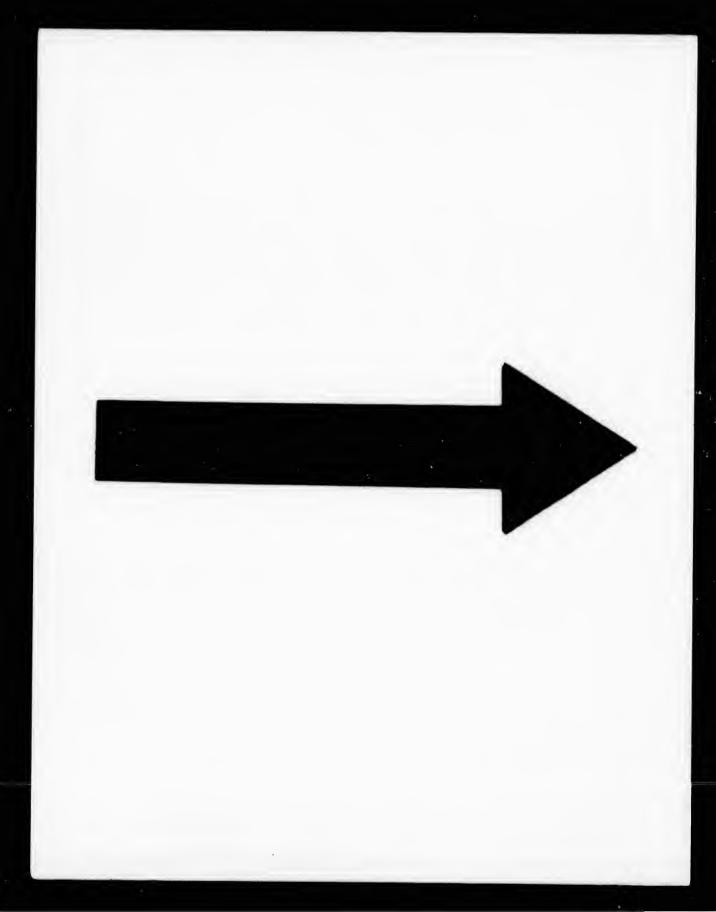
Divide \$345 among A. B. and C., so that B. will receive \$5 for A.'s
 \$4, while C. receives \$6 for A.'s \$5.

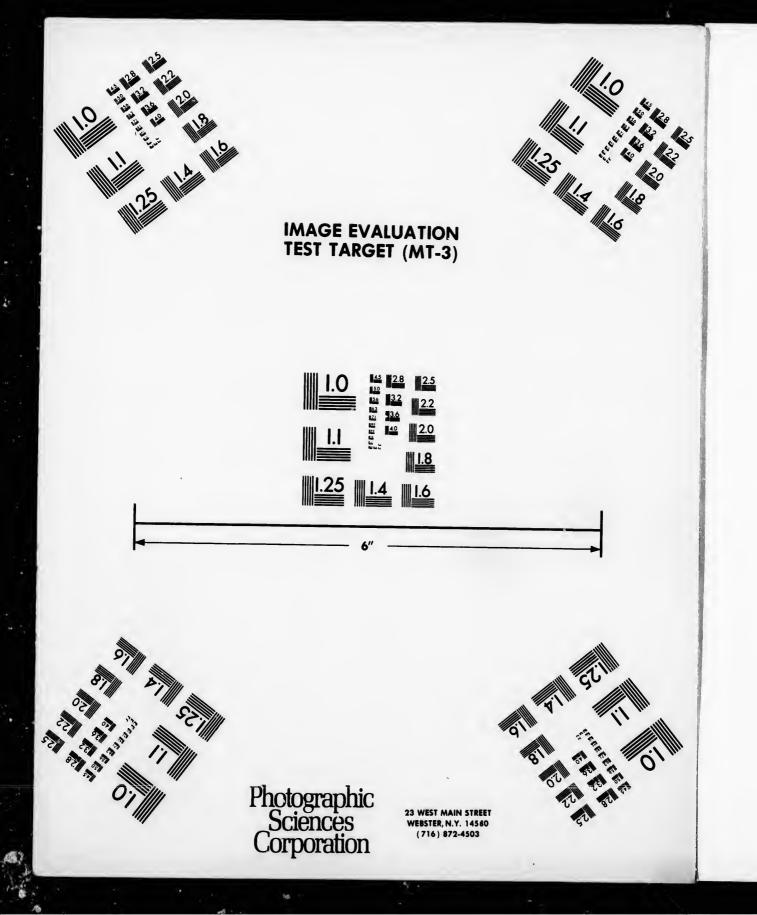
7. Which is the greater .0025 of a mile or \cdot 79 of a rod?

8. How long will it take a train 20 rods long, and going at the rate of 15 miles an hour, to cross a bridge 15 rods long ?

9. When an ounce of gold is worth \$19.45, what is the value of .04 of a pound?

10. A coal dealer bought a quantity of coal at \$6 a ton, and sold it for 48 cents a hundredweight, gaining thereby \$43.20. How many tons did he buy?







PECCENTAGE.

200. Percentage is the method of calculating by hundredths, or it is the term applied to such computations as involve the number 100 as the basis or unit of measure.

201. Per cent. is an abbreviation of the Latin phrase per centum, and signifies on or by the hundred. Thus 4 per cent. means 4 of every hundred and may signify 4 cents of every 100 cents, \$4 of every \$100, 4 lbs. of every 100 lbs., etc.

202. The sign % stands for the phrase per cent.; thus 8 per cent. is written 8%.

203. To express any per cent, as a decimal or as a common fraction.

Since any per cent. is some number of hundredths, it is properly expressed by a decimal fraction, or by a common fraction.

Since 6 % means six-hundredths, therefore $6\% = .06 = \frac{18}{180}$.

| | | TA | BLE. | |
|----------|-------------|--------------------|---------|---|
| SYMBOLS. | | DECIMAL. | | COMMON FRACTIONS |
| 1% | = | .01 | - | $\overline{100} = 100$ |
| 2 % | = | .02 | = | $\frac{100}{100} = \frac{1}{100}$ |
| 4% | = | .04 | = | $r_{00}^{100} = \frac{50}{25}$ |
| 5% | = | .05 | = | $\frac{5}{100} = \frac{1}{20}$ |
| 10% | = | .10 | = | $\frac{10}{100} = \frac{1}{10}$ |
| 25% | = | .25 | - | $\frac{25}{100} = \frac{1}{10}$ |
| 40 % | = | .40 | = | $\frac{40}{100} = \frac{2}{3}$ |
| 100 % | = | 1.00 | - | $\frac{100}{100} = 1$ |
| 125% | = | 1.25 | = | $\frac{100}{165} = \frac{1}{4}$ |
| 1% | - | $.00\frac{1}{2} =$ | .005 = | $\frac{\frac{1}{2}}{100} = \frac{1}{200}$ |
| \$% | = | .00 <u>a</u> = | .0075 = | $\frac{\frac{3}{4}}{100} = \frac{3}{400}$ |
| 121% | - | .121 = | .125 = | $\frac{12\frac{1}{2}}{100} = \frac{1}{8}$ |
| 883 % | - | .83] | - | $\frac{33\frac{1}{3}}{100} = \frac{1}{3}$ |
| 147% | ; == | .143 | - | $\frac{142}{100} = \frac{1}{7}$ |

 $\mathbf{84}$

The student will observe that any per cent is expressed as a decimal by removing the decimal point two places to the left in the number expressing the rate per cent., that is, dividing the rate by 100.

EXERCISE 57.

What decimals and what common fractions are equivalent to-

| 1. | 3%, | 7%, | 17%, | 56%, | 225% | 7. | 28\$%, | 60 % | 5550/ | HE OF |
|------------|---------|--------|--------------------|--------|--------|-----|-----------------|--------|--------|--------|
| 2. | 1% | ₹%, | 1% | 18% | 2% | 8 | 855 o/ | 9710 | 008% | 10%. |
| З. | 21% | 183%. | 871% | 311 %. | | 0. | 85 # % , | 8/2%, | 91 8%, | 61% |
| 4. | 438 0/ | 5610/ | 691 0/ | 683 %. | | 9. | 104%, | 31%, | 33%, | 231%. |
| 5 | 911 0/ | 01 0/ | 100 0 | 007 %. | | 10. | 93%. | 175 %. | 70% | 938 o/ |
| <i>o</i> . | 01 T %, | 08%, | 10 %, | 144%, | 223 %. | 11. | 77 ; %, | 571%. | 154% | 80% |
| 0. | 418%, | 58; %, | 66 3 %, | 831% | | 12. | 135%. | 120/ | 00 0/ | 408.0/ |

204. To change a decimal or a common fraction to an equivalent per cent.

205. Since any per cent. is changed to an equivalent decimal or common fraction by expressing it as so many hundredths, that is by dividing it by 100, it follows that any decimal or common fraction can be changed to an equivalent per cent. by multiplying such decimal or fraction by 100.

Example 1.---What per cent. is equivalent to .06?

SOLUTION.

 $.06 = (.06 \times 100) \% = 6\%$

EXAMPLE 2.-What per cent. is equivalent to the fraction 2?

SOLUTION.

$$x^2 = (\frac{3}{4} \times 100) \% = 75\%$$

Norg.-A decimal is multiplied by 100 by removing the decimal point two places to the left.

EXERCISE 58.

What per cents. are equivalent to the following fractions ?

| | \$ | \$. | ₹, | 1 , | 3, | \$, | 7. | |
|-----|-----------------|----------------|-----------------|-----------------|----------------|------|-----------|-----|
| 2. | 1 3, | 8 , | 1 , | ₿, | \$. | \$. | 1. | |
| З. | 융, | ÷ | 2 , | 37, | \$. | \$. | . | |
| 4. | \$, | 8 , | ÷, | ÷, | Z . | 8. | J. | |
| 5. | 10, | 10, | To, | NT. | 77. | -B | .9. 1 | |
| υ. | 121 | 12, | 19, | 13, | 10. | -Br. | 5. | 11 |
| 7. | 18, | 18, | 30, | 1 20, | 7. | | 11. | 18 |
| 8. | 38, | 7 8. | 1R, | 11. | 17. | 3.5 | 47 | 30. |
| 9. | 75, | +1. | ₽8 , | 98 , | 1.5 | 47 | 30. | |
| 10. | 7501 | 800, | 2000, | Toon, | n | 120 | 378. | |

What per cents. are equivalent to the following decimals? 11. .3. .7. .5, .03, .07, .05, .003, .007, .005, .75, .055, 006. 12. .035, .064, .09, .01, .001, .3875, .0625, .03125, .0025. 13. .034, .0284, .004, .004, .004, .0334, .0014.

206. To find the value of any per cent. of a number or quantity.

| EXAMPLE. | -Find 8% of 6 | 325. | | | | | |
|---------------|------------------------------------|-----------|----|--------|-------------------|-------|--------|
| Solution 1. | OPERATION. 6.25 8 | | | PLANAT | of 625. | | |
| | 50.00 | = | 8% | " | " | | |
| SOLUTION 2. | .08 | 8% of 625 | | LANAT | | 5 = (| 50.00. |
| SOLUTION 3. | 50.00 Operation. 180 × 625 = | - / | | LANAT: | ion. 87 of 628 | 5 = | 50 |
| "he student a | hauld | | | • | | | |

The student should use whichever of the preceding methods gives the shortest solution.

| F | ind- | | | | EXER | CISE | 59. | | |
|-------|-------------------|-------|-------------------|-------|----------------|--------|---------|---------|---|
| 1. | - /0 | | 5, | 25, | 45, | 75, | 125. | 95. | |
| 2. | 25% | of | 4, | 36, | 76, | 96. | 128. | 240 | |
| 3. | 4% | of | 25, | 75, | 125, | 250. | 300. | 1000 | |
| 4. | 121% | of | 64, | 96. | 160. | 320 | 480 | 500 | |
| 5. | $16\frac{2}{3}\%$ | of | 6, | 36, | 72. | 84 | 132 | 394 | |
| 6. | 81 % | of | 12, | 72. | 60. | 240 | 259 | 270 | |
| 7. | $37\frac{1}{2}\%$ | of | 80. | 32. | 48. | 75 | 00 | 704 | |
| 8. | 66 3 % | of | 9. | 27. | 75. | 335 | 17 | 500 | |
| 9. | 61% | of | 32. | 64. | 256 | 000, | 760 | 020. | |
| 10. | 311 % | of | 48. | 80 | 144 | 75 | 900 | | |
| 11. | 871% | of | 16 | 72 | 109 | 250 | 000. | | |
| 12. | $22^{2}_{0}\%$ | of | 27 | 45 | 49 | 500, | 908. | | |
| 13. | 28\$% | of | 91 | 25 | 00, Ee | 007, | 000. | | |
| 14. | 713% | of | 96 | 20, | 90, 70 | 987, | 770. | | |
| 15 | 13/0 750/ | 01 | 20. | 09, | 10, | 117, | 273. | | |
| 16. | 75% | of | Z4, | 32, | 28, | 264, | 760. | | |
| 17. | | or | 10, 1 | 10, | 40, | 350, | 660. | | |
| | | OI | 66, 4 | 75, 9 | 73, | 254. | | | |
| 10. | 44% | ors | 74, 2 | 28, 9 | 937, 8 | 3321. | | | |
| 19. | 50% | of |] , | ł, | 3 , | ÎT, | 70. | | |
| 20. 3 | 125% | of \$ | 7.50, | \$376 | , 436 | bush | iela. S | 328 ton | 8 |
| 21. | 8% | 01 9 | 57 1 , | 621 | 871 | . 61 | 41. | 331 | |
| 22. | 6% | of 8 | 50 yd | s., 4 | 50 m | en, 37 | 5 lbs. | , 580 0 | z |

207. Given the value of any per cent. of a number, to find the number.

EXAMPLE.-24 is 8% of what number? SOLUTION 1.

EXPLANATION.

| C |)P: | ERA | TI | ON. | |
|-----|-----|-----|----|------|--|
| .08 |) | 24 | (| 300. | |

SOLUTION 2.

OPERATION. $\frac{24}{8} \times 100 = 800.$

SOLUTION 3.

OPERATION. 24 $\times \frac{100}{8} = 300.$ The question is $08 \times$ what number = 24. If 24 is the product of two factors, one of which is .08, the other factor may be found by dividing 24 by .08.

EXPLANATION.

If 8% of the number = 24 then 1% " " = $\frac{1}{8}$ of 24 = 3 " 100% " " = 100 × 3 = 300

EXPLANATION.

The question is $\frac{1}{16\sigma}$ of what number = 24. If 24 is composed of two factors, one of which is $\frac{1}{16\sigma}$, the other factor may be found by dividing 24 by $\frac{1}{16\sigma}$.

EXERCISE 60.

Find the numbers of which-

| 1. | 60 is | | 3%, | 2%, | 5%, | 6%. | |
|-----|--------|-------|-------|--------|--------|--------|--------|
| 2. | 96 is | 20%, | | | 75%, | 90%. | |
| 8. | 640 is | 125% | 150%, | 225 %. | 160%, | | |
| 4. | 32 is | | 91 %, | | 7+%, | | 58%. |
| 5. | 320 is | 163% | 35 %, | 448%, | 147% | | |
| 6. | 252 is | 30%, | 40 %, | 60 %, | 90%, | | |
| 7. | 105 is | 121%, | 371%, | 621%, | 871%, | 3 1 %. | |
| 8. | 84 is | 413%, | 583%, | 661%, | 425%, | | |
| 9. | 850 is | 15%, | 35%, | 45%, | 55%, | 65%. | 85%. |
| 10. | 220 is | 777%, | 31%, | 93%, | 231 %, | 831%. | 00 /0. |
| 11. | 48 is | 24%, | 16%, | 12%, | 10%, | 24%, | 36%. |

208. To find what per cent. one number is of another.

EXAMPLE.-What per cent. of 60 is 15?

EXPLANATION.

| SOLUTION 1. | As 15 is is of 60, and as the frac- |
|---|--|
| $\frac{1}{25} = (\frac{1}{25} \times 100) \% = 25\%.$ | tion $\frac{1}{16}$ expressed as % is $(\frac{1}{16} \times 100)\%$ = 25% Art. 205, it follows that 15 is 25% of 60. |

SOLUTION 2. .6) 15 (25 1% × 25 = 25%.

EXPLANATION. 1 % of 60 = .6. 15 is 25 times .6 and therefore 25 times 1 % of 60.

EXPLANATION.

SOLUTION 3. 60) 15 (.25 .25 = 25%.

The question is 60 × what %? -. = 15. If 15 is the product of two factors, one of which is 60, the other factor can be found by dividing 15 by 60. 15 + 60 = .25, and .25 = 25 %.

EXERCISE 61.

1. What % is 30 of 60? 12 of 48? 15 of 45? 7 of 35? 9 of 63? 2. What % of 12 is 2? 36 is 16? 35 is 28? 49 is 21? 75 is 50? 3. What % of 10 is 1? 5? 10? 20? 30? 40? 50? 60? 70? 80? 4. What % of 50 is 9? 12? 15? 18? 30? 45? 56? 100? 125? 300? 5. What % of 200 is 25? 75? 125? 250? 121? 871? 163? 621? 6. What % is 261, 291, 331, 361, 179, 291 of 175? 7. What % is 49.5, 56.25, 58.50, 63, 14.3 of 225 ? 8. What % is .024#, .43, .068, .091, .25 of 21? 9. What % of 1 is 50? 28? 10? 3? 2? 2? 13?

10. What % of 18.79, 187 70, 281.85, 319.43, 394.59 of .1879?

209. To find a number, which, if increased or diminished by a certain per cent. of itself, will be equal to a given number.

EXAMPLE 1.- What number increased by 25 % of itself will equal 300?

EXPLANATION.

| 125% of required number Therefore the "" See Art. 207. | | $\frac{1}{2} \frac{9}{5} \times 300 = 240.$ | If any number be in- oreased by 25% of tself the result will be $(100\%$ $\div 25\%) = 125\%$ of the |
|--|--|---|---|
|--|--|---|---|

of the original number. EXPLANATION

| SOLUTION 2. | |
|--|---|
| $\frac{2}{3}$ of required number = 300 Therefore the " " = $\frac{2}{3} \times 300 = 2$ | 25% = ‡. A number increased by ‡ of itself will be equal to ‡ of it- self that is (4). |

 $(\frac{1}{2} + \frac{1}{2})$ of itself.

Example 2 .--- What number decreased by 20 % of itself will equal 860 ?

SOLUTION 1.

If any number be de-80% of required number = 360 creased by 20 % of itself Therefore the " $=\frac{100}{80} \times 360 = 450$. the result will be (100%) 64 - 20%) = 80% of the

original number.

EXPLANATION.

EXPLANATION.

SOLUTION 2. \$ of required number = 360 Therefore the " 66 = 4 of 360 = 450.

$20\% = \frac{1}{2}$. A number decreased by t of itself will be ({ - +) = + of itself.

EXERCISE 62.

What number increased by-

1. 10% of itself equals 110? 2. 75% of itself equals \$420? 3. 621 % of itself equals \$89.371? 4. 211 % of itself equals \$32.561 ? 5. 831 % of itself equals \$87.12? 6. 15% of itself equals 345? 7. 36 % of itself equals 238 A.? 8. 100 % of itself equals 84.6 cwt.? 9. 6% of itself equals 1272? 10. 22% of itself equals \$549? 11. 3% of itself equals \$9.06? 12. \$% of itself equals \$81.72?

What number diminished by-

| 13. | 65 % | of itself equals \$2,590 ? |
|-----|-------|-------------------------------|
| 14. | | of itself equals 28.5 feet? |
| 15. | | of itself equals 1,035 miles? |
| 16. | 4% | of itself equals \$465.60? |
| 17. | | of itself equals \$203.374? |
| 18. | | of itself equals \$6.65? |
| 19. | 20% | of itself equals 80? |
| 20. | 9% | of itself equals 917? |
| 21. | 871 % | of itself equals 10? |
| 22. | 58% | of itself equals 95,5 ? |
| 23. | 7% | of itself equals 67.95? |
| 04 | 0 | |

24. \$% of itself equals 216.38?

PROFIT AND LOSS.

PROFIT AND LOSS.

210. Profit and Loss are commercial terms used to express gain or loss in business transactions.

211. Gains and losses are usually estimated at some rate per cent. of the cost of the goods including the expenses.

212. To find the Gain, Loss, or Selling Price, the cost and the rate per cent. of gain or loss being given.

EXAMPLE 1.- A merchant sold cloth which cost \$1.75 per yard, so as to gain 8% in selling. What was the gain and selling price?

SOLUTION.

 Cost
 .
 = \$1.75

 Gain
 = 8% of \$1.75
 = .14 Art. 206.

 Selling price
 .
 = \$1.89

EXAMPLE 2.—Goods which cost \$2.40 are sold at a loss of 5%. Find the loss and the selling price.

SOLUTION.

 Cost
 .
 =
 \$2.40

 Loss
 =
 5% of \$2.40 =
 12
 Art. 206.

 Selling price
 .
 =
 \$2.28

213. To find the Cost Price, the Selling Price, and the rate per cent. of gain or loss being given.

EXAMPLE 1.-By selling goods for \$132, I gain 10%. What is the cost price ?

SOLUTION.

| | 100 % 10 % | Cost price | | Cost price Gain |
|----------------|---------------|------------|---|---|
| :: :: :: | 110 % | Cost price | = | Selling price \$132 \$?\$ of \$132 = \$120. Art. 207. |

PROFIT AND LOSS.

EXAMPLE 2.—I find that by selling an article for \$1.80 I lose 10 %. What is the cost price ?

| | | | | SOLUTION. |
|----|-------|------------|---|-----------------------------------|
| | 100 % | Cost price | = | Cost price |
| | | 66 66 | | |
| | 90 % | Cost price | = | Selling price |
| :. | | Cost price | | |
| | | Cost price | = | 100 of \$1.80 = \$2.00. Art. 207. |

214. To find the Cost Price, the Gain or Loss and the rate per cent. of gain or loss being given.

EXAMPLE 1.-By selling a farm at a gain of 20%, I realized a profit of \$850. Find the cost of farm.

SOLUTION.

20% Cost of farm = \$850 \therefore Cost of farm = $\frac{100}{20} \times \$850 = \$4,250$.

EXAMPLE 2.-- A yacht was sold for \$1,200 less than it cost, its owner thereby losing 121 % of the cost. What was the cost?

SOLUTION.

215. To find the rate per cent. of gain or loss, the selling price and the cost price being given.

EXAMPLE 1.-Goods which cost \$5 are sold for \$7. What is the gain %?

EXPLANATION.

Solution. ($\frac{2}{5}$ of 100) % = 40 %. Ans. 7 - 5 = 2 gain. Since the gain % is computed on the cost, the question becomes, 2 is what % of \$5.

By Art. 208 \$2 is $(\frac{3}{5} \text{ of } 100) \% = 40 \%$ of \$5 (the cost).

EXAMPLE 2.—Goods which cost \$7 are sold for \$5. What is the loss %?

EXPLANATION.

Solution. $(3 \times 100) \% = 284 \%$. Ans. $(3 \times 100) \% = 284 \%$.

284% of the cost (\$7).

-

to

te

st

60

d

PROFIT AND LOSS.

1.

216. To find the Selling Price, the Cost Price and the gain or loss per cent. of the selling price being given.

EXAMPLE 1.—For what must I sell an article which cost \$2.25 so as to gain 25 % of the selling price ?

SOLUTION,

| | | Selling price Gain | = | 25 % | 44 | 44 | |
|--|------------|------------------------------------|-----|---------|--------|---------|-----------|
| | Cost price | = | 75% | Selling | price. | | |
| | . 10% | Selling price : Selling price : | | \$2.25 | 0.07 | | |
| | | 01 | | 75 4 | 2.20 = | \$3.00. | Art. 207. |

EXAMPLE 2.- I sold goods which cost \$2.50, so that 1 lost 25 % of the selling price. Find the selling price.

SOLUTION.

| | Selling price Loss | 1 1 | 100 % Selling price. 25% " " | |
|----|-----------------------|-----|---------------------------------|--|
| .: | of the senting price | | 125 % Selling price. \$2.50 | |
| | the selling price | = | 128 of 2.50 = \$2.00. Art. 207. | |

EXERCISE 63.

Find gain or loss and selling price-

| COST. 1. \$8.00, 2. \$3.60, 3. \$4.20, 4. \$5.60, 5. \$13.20, | ^{6лі} N %. | COST. | LOSE %. |
|---|---------------------|-------------|-----------------------|
| | 20 %. | 6. \$15.60, | 37 <u>1</u> %. |
| | 10 %. | 7. \$14.75, | 4 %. |
| | 15 %. | 8. \$13.60, | 62 <u>1</u> %. |
| | 12½ %. | 9. \$10.80, | 16 <u>3</u> %. |
| | 40 %. | 10. \$4.50, | 33 <u>1</u> %. |

Find cost price-

| SELLING PRICE. | GAIN %. | OBT T THE R. | |
|---|---|---|---|
| 11. \$7.50, 12. \$3.90, 13. \$4.59, 14. \$5.50, 15. \$4.56, | 50 %. 80 %. 28 4 %. 22 3 %. 14 %. | SELLINO PRIOE. 16. \$4.75, 17. \$5.64, 18. \$12.60, 19. \$24.30, 20. \$5.61. | LOBS %. 5 %. 60 %. 424 %. 85 %. |
| | | *0.01. | 81 % |

12

The ...

PROFIT AND LOSS.

Find gain or loss %--

| SELLING PRICE. | COST. | SELLING PRICE. | COST. |
|----------------|---------|----------------|----------|
| 21. \$10.00, | \$8.00. | 26. \$10.40, | \$8.00. |
| 22. \$7.00, | \$5.00. | 27. \$6.50, | \$7.50. |
| 28. \$4.80, | \$4.00. | 28. \$13.50, | \$15.00. |
| 24. \$3.60, | \$4.00. | 29. \$10.60, | \$12.00. |
| 25. \$7.50, | \$5.50. | | |

Find cost-

| | GAIN. | GAIN %. | | LOSS. | LOSS %. |
|-----|-----------------|---------|-----|---------|---------|
| 30. | \$3.00, | 10 %. | 34. | \$2.50, | 30 %. |
| 31. | 60c., | 121 %. | 35. | \$4.80, | 25 %. |
| 32. | 37 <u>1</u> 0., | 163 %. | 36, | \$1.20, | 81%. |
| 33. | \$5.60, | 40 %. | 37. | \$3.00, | 61%. |

 Goods which cost \$2.40 were sold so as to gain 25% of the selfing price. Find the selling price.

39. An article which cost \$3.50 was sold so that 123 % of the proceeds were lost. Find the selling price of the article.

40. What is the selling price of a horse which cost \$12^t, and which was sold so as to gain 16^t/₂ % of the proceeds.

l the n.

so as

, of

217. It is customary for merchants and manufacturers to have fixed price lists of their goods, and when the market varies, instead of changing the fixed price they change the rate of discount.

218. Trade Discount is a percentage deducted from the face of bills, the list prices of goods, or from the amount of a debt without regard to time, and is expressed by the term per cent. off.

219. Thus 20% off, means a deduction of 20% from the nominal or asking price. 20 and 5% off, means a discount of 20%, and then 5% from the remainder, etc.

The result is not affected by the order in which the discounts are taken.

220. Dealers usually announce their terms upon their bill heads thus, Terms 3 months, or 30 days less 5%, meaning that a credit of 3 months is given, but if the bill be paid within 30 days a discount of 5% will be allowed.

221. Goods are marked by wholesale dealers or jobbers at a rate % above, which will allow a certain per cent. of discount from the list or marked price, and still realize a margin of gain.

222. The net price of goods is the list price less the trade discount.

228. To find the net price, the list price and discounts being given.

EXAMPLE.—Goods are involved at \$0.0, with discounts of 25, 10, and 5% off. Find cost of goods?

SOLUTION. \$640 160 = 25 % of \$C10 \$430 43 = 10 % of \$430 \$132 21.60 = 5 % of \$432\$410.40 = Net price.

224. To find the single discount equivalent to two or more discounts.

rs

he

эу

n

ιt

e

0

t

EXAMPLE.- Find the direct discount equal to two successive discounts of 26 % and 10 %.

 SOLUTION.

 Set list price = \$100

 1st Discount = 20 = 20 % of \$100

 80

 2nd Discount = 8 = 10% of \$80

 Net price = \$72.

 Total discount on \$100 = \$100 - \$72 = \$28

 \therefore discount = 28 %.

225. From similar examples we derive the following rule to find a single discount equal to two successive discounts.

RULE.

From the sum of the discounts subtract $\frac{1}{100}$ of their product.

226. Then in the above example the discount = $20 + 10 - \frac{20 \times 10}{100} = 28 \%$.

When a third discount is given, combine it with the result obtained from the other two.

Thus, if discounts of 20, 10 and 5% off are given.

From the preceding illustration, 20% and 10% are equal to a single discount of 28%, combining 28% and 5% we get a discount of $28 + 5 - \frac{5 \times 28}{100} = 31\frac{2}{3}\%$, the single discount equal to the discounts of 20, 10 and 5% off.

227. To mark goods so that a given per cent. may be deducted and leave a given per cent. profit.

EXAMPLE.—At what price must I mark an article which cost \$4.00 so that, after deducting 20%, I may still have a profit of 25?

SOLUTION.

Selling price = \$4.00 + 25 % of \$4.00 = \$5.00,

and 20% less than the marked price = Selling price \$5.00. \therefore 80 % of marked price = 5.00.

....

marked price = $\frac{100}{80} \times 5.00 = 6.25 .

EXERCISE 64.

Find cash price of-

| LIST PRICE. TRADE DISCOUNT. 1. \$360, 5 and 20 % off. 2. \$475, 30 and 5 % off. 3. \$800, 20 and 10 % off. 4. \$750, 10 and 8 % off. 5. \$1600, 40 and 20 % off. 6. \$1750, 25 and 10 % off. 7. \$1840, 30 and $\frac{1}{4}$ % off. 8. \$3200, 40 and $\frac{1}{4}$ % off. | LIST PRICE. 9. \$360.60, 10. \$2142.45, 11. \$402.18, 12. \$675.36, 13. \$474.25, 14. \$306.60, 15. \$4362.50, 16. \$3169.20, | 5. 21. and 1 % off. |
|--|---|---------------------|
|--|---|---------------------|

What direct discounts are equal to discounts-

17. 5% and 20%; 30% and 5%; 20% and 10%; 10% and 5%. 18. 40 % and 20 %; 25 % and 10 %; 30 % and 1 %; 40 % and 1 %. 19. 10%, 5% and 3%; 50%, 10% and 5%; 40%, 20% and 10%. 20. 10%, 10% and 10%; 20%, 10% and 5%; 10%, 5% and 5%. 21. 10 %, 81 % and 1 %; 331 %, 20 % and 81 %; 5 %, 21 % and 1 %.

22. What is the difference on a bill of \$425 between a discount of 50% and a discount of 30% and 20%?

23. A bookseller wishes to mark a book which cost \$2.00 that he may allow a discount of 25 % and still make a profit of 20 %. What must be the marked price ?

24. If the list price of certain goods is \$12 per gross, what will I gain or lose by buying of Mr. A., whose discounts are 25% and 10%, instead of from Mr. B., whose discounts are 20, 10 and 5% off?

97

25. For what must I mark goods which cost \$3.60, so that I may allow discounts of 20 and 10% off, and still have a profit of 25 %?

26. A bookseller wishes to mark up the price of a book which he now sells for \$1.70, so that he can deduct 15% and yet receive the present price. What must be the marked price.

MISCELLANEOUS EXERCISE 65.

I.

 A man having 1,000 bushels of apples, sold 5% of them at \$1.25 per bushel; 8% of the remainder at \$1 per bushel;
 50% of what was then left at 75c. per bushel, and the rest at 60c. per bushel, thus receiving 10% more than he paid; how much did he pay for the whole quantity ?

2. Mr. Brooks bought a farm, which was in very poor condition, for \$1,586: and, after two years of careful cultivation, which paid for itself with some improvements, he sold it for 65 % more than he paid for it. What did he sell it for ?

3. The number of inmates in a workhouse 5 years ago was 110; this number has since increased 180%. How many inmates are there now?

4. A merchant bought goods for \$297.70, and paid an additional sum equal to 7% of the purchase price for cartage, freight, etc. What must he sell them for to gain 40% on the whole cost?

5. In a mixture of alcohol and water 85% is alcohol. How many gills of alcohol in 3 gallons of the mixture, and how many gills of water ?

6. 560 bushels of wheat, bought at 1.10 per bushel, were sold at a profit of 10%. What did the wheat sell for?

may

7. Bought a bill of goods amounting to \$875.50, from which was deducted 5%. What was the percentage allowed, and the amount paid?

8. Having \$10,720. I invested 25 % of it in land, and $12\frac{1}{2}$ % of the remainder in fencing it. What remained ?

9. Two men engaged in trade, each with \$3,540. One of them gained 33¹/₃ of his capital, and the other gained 60%. How much more did the one gain than the other?

10. A little boy who has 8 apples gives 25 % of them to his brother, $12\frac{1}{2}$ % to his sister, and 50% to his mother. What per cent. and how many has he left?

11. Charles sold his sled, which had cost him \$1.75, at 20% below cost. How much did he get for it ?

12. A lot of damaged calicoes are to be sold at 75% below the marked price. What prices must be asked for those that are marked 8c., 10c., $12\frac{1}{2}$ c., 16c., 20c., 30c. ?

13. A grain dealer bought wheat for \$9,384, and sold it at a gain of $4\frac{1}{2}$ %. What did he receive for it?

14. If a man owes \$2,500, and agrees to pay it in 4 instalments, the first to be $\delta 0$ % of the whole, the second 25%, the third 15%, the fourth 10%. What will each instalment be?

II.

1. A merchant owes \$6,500, and his property is worth only \$5,425. What per cent. of his debt can he pay ?

2. A man shipped 3,800 barrels of flour to England, and during a storm 19 barrels were thrown overboard. What per cent. was lost?

3. If I have \$374.50 in currency, how much gold can i buy when it sells at a premium of 7 %?

4. The population of a certain village increased in 5 years from 6,000 to 7,800. What was the average rate of increase per year?

5. A man bought 350 acres of land, at \$40 an acre, and sold part of it for \$2,240 at the same rate. What per cent. of the land did he sell ?

6. An agent received \$67.50 for collecting \$4,500. What per cent. was his commission?

7. Bought sugar for \$150 and sold it for \$167.50. What per cent. was the gain ?

8. A merchant owes \$8,250, his assets are 33,240. What per cent. of his debts can he pay?

9. Sold # acres of land for what the whole cost. What was the per cent. gain ?

10. What per cent. of 365 days are 30 days ?

11. Bought a number of eggs, and sold 11 for the money paid for 18. What per cent. was the gain ?

12. A regiment went into battle with 600 men, and came out with 320. What per cent. were lost?

13. Of 4,000 acres of land, I sell 140 acres. What per cent. do I retain?

14. A grocer sold from a hogshead containing 600 pounds of sugar, $\frac{1}{4}$ of it at one time, and $\frac{1}{3}$ of the remainder at another time. What per cent. of the whole remained ?

III.

1. A merchant owes \$15,120, and his assets are \$9,828. What per cent. of his debts can he pay ?

2. If \$52.50 is paid for the use of \$750, 1 year, what is the rate per cent. if \$56.70 is paid for the use of \$1,260?

3. A man shipped 2,600 bushels of grain from Chicago, and 455 bushels were thrown overboard during a gale. What was the rate per cent. of his loss?

4. One number is 6% of another. What per cent. is the latter number of the former?

5. My furniture is worth \$7,200, which is 90% of the value of my lot; and the value of the lot is $33\frac{1}{3}$ % of that of my house. How much are lot, house, and furniture together worth?

6. A gentleman who had a yearly income of \$2,000 for four years, spent \$1,800 the first year, \$1,500 the second, \$1,200 the third, and \$2,260 the fourth. What per cent. of his income did he save during the four years ?

7. A person expended 16% of all he was worth in buying 20% of the stock of a mining company. If the entire stock of the company sold for \$100,000, how much was the person worth?

8. A merchant, embarking in two speculations, in the first made £37 9s. 8d., which was 4% of his investment; in the second he lost £27 16s. 8d., which was 5% of his investment. How much had he invested in both enterprises?

9. A.'s yearly income, which is 7% of \$27,000, is 150% of B.'s income. If B. receives an income of 10% annually from his property, how much is he worth?

10. A leap year is what per cent. of a common year?

11. C. from an income of \$5,840, spends \$4,966.20; D. from an income of \$2,790.40, spends \$2,650.88; E. on anincome of \$1,559.50, saves as much per cent. as the rate per cent. that C. saves, exceeds the rate per cent. that D. saves. How much does E. save?

12. What is the cost of a house which sells at a loss of $7\frac{1}{2}$ %, the selling price being \$11,500?

13. A merchant owes \$12,575, and his assets are \$7,500. What per cent. can he pay?

14. Sold two city lots at \$1,500 each; on one I made 15%, on the other I lost 15%. What did I gain or lose?

1. Adding to a certain number 11% of itself, we have 109.835. What would we get, if we subtracted from the same number 11% of itself?

2. In a certain nursery, 15 % of the trees are pear trees, 1% cherry trees, 4% plum trees, and the rest, numbering 480, are apple trees. How many trees in all, and how many pear, cherry, and plum trees does the nursery contain?

3. P. having lost 20% of his capital, was worth exactly as much as Q., who had just gained 12% on his capital. Q.'s capital was originally \$15,000. How much was P.'s?

4. A railway company sold 12% of its land, and then mortgaged 5% of what was left. It then had 250,800 acres unencumbered. How many acres had it originally?

5. What number, increased by $2\frac{1}{2}$ % of itself, equals $12\frac{1}{2}$. diminished by $33\frac{1}{2}$ % of itself?

6. What fraction, increased by 21 % of itself, equals $\frac{1}{120}$?

7. 240 is 333 % more than what number ?

8. A collector who has 8 % commission, pays \$534.75 for a bill of \$775. What amount of the bill does he collect?

9. What is 3% of \$1,728?

10. What is 9\$ % of 275 miles ?

11. What is the difference between $5\frac{1}{2}$ % of \$800, and $6\frac{1}{2}$ % of \$1,050 ?

IV.

12. 25 % of 800 bushels is $2\frac{1}{2}$ % of how many bushels ?

13. Sold 105 barrels of potatoes, which was 35 % of all I raised. How many did I raise?

14. A farmer sold 7.5 acres of land, which was 15% of all he owned. How many acres did he own?

1. What per cent. of a number is 25 % of ²/₄ of it?

2. 1% of 1,258 is 1% of what number ?

3. What per cent. of a number is 20 % of $\frac{2}{3}$ of it?

4. A man spends \$825.60, which is $33\frac{1}{3}\%$ of his salary. How much is his salary?

5. A man drew out 9% of his bank deposit to pay a debt of \$243.72. How much had he in bank?

6. If a man, owning 40 % of an iron foundry, sells 25 % of his share for \$1,246.50, what is the value of the whole foundry?

7. A farmer sold 8,150 bushels of grain and had 80% of his entire crop left. What was his entire crop?

8. If a man owning 45 % of a steamboat sells $16\frac{2}{3}$ % of his share for \$5,860, what is the value of the whole boat ?

9. The assets of a business man are \$135,700, which sum is 43 % of his debts. What is his indebtedness?

10. A fruit dealer sold a lot of oranges for \$337.50, which allowed him a profit of $12\frac{1}{2}$ %. What did he pay for them?

11. A city lot was sold for \$25,500, the gain on the cost being 325%. What was the cost ?

12. A grocer sold 300 bushels of potatoes for \$285, which was $16\frac{2}{3}$ % less than he had paid for them. How much did they cost him per bushel?

V.

÷.,

13. A. sold goods at a gain of 18%. His profit was \$29.70. How much did he sell them for ?

14. By selling a lot of goods for \$380, I gain 3 times the per cent. that would be gained by selling them for \$340. What per cent. is gained in the latter case? (\$380 - \$340 = 2\$ times the gain.)

15. In the schools of a village yesterday there were 1,235 pupils present, which was 95% of the whole number belonging. How many belonged to the schools?

1. Sold a horse for \$340, which was 15% less than his value. What was his value?

2. A man having increased his bank deposit 40%, it amounted to \$840. How much had he at first?

3. My income this year is \$2,232, which is 7% less than it was last year. How much was it last year?

4. A man sold 160 acres from his farm, which was $12\frac{1}{2}$ % less than the number of acres he retained. How many acres in his farm ?

5. The price of a single ticket from Princeton to Woodstock is 30c., but 20 coupon tickets can be bought for \$5. What per cent. is saved by buying coupon tickets? What per cent. is lost by buying single tickets?

6. 10% of a flock of sheep were killed by dogs; $6\frac{3}{3}$ % of the rest were lost; $33\frac{1}{3}$ % of the remaining number were sold, and 28 then remained. What was the original number?

7. At harvest time a farmer sold 60 bushels of wheat, which was 25% of the quantity he sent to mill, and what he sent to mill was 40% of what he kept over till the next spring. How many bushels had he at first?

VI.

8. When a merchant sold his goods for \$261, he gained twice as much as he would have lost had he sold them for \$207. What was his gain per cent.? (How many times the loss is the difference between \$261 and \$207?)

9. A grocer sold butter at 12% profit. Had he sold it for 2c. more per pound, he would have gained 20%. What did 50 pounds cost him?

10. A boy buys an old pair of skates for 50c. and sells them for 25c. He then buys a pair for 25c. which he sells for 50c. What per cent. did he lose on the first pair, what per cent. did he gain on the second?

11. If a dealer buys a hat for \$3, and sells it for \$4, what per cent. does he gain? If he buys it for \$4 and sells it for \$3, what per cent. does he lose?

12. One hundred pounds of beef were sold for \$6, having been bought at 4c. a lb. What per cent. profit?

13. A retail dealer in boots and shoes sold 50 pairs of boots for \$300, they cost him \$5 a pair. What rate per cent. did he gain?

14. A merchant bought goods for \$500. What per cent. would he gain by selling them for \$530? For \$525? For \$550? For \$540? For \$560? For \$575? For \$600? For \$1,500?

VII.

1. William buys a penknife for 20c. and sells it to James for 25c. What per cent. does William gain, and what per cent does James lose?

2. If the 25 minutes of school time given to recesses are $8\frac{1}{3}$ % of the daily session, how many hours in the session?

3. If a book is marked to be sold at 25% above cost, but it is sold at 20% below the marked price, what was the gain or loss per cent.?

1

4. If 80 pounds of coffee are exchanged for 120 pounds of sugar, what per cent. is the coffee worth per pound more than the sugar?

5. What per cent. do I gain by selling an article for \$8 for which I paid \$2.25? What per cent. do I lose by buying an article for \$3 and selling it for \$2.25?

6. A drover sold a horse for \$226, and thus gained 25 %. What did he pay for him ?

7. Bought 300 long tons coal at \$3.75 a ton and sold it at \$4 60 a short ton. What is the per cent. profit?

8. Bought a barrel of syrup for \$20. What must I charge a gallon in order to gain 20% on the whole?

9. Sold 25 tons of coal at \$5.64 per ton, and made \$62. What did the coal cost, and what per cent. was the profit?

10. A quarter section of land was sold for \$4,563, which was 8% less than cost. What was the cost per acre?

11. If 15 % of what is received for goods is gain, what is the gain per cent. ?

12. Sold goods for \$29,900 and made 15 % after deducting 5% for cash. What was the cost and the marked price ?

13. A dealer sold 1,600 bbls. beef for \$24,000, which was a loss of 25 %. What did the whole cost, and what did he get a barrel?

14. A builder sold a house for \$8,250, which was 12% more than it cost him. What was the cost?

VIII.

1. A merchant sold cloth at \$3 per yard, and thereby gained 20%. What per cent. would be have gained if he had sold the cloth at \$3.75 per yard?

2. A person at two auction sales bought 1,170 books, buying at the second 30% of the number purchased at the first. How many did he buy at the second ?

3. What number, diminished by 25% of half of itself, equals 12,600?

4. Mr. A. paid three times as much for his horse as for his gig. If he had paid 15% more for his gig, and $8\frac{1}{3}\%$ less for his horse, they would together have cost \$468. How much did he give for each?

5. A merchant in 1872 made 3% on his capital, and in 1873, $8\frac{1}{3}\%$ on his capital thus increased. Capital and profit then equaled \$22,851. What was his original capital? What was his profit in 1873?

6. A. offered B. \$6,045 for a farm; which B. declined, as it was $2\frac{1}{2}\%$ less than it cost him. B. afterward sold it for \$6,855. Did he gain or lose on the farm, and what per cent?

7. A statue was sold for \$758.75, which was $\frac{1}{2}$ of 1% more than it cost. Had it been sold for \$700, what per cent. would have been gained or lost?

8. Sold goods for \$4,026.75, at a loss of $3\frac{1}{4}$ %. What would they have had to sell for to yield a profit of $3\frac{1}{4}$ %?

9. B. bought a horse for \$200, and sold it at 20% advance to C., who sold it to D. at a loss of 10%, and D. sold it to E. for 5% more than it cost him. If E. had paid \$21.60 less for the horse, would D. have lost or gained, and what per cent.?

10. K. sold X. some goods for \$394, at a loss of $1\frac{1}{2}$ %. X. sold them to Y., at a profit of $1\frac{1}{2}$ %. Did they cost Y. more or less than K., and how much?

11. Sold 40 bush. 1 pk. of apples for $\$81.39\frac{1}{2}$, clearing 4%. What would they have had to sell for per bushel, to yield a profit of 9%?

e

12. A drover laid out equal sums for sheep, cows, and hogs. On the hogs he lost 7%, on the sheep he made 15%, and on the cows he lost 1%. If he received for the whole \$1,535, and bought 25 hogs, what did each hog cost him ? What did all the sheep cost him ?

18. Jones offered his house for 15% more than it cost him, but afterward sold it for \$15,525, which was 10% less than his original offer. How much did his house cost him?

14. The population of a certain city in 1871 increased 4% on that of 1870; in 1872 it increased 5% on that of 1871; in 1873 it increased 6% on that of 1872, and amounted to 1,389,024. What was its population in 1870?

15. If a certain number be increased by $16\frac{2}{3}\%$ of itself, and the sum is diminished by 50% of itself, 10% of the remainder is 14. Required, the number.

IX.

1. If a merchant who buys goods on 6 months' credit is allowed a deduction of 5% for paying his bill within 30 days, what can he save on a bill of 560? How much on 5650?

2. If a man fails to pay his water rent until he is charged 12% for delay, how much will he lose if his water rate is \$18.75?

8. If 1% per month, counting from the time of payment, is allowed on all taxes paid before July 1st, and 1% per month charged on all taxes remaining unpaid thereafter, how much more does A. pay than B., if B. pays his taxes February 1st, and A. pays his taxes November 1st, their tax-bills each being \$180?

4. What is the net amount of a bill of goods, the list price of which is \$435, sold 5% off for cash, trade discount 8%?

5. Sold books on 3 mo. amounting to \$854.75 at a discount of $12\frac{1}{2}$ % from retail price, and 10% off for cash. What is the net value of the bill ?

6. The gross amount of a bill is \$236.37; the rates of discount are 15% and 8%. What is the net amount?

7. Find a direct discount equal to a discount of $12\frac{1}{2}\%$ and 8%.

8. What direct discount is equal to a discount of 25 % and 17 % ?

9. On a bill of 625, what is the difference between a discount of 30% and a discount of 25% and 5%?

10. Bought books at a discount of 20% on the retail price, and sold them at the retail price. What per cent. did I gain ?

11. What per cent. would I gain at a discount of 331 %?

12. With a trade discount of 8% and 5% for cash, goods were sold for \$825 at a profit of 15%. What was the cost?

13. A bookseller wishes to mark up the price of a book which he now sells for \$2, so that he can deduct 15% and yet receive the present price. What must be the marked price?

14. A merchant sells cloths for \$268 by which he gains 23%. How must he mark them so that he may deduct 4% and make the same profit?

15. Bought diamonds at \$920. How must I mark the price that after abating 5% the profit may be 25%?

16. What a vist be the price of an article from which you deduct 20% and base 20 cents?

MARKING GOODS.

109

MARKING GOODS.

228. It is customary in mercantile houses to use a private mark, which is placed on the goods to denote their cost and selling price. A word or phrase containing ten different letters is taken, the letters of which are used to indicate the ten digits. For example, the word "Sutherland" is selected; then the letters represent the figures as follows:

Sutherland 1234567890

If it is required to mark \$1.75, it is done thus, Sle; 47 hl; 90 nd.

229. The following are among the words and phrases that may be used : Haliburton, Chelmsford, Cumberland, Blacksmith, Now be smart, Strike hard, Cash profit, Black horse, etc.

230. It sometimes happens that the selling price contains three figures, while the cost price contains but two. To prevent this difference from being noticed, the letter denoting the cipher is prefixed to the cost price. For instance, the cost price was 85 cents, it would be marked dae; and the selling price, sue; thus each price would be indicated by three letters.

281. An extra letter, called a "Repeater," is used to prevent the repetition of a figure. Instead of writing see for 1.55, which would show that the two right hand figures were alike, and thus aid in giving a clue to the key-word, some additional letter is selected for a repeater,—y, for instance—and then the price would be written sey; 337 would be written tyl.

232. Arbitrary characters are frequently used instead of letters, thus:

1277454567890

That s of

dia-

12%

ınd

lis-

ail did

%? ds

t? ok

ad ed

18 :%

u

MARKING GOODS.

233. Fractions may be designated by additional letters or characters; thus g may represent $\frac{1}{2}$; f, $\frac{1}{3}$, etc.

EXERCISE 66.

1. What is the profit and what is the selling price of the following:

| Cost \$1.10, | Freigl | ht 10%, | Gain 20 | %. Selli | ng price. |
|----------------|--------|---------|---------|----------|-----------|
| " 1,80, | 44 | 8%. | " 10 | | 44 |
| " 4.50, | ** | 10%, | " 25 | /- | 61 |
| " 1.75, | | | · 20 | /- | 44 |
| " $2.50,$ | " | 10%, | " 30 | /- | " |
| 3 6 1 .1 | 111 | | | /0 | |

Mark the selling price of the above, using the word "Chelmsford."

2. Knowing a merchant's profit on cloth to be 25% and his key-word Haliburton, what letters would be used in indicating the cost price per yard, the selling price being hrb?

3. What letters would be used in marking the selling price of single articles which were bought at \$3.50 per dozen, and sold at a profit of 20%, using the word "Cumberland."

4. A publisher marks each copy of a work skd. What mark should he put on each so as to be able to allow the trade 30% discount? (Key-word "Strike hard.")

5. What would be the selling price of imported articles bought at \$4.60, on which the charges were 50% of the purchase price, if they were sold at 40% profit on total cost? How would the selling price be marked if the phrase "Cash profit" be used, with y as a repeater?

6. A merchant using as his key-word "Chelmsford," indicates the cost per yard of a piece of silk, thus cod. What mark will indicate the selling price so that he may sell it at 10% less than the marked selling price and still make 20% profit?

7. A man wishing to sell a web of silk asks 40% per yard more than it cost him, but he finally sold it at 10% less than his asking price, and made a profit of 52 cents a yard: Using the phrase "Now to smart" indicate the cost price, the asking price and the selling price.

8

a

COMMISSION AND BROKERAGE.

2:34. Commission is an allowance made to agents or commission merchants for transacting business. It is usually calculated at so much per cent. on the amount of money received for sales or expended in purchase.

235. A Commission Merchant or Agent is a person engaged in the buying and selling of goods for another, as the purchase or sale of merchandise or real estate, collecting or investing money, etc.

236. An Agent's Commission for sale is computed on the gross proceeds, and for purchase on the prime cost.

237. A Broker is one who effects purchases or sales in the interest of buyer or seller.

A broker does not generally take possession of the article bought or so'. He usually contracts in the name of the party from whom he receives his compensation.

238. Brokerage is the compensation paid to a Broker.

239. The Principal is the person for whom the business 's transacted.

240. A Consignment is property received to be sold on commission.

241. The Consignor or Shipper is the person who ships the goods to be sold.

242. The Consignee is the person to whom the goods are sent to be sold.

243. A Guarantee is the charge made for assuming the risk of loss from non-payment by the purchaser.

241. The Gross Proceeds of a sale or collection is the total amount received by the agent before deducting commission or other charges.

245. The Net Proceeds is what remains after all charges have been deducted.

246. An Account Sales is a statement in detail rendered by the Consignee to the Consignor, showing the sales of the consignment, all charges or expenses attending the same, and the net proceeds.

247. An Account Purchase is a detailed statement made by the purchasing agent to his principal, showing the quantity, grade and price of goods bought on his account, all expenses incident to the purchase, and the gross amount of the purchase.

248. To find the Commission on a sale of goods, the gross proceeds, and per cent. of commission being given.

EXAMPLE.—How much commission will be due an agent who sold a house and lot for \$6,000, and charged 3% for his services ?

SOLUTION.

\$6,000 × .03 = \$180. Ans.

249. To find the Commission on the purchase of goods when the prime cost and the per cent. of commission are given.

EXAMPLE.—My agent in London bought for me 350 yards of silk, which cost \$2.50 a yard, at a commission of 20%. Find the amount of his commission.

Solution. \$2.50 × 350 = \$875.10 = Cost of silk. \$875.00 × .02 = \$17.50. Ans.

250. To find the amount of a Sale when the amount of commission and the per cent. of commission are given.

EXAMPLE.—Received \$245 for selling a shipment of goods at a commission of 5%. How much did I receive for the goods?

| | | Soluti | ON. | • |
|-------|------------|------------|-----|------------------------------|
| 5% | of amoun | t received | = | \$245 |
| 1% | " | ** | = | $\frac{\$215}{5}$ |
| 100 % | 16 | ** | | $\frac{\$245 \times 100}{5}$ |
| Amoun | t received | for goods | = | \$4,900. Ans. |

251. To find the Commission on an investment when the amount sent the agent includes both the amount to be invested and the agent's commission.

EXAMPLE 1.- A commission merchant received a check for \$5,150, to be invested in tea after deducting his commission of 3%. How much money did he invest, and what was the amount of his commission?

SOLUTION.

The amount to be invested is 100% of itself, the commission is 3% of amount invested.

| ∴ 103% o | of amount t | o be invested | • | \$5,150 |
|----------------|----------------------------|-----------------------------|---|---------------------------|
| 1% | 41 | 44 | - | \$5,150 103 |
| 100% | " | 41 | | \$5,150 × 100 |
| ∴ The Commi | amount to ssion, \$5,1. | be invested 50 - \$5,000 | | 103 \$5,000. \$150. |

Example 2.-Having sold a consignment of cotton on 3% commission, I am instructed to invest the proceeds in city property, receiving a commission of 2% on the price paid for the property. My whole commission is \$200. Find the amount for which the cotton sold.

SOLUTION 1.

Take the amount for which the cotton sold as a unit

then $\frac{3}{100}$ of the amount of sales = first commission. 100 44

" = what is left after deducting 1st Com.

Cn every \$102 of amount left after deducting 1st Com., the agent receives \$2 for his second commission.

| \therefore The agent's commission = | 71 | of the amount to be invested. |
|---|----|-------------------------------|
| Hence $\frac{1}{81}$ of $\frac{97}{100} = \frac{97}{5100}$ of sales | | |
| $\therefore (1\frac{3}{5\sigma} + \frac{5}{5}\frac{7}{5\sigma}) \text{ of sales}$ | = | Agent's total commission. |
| 152 of sales | = | \$200. |
| Sales | = | \$4,080. Ans. |

SOLUTION 2.

$$3\% + 2\% = 5\%$$
.

If the 5% commission had been charged on the whole amount of sales, the commission would have been 2% of 200 = 4 more, *i.e.*, the entire commission would have been 200 + 4 = 204 = 5% of sales.

> : 5% of sales = \$204. Sales = \$4,080. Ans.

Again: If the 5% commission had been taken on the amount of purchase money, the entire commission would have been 3% of \$200 = \$6 less than it was, *i.e.*, the entire commission would have been \$200 - \$6 = \$194 = 5% of purchase money.

 \therefore 5% of purchase money = \$194. Purchase money = \$3,880.

SOLUTION 3.

It will be found that on every \$102 from sale there is \$5 entire commission. Suppose we allow for commission for selling, \$2 of the \$102, leaving \$100. For commission for purchasing, \$3 of the \$100, leaving \$97. The entire commission would be \$5.

In the former case we have charged 2% of \$3 = 6 cents too much. But in the latter case we have charged 3% of \$2 = 6 cents too little, *i.e.*, the *excess* equals the deficit, and we have still \$5 entire commission.

> Then, $\frac{5}{102}$ of sales = \$200. Sales = \$4,080

SOLUTION 4. Let 100 % = Sale. 3% of sale = First Commission. $1\frac{1}{2}$ of 97% = $1\frac{1}{2}$ % of sale = Second 64 3% of sale + 1#% of sale = Total • • $4\frac{4}{51}$ % of sale = \$200. 100% of sale = \$4,080.

From the foregoing solutions we obtain the following

If commission on sale is 4% and on purchase 8%, the entire commission = $\frac{4+3}{100+3}$, *i.e.*, $\frac{7}{103}$ of sale money, and $\frac{4+3}{100-4}$, *i.e.*, $\frac{7}{96}$ of purchase money.

And generally if we have m per cent. on sales, and n per cent. on purchase, the entire commission = $\frac{m+n}{100+n}$ of sale money, and $\frac{m+n}{100-m}$ of purchase money.

EXERCISE 67.

Find the commission-

1. On the sale of merchandise for \$3,150, at $2\frac{1}{2}$ %.

2. On the sale of a mill for \$8,450, at $2\frac{3}{4}$ %.

3. On the sale of 375 bbl. of flour, at \$6.25 a bbl., at 31%.

4. On the purchase of a farm for \$12,370, at $2\frac{1}{4}$ %.

5. On the sale of 255 bales of cotton, each weighing 520 lb., at $14\frac{3}{4}$ cents a lb., at $1\frac{1}{2}$ %.

Find the rate of commission-

6. When \$78 is paid for selling goods for \$5,200.

7. When \$84 is paid for collecting a debt of \$4,800.

8. When \$189 is paid for selling a farm for \$7,560.

Find the amount of sales-

9. When a commission of \$360 is charged, at $2\frac{1}{2}$ %.

10. When the brokerage charged is \$48, at $\frac{1}{4}$ %.

11. When the agent charges \$59.60 commission at $1\frac{3}{4}$ %.

12. When a commission of \$57.82 $\frac{1}{2}$ is charged, at $4\frac{1}{2}$ %.

13. When the net proceeds are \$38.70, commission 34 %.

14. When the net proceeds are \$2,444.55, brokerage $\frac{2}{4}$ %.

le эf 70

• ?

ıe ld ıe

)4

r n 63

\$5

ts of

it,

Find the amount to be invested and commission-

15. If \$4,455 is remitted, deducting $1\frac{1}{4}$ % commission.

16. If \$9,909.40 is remitted, deducting $3\frac{1}{2}$ % commission.

17. If \$6,500 is received, and $1\frac{1}{4}$ % brokerage deducted.

18. If \$2,846.25 is remitted, deducting $3\frac{1}{2}\%$ commission.

19. What weight of wool, at 52 cents a lb., can be bought for \$1,109.60, after deducting a commission of 4%.

20. Sent to my agent in Hamilton \$1,508.80, to invest in flour at \$5.75 a bbl., after deducting his commission at $2\frac{1}{2}$ %. How many bbls. can he buy ?

21. An agent sold a house and lot for \$8,500, and charged 3% for his services. How much was his commission?

22. If an agent's charges are 2%, how much commission will be earn by selling property valued at \$10,500?

23. A real estate agent sold a farm of 75 acres at \$85 an acre, on a commission of 2%; and the stock and implements on the farm for \$3,250, on a commission of 3%. Find the total amount of his commission.

24. An agent received \$612.50 for selling grain, on a commission of $1\frac{1}{4}$ %. What was the amount of his sales?

25. A collector's charges for collecting a note amounted to \$14.10, at a commission of 5%. What sum was collected?

26. An agent receives \$12,504.20 to invest in wheat, on a commission of 3%. Find the amount of money invested in wheat.

27. How many lbs. of wool at 27c. a lb., can be bought' for \$8,424, if the agent is allowed 4% for purchasing?

28. Paid an agent a commission of \$133.12 $\frac{1}{2}$, at $2\frac{1}{2}$ %, to purchase wheat at \$1.87 $\frac{1}{2}$ a bushel. How many bushels did he buy, and what was the amount of his bill ?

117

29. Paid a broker \$38.10 for buying 120 shares of railroad stock, at $95\frac{1}{4}$ % a share. What was the rate of his brokerage?

30. An agent in Montreal remitted \$3,795.66 on a sale of 540 barrels of flour, at \$7.25 a barrel. What was his rate of commission?

31. A real estate broker charges \$182.34 for investing\$12,156 in a factory. What was his rate of brokerage ?

32. I sell through my broker 7 tons of Brazil nuts at \$7.50 per cwt. How much do I receive if the broker charges 1% for selling?

33. Sent \$414 to an agent in Toronto to be invested in prints, at $12\frac{1}{2}$ cents a yard, after taking out his commission of $8\frac{1}{2}$ %. How many yards can be purchase?

34. My attorney collected 80% of a note for \$1,200, and charged $5\frac{1}{2}$ % commission. What amount should he pay me?

35. An agent sells a consignment of flour for \$7.532.80 and then purchases 1,840 bushels of wheat, at \$1.40 a bushel, his commission being $2\frac{1}{4}$ %. What sum must he remit to the consignor?

36. An auctioneer, who charged 2% for selling, found his commission for the sale of a certain house just sufficient to pay for a Cyclopædia in 16 volumes, worth \$5.50 a volume. What did the house sell for ?

87. A commission merchant received a remittance of \$1,000 to be invested in sugar, after deducting his commission of 2%. The sugar costing $8\frac{5}{2}$ c. a lb., how many pounds could he buy?

38. How much does a house bring, for which the owner receives 24,255, 1% of the purchase money having been first deducted for the agent who sold it?

d. on. ght

on.

.

est at

nd is-

ion

85 le-%.

a

? ed ol-

on

ed ht

to els

39. How many barrels of flour, at \$5.60, can be bought for \$2,545.20, a commission of 1% for purchasing having also to be paid out of this sum?

40. A commission merchant sold 500 lbs. of butter at 18c. per lb., and invested the proceeds in oats at 42c. a bushel. He charged $4\frac{1}{2}$ % for selling and $1\frac{1}{2}$ % for buying. What was his total commission, and how many bushels of oats did he buy?

41. A fruit broker sold \$680 worth of apples, and after deducting 5% commission and 20% for freight and other charges, invested the balance in oranges. How much did he invest in oranges if he charged 2% for buying?

42. My agent in Brantford sells for me a quantity of dry goods on commission at 6%. How much must be sold that my agent can buy flour with the proceeds to the value of \$5,400, after retaining his commission, for buying, of $2\frac{1}{2}$?

43. Sold goods at $2\frac{1}{2}$ % commission, which I invested in sugars, and sold them at a profit of 15%, realizing a gain of \$240. How much commission did I receive, and how much did the goods sell for ?

44. A merchant purchased an invoice of grain, which, including a commission of $1\frac{1}{2}$ %, cost \$5,050.65. The freight charges were \$15.35. He sold the grain at a profit of 15% on the entire cost, and invested the proceeds in sugar, which he sold at a profit of 5%. What was the amount paid for commission? What the entire cost of the grain, and how much were his profits ?

45. A commission merchant bought goods for which he received 5 % commission for buying and \$63.25 for charges. The total cost of goods, commission, and charges was \$3,250. What was paid for the goods?

119

46. An agent bought coffee at $\frac{5}{6}$ % brokerage, and received \$350. He afterwards sold the coffee at a profit to his principal of \$5,160, after deducting $1\frac{1}{2}$ % commission on the amount for which it was sold. How much was his commission?

47. I received from Day & Son, of Chicago, a ship load of corn, which I sold for 60c. per bushel, on a commission of 4%; and, by the shipper's instructions, invested the net proceeds in barley, at 75c. per bushel, charging 5% for buying; my total commission was \$1,350. How many bushels of corn did Day & Son ship, and how many bushels of barley should they receive ?

48. A Buffalc brewer remitted \$21,500 to a Toronto commission merchant, with instructions to invest 40% of it in barley, and the remainder, less all charges, in hops. The agent paid 60c. per bushel for barley, and 20c. per pound for hops, charging 2% for buying the barley, 3% for buying the hops, and 5% for guaranteeing the quality of each purchase. If his incidental charges were \$187.50, what quantity of each product did he buy, and what was the amount of his commission?

49. A Toronto factor received from Cincinatti a consignment of corn, which he sold at 75c. per bushel, on a commission of 5%; and by instructions of the consignor invested the net proceeds in wool, at 20c. per pound, charging 2% for buying, and 8% additional for guaranty of quality. If the total amount of the agent's commission and guaranty was 1,640, now many bushels of corn were received?

50. My Memphis agent sends me an account purchase of 350 bales of cotton, averaging 480 lbs. each, bought at 15c. per lb., on a commission of $2\frac{1}{2}$ %. His charges, other than for commission, were: freight advanced, \$126.50,

ght ng

at . a

ig. of

;e**r**

er id

ry at of ?

in in

W

h,

10 lit

in

10 10

ie

s.

cartage, \$53.25, and insurance, \$13.75. What sum should I remit to pay the account?

51. An agent sells a consignment of goods for \$2,100. He pays \$33.50 for freight, and, reserving his commission remits \$2,024.77. Find the rate of his commission.

52. An agent sells 1,100 barrels of flour, at \$4.50 a barrel, and charges $2\frac{1}{2}$ % commission, He invests the proceeds in steel, at $1\frac{1}{2}c$. a lb., charging $1\frac{1}{2}$ % commission. What is his entire commission, and how many tons of steel (2,240 lbs. to a ton) does he buy?

53. A commission merchant has consigned to him 5,000 lbs. of cotton, which he sells at 14c. a lb., and charges 2% commission. With the net proceeds he buys cotton cloth, at 10c. a yard, charging $1\frac{1}{2}$ % commission for buying. How many yards of cloth does he buy ?

54. A commission merchant has consigned to him 5,000 barrels of flour, which he sells at \$5.50 a barrel, and charges $2\frac{1}{2}$ % commission; the expenses for freight, etc., amounted to \$250. With the net proceeds he buys sugar, at $6\frac{1}{4}c$. a lb., charging $2\frac{1}{2}$ % commission for buying. How much sugar does he buy, and what is the amount of his commissions?

iould

,100. sion

50 a prosion. steel

,000 2% oth, How

000 and etc., gar, Iow his

CUSTOM HOUSE BUSINESS.

252. Duties or Customs are taxes levied by the Dominion Government on imported goods, for revenue purposes and for the protection of home industry.

253. Duties are of two kinds, ad valorem and specific.

254. An Ad Valorem Duty is a certain per cent. assessed or levied on the actual cost of the goods in the country from which they are imported, as shown by the income.

255. A Specific Duty is a tax assessed at a certain sum per ton, foot, yard, gallon, or other weight or measure, without reference to the value.

Norg.-Upon certain goods both specific and ad valorem duties are levied.

256. A Custom House is an office established by the Dominion Government for the transaction of business relating to duties, and for the entrance and clearance of vessels.

257. Ports of Entry are places at which custom houses are established; and it is lawful to introduce merchandise into a country only at these places.

258. A Clearance is a certificate given by the Collector of a Port after the requirements of law have been complied with, that the vessel has been properly entered.

259. An Invoice or Manifest is a statement made by the seller or shipper, giving a description of the same, showing actual cost, or value of such merchandise; showing also, marks, numbers, quantity, charges, and other details. 260. All invoices are made out in the weights and measures of the country from which the importation is made.

261. All invoices of merchandise subject to an ad valorem duty, are made out in the currency of the country from which the importation is made.

262. When the value of the foreign currency is fixed by law the value is to be taken in estimating the duties; when the value is not fixed by law, the invoice must be acompanied by a consular certificate showing its value.

263. A Tariff is a schedule of goods, and the rates of import duties imposed by law on the same.

264. The Free List includes classes of goods that are exempt from duty.

265. Tonnage is a tax levied upon a vessel independent of its cargo, for the privilege of coming into a port of entry.

266. Allowances are deductions made in estimating Specific Duties, and are distinguished as Leakage, Breakage, Draft, Tare, etc.

267. Leakage, determined by gauging, is an allowance for the waste of liquids imported in barrels or casks.

268. Breakage is an allowance made for loss of liquids imported in bottles.

269. Draft is an allowance made for waste or impurities.

270. Tare is an allowance made for the box, bag, crate, or other covering of the goods.

271. Gross weight is the weight before any allowances are made.

272. Net weight is the weight after all allowances are made.

128

273. Drawback.—When distilled spirits, fermented liquors, and tobacco upon which an excise duty has been paid, and foreign merchandise upon which an import duty has been paid, are exported, the tax or duty upon the same is refunded. Such return of the tax or duty is called a Drawback.

274. An Appraiser is an officer of the customs who examines imported merchandise and determines the dutiable value and the rate of duty of the same.

275. A Bonded Warehouse is a place for the storage of merchandise on which the duties have not been paid.

Notes 1.—The law requires an entry for goods to be made within three days after arrival. If no entry is made the goods may be conveyed to the Queen's Warehouse, and may be sold after thirty days for duties.

2. In case goods are warehoused, that is, claimed by the importer and transferred by proper entry to some bonded warehouse, they cannot be sold within two years from the date of such transfer.

3. When goods arrive at a Port of Entry and are unclaimed, they are taken to the Queen's Warehouse, and are subject to sale by auction within thirty days. The proceeds of the sale, after paying all expenses, are paid over to the Receiver General, and may be recovered by proving ownership.

276. A Custom House Broker is a person who makes entries, secures permits, and transacts other business at Custom Houses for merchants. He is familiar with the tariff laws, and the details and regulations of Custom House business. He usually acts under the power of an attorney.

277. To find Specific Duty.

EXAMPLE.—What is the specific duty on 150 casks of alcohol, of 60 gallons each, at 20c. per gallon; leakage, 5 %?

Solution. 60 gal. \times 150 = 9000 gal. = Gross quantity. Less 5% for leakage = 450 gal. / 8550 gal. = Net quantity. 20c. \times 8550 = \$1710.00 = Specific duty.

and on is

orem from

ed by when inied

ss of

are

dent try.

ting age,

nce

iids

ies.

ag,

ces

are

278. To find Ad Valorem Duty.

EXAMPLE. — What is the ad valorem duty, at 40%, on 120 boxes of brass rivets, at 50 lb. per box, invoiced at 9c. a lb., tare 8 lb. per box?

EXERCISE 68.

Find the specific duty-

1. On 50 hhd. of sugar, each weighing 480 lb., at $1\frac{1}{4}c$ a lb., tare 78 lb. per hhd.

2. On 360 doz. bottles of porter, duty 50c. a doz., breakage 10%.

3. On 250 chests of tea, each 75 lb., invoiced at 15c. a lb., duty $3\frac{1}{2}$ c. a lb.

4. On 120 bags of coffee, gross weight 148 lb. each, allowing 3 % tare, at $3\frac{1}{2}c$. a lb.

5. On 60 packages of figs, each 16 lb. weight, at $2\frac{1}{2}c$. per lb., tare 5%.

6. On 897,120 lb. of bituminous coal at 75c. per ton.

7. On an importation of 200 boxes of plate glass, each box containing 20 plates 24×48 in. in size, at 25c. per sq. ft.

8. On 40 doz. bottles of wine, at \$2 per doz., on allowance of 10% for breakage.

9. On 1,500 doz. empty bottles, breakage 4 %, and rate of duty 10c. per doz.

10. On 6 blocks of marble, each 10 ft. long, 3 ft. wide, 2 ft. high, at 65c. per cu. ft.

boxes of box?

at 14c

doz.,

15c. a

each,

 $t \ 2\frac{1}{2}c.$

on. each 3. per

llow-

rate

vide,

Find the ad valorem duty-

11. On 16 tons of steel, invoiced at 18c. per lb., at 25 %.

12. On 175 boxes of raisins, 18 lb. per box, at 17 %.

13. On 650 doz. kid gloves, invoiced at 6.50 a doz., at 52%.

14. On 600 gal. sperm oil, of 42 gal. each, invoiced at 45c. a gal., at 20%; $3\frac{1}{2}$ % being allowed for leakage.

15. What is the duty at 40% on an invoice of French jewellery, amounting to 8,560 francs?

16. What is the duty on an invoice of books from Vienna the value of which was 6,429 florins, at 38 %.

17. What is the duty on an invoice of linens amounting to $\pm 3,256$ sterling at 27 %, allowing \$4.866½ to a pound ?

18. Find the duty on an invoice of woollen cloths from Germany valued at 8,437 Reichmarks, at 45 %.

19. What is the duty on 1,000 yd. of brussels carpet, 27 in. wide, invoiced at 6s. 9d. per yd.; duty 44c. per sq. yd. specific, and 35 % ad valorem ?

20. An invoice of woollen cloth, imported from England, was valued at £956 6s. If its weight was 684 lb., how much was the duty, at 50c. per lb. specific, at 85% ad valorem?

21. I imported from the United States 7,240 bush. of corn and $17\frac{1}{2}$ tons of hay, invoiced at \$9.50 per ton. What amount of duties had I to pay, at 15c. per bush. on the corn and 20% on the hay?

22. The duty, at 19%, on an importation of satin, is \$309.70. What is the invoice of the goods?

23. How much duty must be paid on an importation of 27,640 lb. of wool, invoiced at £1,497 10s. 4d., if the rate of duty is 10c. per lb. specific, and 11 % ad valorem?

24. What is the duty and total cost of 2,500 pieces bleached calico, 38 yd. each in length, and $1\frac{1}{2}$ yd. wide; price 6d. per yd., duty 4c. per sq. yd., and expenses at Liverpool £65 10s.? What is the amount of a bill of exchange at \$4.87 to the £ to cover the cost?

25. Find the duty on 50 cases of tobacco, each weighing 60 lb., and 50,000 Havanna cigars weighing 55 lb, invoiced at \$75 per M., the duty being 50c. per lb. specific on the tobacco and \$2.50 per lb. specific on the cigars, and 25% ad valorem on both.

26. Paid \$22.40 duty on 100 bbl. of sugar, each weighing 220 lb., invoiced at 8c. a lb., tare 4%. What was the rate?

27. Required the duty and total cost of 1 case of French silks, value 3,500 francs, duty 50% ad valorem; 1 case velvets, value 28,000 francs, duty 50%, expenses, cartage, shipping, etc., 625 francs, and commission $2\frac{1}{2}\%$.

28. A merchant imported 80 pieces three-ply carpet, 75 sq. yd. in a piece, and paid \$2,591.84 duty, at 16c. per sq. yd., and 80% ad valorem. What was the invoice price per yd., in sterling money?

29. A merchant imported 300 pieces of three-ply carpet, each piece containing 75 sq. yd., invoiced at 3s. 6d. per sq. yd., upon which he paid a duty of 17c. per sq. yd. specific, and 35% ad valorem. What was the total amount of duty paid?

30. On 40 cases of tobacco, each weighing 65 lb., and 20,000 Havana cigers, weighing 200 lb., invoiced at \$45 per M., the duty on tobacco being \$.30 per lb., and on cigars $$2\frac{1}{2}$ per lb. specific, and 40 % ad valorem.

31. Find the duty at 33 % ad valorem, on 1 case of shawls valued at $\pounds 42$ 5s., 1 case of linens at $\pounds 37$ 10s., duty 40 %;

1 case prints at £8 5s., duty 20%; incidental expenses £1 5s., commission $2\frac{1}{2}\%$; consul's fees 15s. What is the total cost in Canadian money?

32. W. A. Murray & Co. imported 10 cases of shawls, averaging 216 lb. a case, invoiced at 24884.10 francs, the duty being \$.50 a lb., and 35 % ad valorem. The invoice was paid with a bill of exchange, bought at 5.16 francs to the dollar. What was the duty, and what did the shawls cost, after paying other charges to the amount of \$75.80?

pieces wide ; ies at ill of

ghing oiced n the 25 %

thing rate?

ench case tage,

t, 75 per price

rpet, per yd. ount

,000 М., \$21

wls %;

INSURANCE.

279. Insurance is a contract by which one party engages for a stipulated consideration to make up a loss which another may sustain. It is distinguished as Property Insurance, Life Insurance, Accident Insurance, and Health Insurance.

280. An Insurance Company is a company or corporation which insures against loss or damage.

281. Insurance companies may be classified according to principles of organization as follows :--1. Stock; 2. Mutval; 3. Mixed, or Stock and Mutval.

282. A Stock Insurance Company is one in which the capital stock is owned by the members of the company called stockholders. They alone share the profits and are liable for the losses.

The business of a stock company is managed by directors chosen by the stockholders.

283. A Mutual Insurance Company is one in which the persons insured receive a share or division of the profits.

284. Non-participating policies, the holders of which do not share in the profits or losses, are issued by certain mutual and mixed companies.

INSURANCE.

285. A Mixed Insurance Company is one which is conducted upon a combination of the stock and mutual

286. The Insurer or Underwriter is the party who assumes the risk, or agrees to indemnify against loss.

287. The Policy is the name applied to the written agreement of contract between the Insurance Company (the Insurer or Underwriter) and the party insured.

288. A Valued or Closed Policy is one in which the amount insured is definitely determined at the time the insurance is effected. Houses, furniture, and goods in a store are insured in policies of this kind.

289. An Open Policy is one upon which additional insurances may be entered at any time from port to port, at rates and under conditions agreed upon.

290. The Premium is the amount paid for the insurance.

291. An Insurance Agent is a person who represents one or more Insurance Companies, and acts for them in soliciting business, collecting premiums, adjusting loses, etc.

292. An Insurance Broker is a person who effects insurance for a compensation called brokerage or commis-

party loss d as ance,

rpor-

rding tock ;

h the pany d are

etors

which f the

vnich rtain

FIRE INSURANCE.

FIRE INSURANCE.

293. Fire Insurance refers to insurance against loss or damage by fire. Losses may be total or partial.

294. Fire Insurance Losses are usually adjusted by the insurance company paying the full amount of the loss, provided that such loss does not exceed the sum insured; if the policy, however, contains the "average clause," the payment made is such proportion of the loss as the amount of insurance bears to the total value of the property.

295. The Term of Insurance is the period of time for which the risk is taken, or the property insured.

296. Short Rates are certain rates of premium charged by the companies when the term of insurance is less than a year.

297. In case a policy is terminated at the request of the insured, he is charged the "short rate" premium; if, however, it be terminated at the option of the company, the lower long rate will be charged, and the company refund the premium for the unexpired time of the policy.

298. To guard against fraud, property is not usually insured for its full value, and no more can be recovered than the amount of actual loss. The party insured must also have an interest in the property insured.

299. Dwelling-houses and permanent property, about the value of which opinions differ, and which deteriorate in time, may generally be insured for from one-half to threefourths their estimated value; goods in store, at their cash value.

Insurance companies usually reserve the privilege of rebuilding, replacing, or repairing damaged property.

7

MARINE INSURANCE.

300. Marine insurance refers to insurance of vessels and their cargoes against the dangers of navigation.

301. Inland or Transit Insurance refers to insurance of merchandise while being transported from place to place either by rail or water routes, or both.

302. Marine Insurance losses are adjusted by the insurance company paying only such a proportion of the loss as the sum insured is to the entire value of the vessel.

303. Policies on Cargoes are issued for a certain voyage, and on vessels, for a voyage, or for a specified time.

304. Salvage is an allowance made to those rendering voluntary aid in saving vessels or cargoes from marine

305. When the insured ships goods, or receives information of goods shipped to him, he must notify the insurance company as soon as he is in receipt of bill of lading or other advice of shipment, that it may be entered on the

306. Goods at sea may generally be insured from 5% to 25 % more than their cost or invoice price, in order to cover the expenses of freight, insurance, and a share of the

307. To find the cost of insurance, the amount insured, and per cent. of premium being given.

EXAMPLE -A house and its contents are insured for \$8,500. What is the cost of insurance for one year at 11% premium ?

SOLUTION. \$8,500 × .015 = \$127.50.

RULE.

Multiply the amount of insurance by the rate per cent. of premium, and the product will be the cost of insurance.

ss or

l by loss. red : the the the

for

rged than

f the ; if, any, oany cy. Jally red must

bout te in hreecash

ge of

308. To find the amount insured, the premium, and the per cent. of premium being given.

EXAMPLE.—I paid \$170 to insure a stock of goods for one year at a premium of 2%. For what amount was the policy insured?

| | | | SOLUTION | | | |
|---------------|---------|-----|-----------|---|--------------------------|------|
| 2 % of | f amor | int | of policy | = | \$170 | |
| 1% | ** | | 66 | = | $\frac{170}{2}$ | |
| 100 % | " | | " | = | $\frac{170 \times 2}{2}$ | 100 |
| : Amoun or | nt of p | oli | ру | = | \$8,500. | Ans. |
| | \$170 | ÷ | .02 | Ħ | \$8,500. | Ans. |
| | | | RULE. | | | |

Divide the premium by the rate per cent. of premium, and the quotient will be the amount insured.

309. To find the rate per cent. of premium, the premium and the amount of insurance being given.

EXAMPLE.—I paid \$85 premium on a house insured for \$6,800. What was the rate per cent. of insurance?

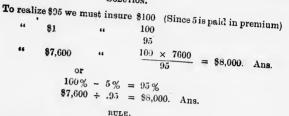
| | S | OLUTION | ι. | | | | |
|---------|------------|-----------|----|-----------------------------|----------------------|------|--|
| Cost of | insuring | \$6,800 | is | \$85 | | | |
| " | ** | \$1 | " | $\frac{85}{6800}$ | | | |
| ٠ | " | \$100 | " | $\frac{85 \times 680}{680}$ | | | |
| | ∴ Ra | ate | = | 11 %. | Ans. | | |
| - | \$85 ÷ \$6 | 800 RULE. | = | .0125, | or 1 1 %. | Ans. | |

Divide the premium by the sum insured, and the quotient will be the rate.

310. To find the sum to be insured that will cover both premium and insurance, in case of loss, the value of the property and the rate being given.

EXAMPLE.—For what amount must property worth \$7,600 be insured, at 5%, so that in case of loss, both the premium and the value of the goods may be recovered ?

SOLUTION.



133

Divide the value of property by 100%, minus the rate of insurance, and the quotient will le the sum insured.

311. To estimate proportionate losses.

EXAMPLE.-- A merchant insured \$2,500 in the Ontario Mutual. \$1,500 in the Phœnix, and \$3,500 in the Western. A loss by fire of \$6,000 occurred. How much should each company pay?

SOLUTION. \$2,500 Ontario Mutual. 1,500 Phoenix. 3,500 Western. \$7,500 = Sum insured. $6,000 \div 7,500 = .80$ = Rate of loss on \$1. Ex. $2,500 \times .80$ = \$2,000 = Share of Ontario Mutual. $1,500 \times .80 = 1,200 =$ ** Phœnix. $3,500 \times .80$ = 2,800 = 66 Western,

RULE.

Divide the loss by the total insurance, the quotient will be the per cent. which each must pay.

EXERCISE 69.

1. What will it cost to insure a factory worth \$26,000 at $\frac{4}{5}$ %, and machinery worth \$16,800 at $\frac{5}{5}$ %, with \$1.50 for

2. What premium must be paid for insuring \$6,500 on a store for 3 years at $2\frac{1}{2}$ %?

ınd

at a

ınd

:he

800.

ent

7er ue

be lue

3. My house cost me \$8,400. I insured it for \$ of its value, at \$% per year. My books and furniture were insured for \$8,000 at the same rate. What did I pay annually for insurance on both ?

4. If \$125 are paid annually for insuring \$24,000, what is the rate per cent?

5. Paid \$350 on a shipment of goods to insure $\frac{3}{4}$ the value, at $3\frac{5}{5}$ %. What was the whole value?

6. A house is insured at \$%, and the premium is \$93.60. For how much is it insured?

7. The cargo of steamer Gallion, bound for Liverpool. is insured at $\frac{1}{2}$ %. For what sum is it insured, the premium being \$1,500?

8. A manufacturing company paid \$214.80 premium for insurance on $\frac{3}{4}$ of the cost of its building and machinery, at 60c per \$100. What was their cost?

9. A company had \$125 premium for insuring property worth \$18,000. If similar property worth \$45,000 were insured at the same rate in another company, what would be the premium ?

10. A merchant sent a cargo of goods worth \$25,275 to Canton. What sum must he get insured at 3%, that he may suffer no loss, if the ship is wrecked ?

11. What sum must be insured, at 3%, on a consignment of tea worth \$4,200, to cover property and premium?

12. A shipowner insures a ship and cargo for \$89,325, at $4\frac{1}{2}$ %, the policy covering both property and premium. What is the value of the property?

13. If a warehouse is worth \$266,250, what sum must be insured, at 2%, to cover the property and premium ?

14. The premiums paid for insuring two stores are 98.24 and 146.50; the rate is $1\frac{3}{2}$ %. What sum must be insured to cover the property and premium ?

its

ere

ay

ıat

 \mathbf{he}

50.

is

m

or

y,

ty

re

ld

 \mathbf{to}

10

1t

ıt.

ı.

3t

θ

e

15. The loss by fire on a store and contents was \$4,525; the property was insured \$2,500 in Western, \$4,000 in British American, \$2,000 in Provincial, and \$3,000 in Royal Canadian. How much should each pay?

16. The loss by fire on a piece of property was \$8,000, of which \$2,000 was insured in the Ottawa Agricultural, \$3,000 in the London Mutual, and \$8,000 in the Citizen. How much did each company contribute ?

17. A block of stores and contents was insured for \$220,000, and became damaged by fire and water to the amcent of \$150,000. Of the risk, \$40,000 was taken by the Quebec Co, \$65,000 by the British American, \$35,000 by the Western, and the remainder was divided equally between the Royal Canadian and the London Mutual. What was the net loss of each company, if the premium paid was $1\frac{7}{5}\%$?

18. A man owing $\frac{2}{5}$ of a ship, insured $\frac{2}{5}$ of his interest at $1\frac{1}{2}$ %, and paid \$91.50 for premium, and a policy charge of \$1.50. If the ship becomes damaged to the extent of \$12,000, how much can be recovered on the policy ?

19. For how much must a house worth \$6,000, and furniture worth \$2,000, be insured, at $1\frac{1}{2}$ %, to cover the cost of the policy, which was \$2, the amount of premium paid, and $\frac{3}{4}$ of the value of the property ?

20. A schooner is valued at \$10,500, and has a cargo of 9,500 barrels of apples, worth \$2.10 per barrel. What amount of insurance must be obtained, at $2\frac{1}{8}$ %, to provide, in case of loss, for the value of the property, the premium, and \$5 additional which the owner paid for survey and policy?

21. The furniture in my house is estimated at one-half the value of the house. I get both insured for \$7,687.50 for 5 years, at $2\frac{1}{2}$ %, and find that in case of total destruc-

tion the face of the policy will be full indemnity for both the property and premium. Find the value of the house.

22. A factory worth \$45,000 is insured, with its contents, for \$62,500; \$30,000 of the insurance is on the building, \$12,500 on machinery worth \$20,000, and \$20,000 on stock worth \$35,000. A fire occurs by which the building and the machinery are both damaged, each to the amount of \$15,000, and the stock is entirely destroyed. How much is the claim against the company, if the risk is covered by an "ordinary" policy? How much if the policy contains the "average clause?"

23. A merchant, owning a store worth \$12,000, and goods to the same amount, insures them both for two-thirds of their value, at the rate of 50c. on \$100, through a broker, who allows him a discount of 10% on the premium and retains 5% himself. How much does the insurance cost the merchant, what does the broker get, and what is the net premium received by the company?

24. Three companies insure, at $\frac{3}{4}$ of its value, a building worth \$16,000. The first company takes $\frac{1}{3}$ the risk, at $\frac{3}{4}$ of 1%; the second, $\frac{2}{5}$ of it, at $\frac{7}{5}$ of 1%; and the third, the remainder, at $\frac{3}{4}$ of 1%. Find the total premium?

nts, ing, on ildthe red. : is the

oth 1se.

nd rds er, nd ost he

ng ; <u>3</u> he

TAXES.

TAXES.

312. A Tax is the sum assessed on the person, property or income of an individual for local improvement, payment of officers, support of schools, and other general purposes.

313. A Poll Tax is a certain sum required of each male citizen liable to taxation, without regard to his property.

314. A **Propert Tax** is a tax assessed on real or personal estate, and is assessed at a given rate per cent. of the valuation, but usually at so many cents on \$100, or so many mills on \$1.

315. Property is of two kinds,-Real and Personal.

316. Real Property or Real Estate is immovable property, such as lands and houses.

317. Personal Property is movable property, such as merchandise, furniture, ships, cattle, money, mortgages, etc.

318. An Assessor is an officer appointed to estimate the value of property.

319. An Assessment Roll is a list or schedule containing the names of all the persons liable to taxation in the municipality, and the valuation of each person's taxable property.

320. A Collector is a person appointed to collect the taxes.

TAXES.

821. To find the tax, the sum assessed and the rate of taxation being given.

EXAMPLE.—The rate of taxation in a certain city was $11\frac{1}{2}$ mills on the dollar. What tax was paid by a person whose property was assessed for \$12,000?

SOLUTION.

On \$1 the tax is .001125. .: "\$12,000 ".001125 × 12000 = \$135. Ans.

RULE.

Multiply the sum assessed by the rate of taxation, and the product will be the tax.

322. To find the rate of taxation, the sum assessed and the tax being given.

EXAMPLE 1.—In a certain village a school-house is to be built at a cost of \$5,725, to be paid by a tax upon the assessed property valued at \$229,000. What rate of taxation will cover the cost ?

SOLUTION.

On \$229,000 there is a tax of \$5,725.

:. " \$1 " $\frac{5,725}{229,000} = 2\frac{1}{2}c$. Ans.

Divide the property tax by the sum assessed, and the quotient is the rate of taxation.

EXAMPLE 2.—A tax of \$16,230 is to be assessed upon the village of Caledonia; the valuation of the taxable property is \$800,000, and there are 115 polls, to be assessed at \$2 each. What will be the tax on the dollar, and how much will be the tax of Mr. Scott, whose property is valued at \$12,500, and who pays for 2 polls ?

SOLUTION.

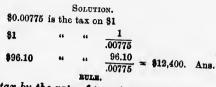
| \$2 | × | 115 | = | \$230 | Amount of poll tax. |
|----------|---|---------------|---|-----------|---------------------------|
| \$16,230 | - | \$230 | = | \$16,000. | " property tax. |
| \$16,000 | ÷ | \$800,000 | = | .02 | Rate of taxation. |
| \$12,500 | × | .02 | = | \$250 | Mr. Scott's property tax. |
| \$250 | + | \$4 (2 polls) | | | " total tax. |

323. To find the sum assessed, the rate of taxation and the tax being given.

EXAMPLE.—The tax on a certain property was \$96.10, and the rate of taxation 73 mills on the dollar. For how much was the property assessed?

138

in the



TAXES.

Divide the tax by the rate of taxation, and the quotient will be the sum assessed.

324. To find what sum must be levied on the assessed valuation to raise a given net amount.

EXAMPLE. - What sum must be levied to raise \$38,800 net, allowing 8% for collection ?

| m | | | | | OLUTION | r. | | | |
|-----|-------|----------|----------|------------------|--------------|----------------|------------------|----------------|----|
| 1.0 | raise | \$97 | net, | \$100 | - | must | be levied | | |
| | ** | \$1 | " | $\frac{100}{97}$ | - | " | " | | |
| | 66 | \$38,800 | , | | 38,800 97 | 2 " | " | = \$40,000. An | 8. |
| | | | | \$1.00 \$38,8 | | .03 = .97 = | .97 \$40.000. | | |

Subtract the rate allowed from \$1, and divide the net amount to be vised by the remainder; the quotient will be the sum to be levied.

325. When the rate of taxation is ascertained, for convenience a Tax Table is usually prepared on that basis. The following is based on the rate of 8 mills on the dollar. By its use much labor and time may be saved.

| 1 pays 2 " 3 " 4 " 5 " 6 " 7 " 8 " 9 " 10 " | 8 .003 .006 .009 .012 .015 .018 .021 .024 .027 .030 | * 10 20 30 40 50 60 70 70 90 100 | pay " | \$.03 .06 .09 .12 .15 .18 .21 .24 .27 .30 | \$ 100 200 300 400 500 600 700 800 900 1000 | pay | \$.30 .60 .90 1.20 1.50 1.80 2.10 2.40 2.70 3.00 | \$ 1000 2t 00 3000 4000 5000 6000 7000 8000 9000 10000 | | \$ 3.00 6.00 9.00 12.00 15.00 15.00 18.00 21.00 24.00 27.00 30.00 |
|---|--|--|----------|--|---|-------------------------|---|--|--|--|
|---|--|--|----------|--|---|-------------------------|---|--|--|--|

TAX TABLE AT THREE MILLS PER DOLLAR.

TAXES,

EXAMPLE.—Find, from the tax-table, the amount of taxes Mr. A. has to pay on a property assessed at \$2,475.

| Solution. | | | | | | | |
|-----------|---------|---|------------------|--|--|--|--|
| Tax on | \$2,000 | = | \$6.00 | | | | |
| 66 | 400 | = | 1.20 | | | | |
| 66 | 70 | = | .21 | | | | |
| 66 | 5 | = | .01 1 | | | | |
| 46 | \$2,475 | = | \$7.421. | | | | |

EXERCISE 70.

1. My property is assessed at \$6,400. At the rate of $3\frac{1}{2}$ mills on the dollar, how much tax will I be required to pay?

2. What amount of tax must a man pay who is assessed \$12,000 for real estate and \$4,500 for personal property, if he pays a rate of $2\frac{1}{2}$ %?

8. At what rate must property, valued at \$1,250,000, be assessed to raise a tax of \$15,000?

4. What is the assessed value of a property that pays a tax of \$182, at the rate of $3\frac{1}{4}$ mills on the dollar?

5. A tax of \$7,380 was levied upon the taxable property of a county, valued at \$2,460,000. What was the rate, and what was the tax on a farm assessed at \$4,000?

6. My entire property is worth \$8,000, and is assessed at $\frac{3}{4}$ of its value, at the rate of $7\frac{3}{4}$ mills on the dollar. I pay an additional tax for 2 polls, at \$2 each. What is my total tax?

7. What sum must be assessed on a school-section to build a school-house, at a cost of \$2,730, and pay $2\frac{1}{2}$ % for collection ?

8. What amount of tax must a man pay who is assessed \$10,500 for real estate, and \$5,000 for personal property, if he pays 1½ % City tax, ½ % County tax?

·. A.

' 3½ l to sed

, be

, if

s a

rty ite,

sed I my

to for

sed rty, 9. A Town-hall, costing \$12,250, was built by a tax assessed upon the property of the town. The tax rate was 5 mills on the dollar, and the cost of collection 2%. What was the valuation ?

10. If my property is valued at \$2,500, and the rate of taxation for school purposes is 5 mills on the dollar, what does the tuition of each one of my three children cost me if all of them attend the public schools?

From the table find out how much-

| 11. Mr. W. H. J | un pays | on | \$ 6,000 | |
|---------------------|---------|----|-------------|--|
| 12. Mr. M. How | ard " | " | \$ 5,583 | |
| 13. Mr. H. Brien | ly " | " | \$ 5,354 | |
| 14. Mr. E. Muni | | | 0,000 | |
| 15. Mr. W. Gale | r " | | 7,534 | |
| 16. Mr. D. Turn | | | 5,821 | |

17. Make out a tax table, rate 15 mills on the dollar.

18. Allowing 5% for taxes uncollectable, and 2% for collection, what sum must be levied that 50,000 may be realized for the building of a school-house?

19. The Council of the Village of Dunville wish to levy a tax which will net them \$18,979, after paying the expense of collection, which will be 3%. The assessed value of real and personal property is \$1,260,000, and there are 323 polls, each taxed \$2. How much will \$1 be assessed ?

20. For the purpose of building a town-hall, a tax of \$15,961.60 is to be levied on property valued at \$1,856,000. What will be the tax on Dr. Burns' property, which is valued at \$8,650?

21. A bridge costing \$18,135 was built by the proceeds of a tax levied upon the property of a town, the rate of taxation being 50c. on \$100 (5 mills on \$1), the cost of collection being $2\frac{1}{2}$ %. What was the assessed valuation of the property ?

22. If the assessed value of the real and personal property of a city is \$80,000,000, and a special tax is desired for the construction of sewers, what must be the rate of levy to realize \$188,160 for the purpose, if 2% be allowed for collection and 4% of the levy be uncollectable \$

TALLS.

23. If a tax of \$2:40 is assessed upon a cotton mill valued at \$48,000, what is the valuation of a piece of property that pays a tax of \$35.50, at the same rate?

24. The assessed valuation of the real estate of a county is \$1,910,887, of the personal property, \$921,073. The year's estimated expenditure is:—For schools, \$8,400; interest, \$6,850; highways, \$7,560; salaries, \$5,150; and contingent expenses, \$18,675. What tax must be levied on a dollar to meet expenses and provide a sinking fund of \$7,000 ?

MISCELLANEOUS.

EXERCISE 71.

I.

1. A commission merchant, whose rate both for selling and investing is 5%, receives 24,000 lb. of pork, worth 6c. a lb., and \$3,000 in cash, with instructions to invest in a shipment of cotton. What will be his entire commission?

2. Having sold a consignment of cotton on 3% commission? sion I am instructed to invest the proceeds in town lots, after deducting my purchase commission of 2%. My total commission is \$265. How much money did I invest in town lots?

8. I send a quantity of goods into the country to be sold by auction, on a commission of 9%. What amount of goods must be sold, that my agent may buy produce with the avails, to the value of \$3,500, after retaining his purchase commission of 4%?

4. A commission merchant sells a consignment of wheat for \$7,240. He pays \$40 for freight and storage, and charges a commission of $2\frac{1}{4}$ %. What are the net proceeds?

5. A merchant buys, through an agent, 480 yds. of carpet at 80c. per yd., and pays the agent $\frac{3}{4}$ % commission. The freight amounted to \$1.92. At what price per yard must the carpet be sold to realize a profit of $83\frac{1}{3}$ %?

6. I purchased 6,000 bushels of wheat in Winnipeg at 85c. a bushel, and shipped the same to my agent at Ottawa, who sold it at \$1.10 per bushel. How much did I make, after paying \$548 for expenses and a commission of 2%;

be e? nill of a. 3. 0; 0;

nal is the

be ng

7. I remit to my agent at Chicago \$84,650, to purchase flour. After deducting his commission of $1\frac{1}{2}$ % and \$20.25 for other expenses, how many barrels of flour at \$5 a barrel will the money purchase ?

8. A flour merchant in Montreal remitted to his correspondent in Toronto the proceeds of a consignment amounting to \$2,453.75 per draft, which he purchased at the expense of the consignor, at $1\frac{1}{2}$ % premium. What was the amount of the consignment, his commission being $2\frac{1}{2}$ %?

9. Sold 2,978 bushels of wheat at \$1.05 a bushel; invested the proceeds in sugar, as per order, reserving my commission of 5% for selling and $1\frac{1}{2}$ % for buying, and the expenses of shipping, \$53.37. How much did I invest in sugar?

10. Sold goods to a certain amount on a commission of 5%, and having remitted the net proceeds to the owner, received for prompt payment $\frac{1}{3}$ %, which amounted to \$16.15. What was the amount of commission?

II.

1. My agent bought tea at $\frac{5}{8}$ % brokerage, and was paid \$450. He afterwards sold the tea at a profit to me of \$6,150, deducting $1\frac{1}{2}$ % commission on the sale. How much was his commission?

2. 11,500 bushels of wheat were bought through an agent, who charged $\frac{1}{5}$ % for buying. If the agent paid 85c. per bushel for the wheat, \$762.50 freight, and \$12.50 insurance, what sum should be remitted to him in full settlement?

3. From a consignment of 3,160 lbs. of tea, sold by an agent at 30c. per lb., the consignor received as net proceeds \$853.74. What was the per cent. of commission charged for selling, if the charges for storage and insurance amounted to \$51.60 ?

se

25

rel

)8-

ıthe

he

1;

аy

he

in

of

r,

to

id

of

:h

 \mathbf{n}

c.

60

11

n

s

đ

e

4. A man wishes to draw on New York for an amount sufficient to cover expenses of 2% exchange and $2\frac{1}{2}$ % commission, and leave him the sum of \$5,242.50. For how much must he draw?

5. A farmer received from his city agent \$490 as the net proceeds of a shipment of butter. If the agent's commission is 3%, delivery charges \$6.80, and 5% charge is made for guaranty of quality to purchasers, how many pounds, at 27c. per lb., must have been sold, and how much commission was allowed ?

6. Sold by consignee 16,000 bushels of wheat, at 95c.; 5,760 bushels of corn, at $86\frac{1}{2}$ c.; 9,245 bushels of oats, at 63c.; and 1,120 bushels of barley, at \$1.78. Required, the gross proceeds; also the net proceeds, the charges amounting to \$515.20, and the commission being $2\frac{1}{2}$ % for selling, and $2\frac{1}{2}$ % for guaranteeing payment?

7. A broker sold 315 bales of cotton, averaging 395 lbs. to the bale, at 164c., his commission being $2\frac{3}{4}$ %, and the charges \$179. He invested 25% of the net proceeds in flour for the consignor, charging a commission of $1\frac{1}{4}$ %. How much was still due the consignor?

8. An agent bought butter on a commission of 10%, cheese on a commission of 6%, and eggs on a commission of 5%. If his commission for buying the butter was \$21, for buying the cheese \$21.60, and for buying the eggs \$22, and he charges 25% additional for guaranteeing the freshness of the eggs, what sum should the principal remit to pay for purchases and charges?

9. A merchant sent to his agent in New Orleans a consignment, the gross proceeds of which were \$7,689, the charges being \$323.57, and the commission $3\frac{1}{2}$ %. He directed the agent to buy sugar with the net proceeds, and pay himself his commission for buying $(2\frac{1}{2}\%)$ out of the same. What was the amount invested, and the agent's commission for both transactions?

10. An agent sold 2,000 bushels Alsike clover seed, at \$7.85 per bushel, on a commission of 5%; and 1,200 bushels medium red, at \$5.20 per bushel, on a commission of $2\frac{1}{2}$ %; taking the purchaser's 3 month's note for the amount of the sales. If the agent charges 4% for his guaranty of the notes, what amount does he earn by the transaction?

III.

1. A consignment of butter was sold for \$1,570, of which \$1,546.45 were the net proceeds. What was the rate per cent. of commission?

2. An Australian buyer shipped 33,000 lbs. of coarse wool to a London agent to be sold on commission, and gave instructions for the net proceeds to be invested in leather. If the agent sold the wool at 18c. per 15., on a commission of 2%, and charged 10% for the purchase and guaranty of grade of the leather, what was the amount of his commissions?

3. What are the net proceeds from the sale of 2,250 bbls. of flour, at \$6.25 a bbl., if the charges for freight and storage be 50c. a bbl., commission for selling 2%, for guaranteeing paying $1\frac{1}{2}$ %?

4. An agent sold, on commission, 1,750 bbls. of messpork, at \$16.50 per bbl., and 508 bbls. of short-ribs, at \$18 per bbl., charging \$112.50 for cartage, and \$5.55 for advertising. He then remitted to his principal \$36,000, the net proceeds. Find the rate of commission.

5. A commission merchant received \$1,640 with which to buy corn, after deducting a commission of 2½%. What is the amount of his commission, and how many bushels of corn, at 62½c. a bushel, can he buy?

n

1

θ

8

Э

6. The holder of a doubtful claim of \$850, handed it to an agent for collection, agreeing that, for every dollar sent him by the agent, the agent might keep for himself 20c. The agent succeeded in collecting but $\varepsilon \gamma \%$ of the debt. How much did the agent remit, how much commission did he receive, and what was his per cent. of commission?

7. A merchant buys, through an agent, 730 yds. of carpeting, at \$1.25 a yd., and pays the agent $\frac{3}{4}$ of 1% commission; the freight amounted to \$7.87. At what price per yard must the carpeting be sold to realize a profit of 20%?

8. I remitted \$10,500 to a Duluth agent to be invested in wheat, allowing him a commission of 3% for investing. The agent paid 95c. per bushel for the wheat, and charged me $1\frac{1}{2}$ cts. a bushel per month for storage. At the end of 4 months the agent sold the wheat at \$1.10 per bushel, on a commission of 5%. If I paid \$350 for the use of the money, did I gain or lose by the operation, and how much?

9. A commission merchant sells a consignment of cotton for \$5,216. He pays \$51 for freight and storage, and charges a commission of $2\frac{1}{4}$ %. What are the net proceeds?

10. The net proceeds of a consignment of wheat was $96\frac{1}{2}$ % of the net proceeds of a consignment of oats, and the rate of commission on each was $4\frac{1}{2}$ %. The sum of the net proceeds on both consignments was \$5,895, and the sum of the charges, other than commission, was \$330, of . which \$175.00 was charged to the consignment of wheat. How much was the commission on the consignment of oats?

IV.

1. Find the duty on 3 dozen clocks, invoiced at \$21.50 each, and 6 dozen watches, invoiced at \$35 each, if the ad valorem duty was 35% on the clocks, and 25% on the watches.

2. A wine merchant imported 6 casks of wine, and paid \$432 duty, at \$2 per gallon, leakage 10% allowed. How many gallons to each cask, had no leakage been allowed?

3. Paid \$325 duty on goods which had been damaged; allowance for damage is 24%, and the duty was 24%. What was the invoice price of the goods?

4. An importer paid \$825 duty on an invoice of silks, the duty being 24%. But damages of 15% were allowed at the custom-house. What was the entire cost of the goods?

5. A sugar refiner imports 50 hhds. of sugar weighing 480 lbs. each, and 120 hhds. of molasses containing 63 gals. each. What is the amount of the duties, if the sugar pay Sc. a lb. and the molasses 8c. a gal., an allowance being made on the sugar of 10%, and 2% on the molasses ?

6. A liquor dealer receives an invoice of 120 dozen bottles of porter, rated at \$1.25 per dozen. If 2% of the bottles are found broken, what will be the duty at 24%?

7. A merchant imported 56 casks of wine, each containing 86 gals. net, the duty at 30% amounting to \$907.20. At what price per gallon was the wine invoiced?

8. The duty on an invoice of French lace goods at 24% was \$132, an allowance of 12% having been made at the custom-house for damage received since the goods were shipped. What was the cost or invoice of the goods ?

9. A quantity of Valencias, invoiced at \$1,654, cost me \$1,980.50 in store, after paying the duties and \$12.24 for freight. What was the rate of duty?

10. A merchant imported 50 casks of port wine, each containing originally 36 gals., invoiced at \$2.50 per gal. He paid freight at \$1.30 per cask, and duty at 30 %, $1\frac{1}{2}$ % leakage being allowed at the custom-house. and \$8.50 for cartage. What did the wine cost him in store?

1. The duty at 19% on an importation of Denmark satin was \$619.40. What was the invoice of the goods?

V.

2. The duty on 600 drums of figs, each containing 14 lbs., invoiced at 5¹/₄c. per lb., was \$35.28. Required, the rate of duty?

3. The duty on an importation of Bay rum, after allowing 2% for breakage, was \$823.20, and the invoice price of the rum was \$.25 per bottle. How many dozen bottles did the importer receive, duty at 24%?

4. A merchant in New York imports from Havana 200 hhds. of W. I. molasses, each containing 63 gals, invoiced at \$.30 per gal.; 150 hhds. of B. coffee sugar, each containing 500 lbs., invoiced at \$.05 per lb.; 80 boxes of lemons, invoiced at \$2.50 per box; and 75 boxes of sweet oranges, invoiced at \$3.00 per box. What was the whole amount of duty, estimated at 24% on molasses and sugar, and at 8% on lemons and oranges?

5. The duty on an invoice of 300 dozen Buffalo porter, at 30%, was \$190,512; breakage, 2%. Required, the invoiced price per dozen?

6. Imported 12 casks of wine, each containing 42 gals., invoiced at \$3.25 per gal.; paid \$96 for freight, and a duty of 40%. How much shall I gain % in selling the whole for \$2,747.58?

7. Paid \$68.90 duties, at the rate of 9%, on 50 casks of raising, tare, 15 lbs. per cask; allowing the gross weight of each cask to have been 115 lbs., what was the invoiced value per lb.?

VI.

1. A man paid \$175 for insuring his dwelling, at $\frac{1}{4}$ %, and \$100 for insuring the furniture, at $1\frac{1}{4}$ %. If both are destroyed by fire, how much is he entitled to receive?

2. A canal-boat load of 840 bushels of wheat, worth 90c. per bushel, is insured for three-fourths of its value, at $1\frac{2}{3}$ % premium. In case of the total destruction of the wheat, how much will the owner lose?

8. A company took a risk at $2\frac{1}{2}$ %, and re-insured $\frac{2}{5}$ of it in another company at $2\frac{1}{2}$ %. The premium received exceeded the premium paid by \$72. What was the amount of the risk?

4. I insured my grocery store, valued at \$13,500, and its contents, valued at \$33,000, and paid \$350 for premium and policy. If the policy cost \$1.25, what was the rate per cent. of premium ?

5. A merchant shipped a cargo to London, and to cover both the cargo and the premium, he took out a policy of \$100,800, at $8\frac{1}{2}$ %. What was the value of the cargo?

6. The steamer Cibola, valued at \$90,000, is insured for \$75,000, at $2\frac{1}{2}$ %. What will be the actual loss to the insurance company, in case the steamer is damaged to the amount of \$20,000 ?

7. Insured for their full value 200 barrels of flour, worth \$5.75 a barrel, and 400 barrels worth \$6.25, at $\frac{2}{10}$ of 1%. 125 barrels of the first lot and 250 of the second were burned. What was the actual loss to the company ?

8. A speculator bought 2,000 barrels of flour, and had it insured for 80% of its cost, at $3\frac{1}{2}$ %, paying a premium of \$429. At what price must he sell the flour, to make a net profit of 10%?

9. A vessel is so insured that if lost the owner may receive both the value of the vessel and the premium. The value of the vessel is \$96,084, and the rate of insurance $1\frac{7}{5}$ %. Find the premium.

10. An underwriter agreed to insure some property for enough more than its value to cover the premium. A policy was issued for \$25,087.81. The rate being 35c. on \$100, what was the property worth ?

11. For what sum must a policy be issued, to insure a vessel for \$36,000 and cover also the premium, the rate being $1\frac{1}{2}$ %?

12. A speculator bought 1,000 bbls. of flour, and had it insured for 80% of its cont, at $3\frac{1}{2}$ %, paying a premium of \$214 50. At what price must be sell the flour to realize a profit of 20%?

13. Four companies form in insuring a ship and cargo for \$60,000. One company takes $\frac{1}{3}$, at $\frac{3}{5}$ of 1%; a second takes \$10,000, at $\frac{3}{4}$ of 1%; a third, \$15,000, at $\frac{5}{5}$ of 1%; a fourth, the remainder, at $\frac{1}{4}$ of 1%. How much is paid for insurance ?

VII.

1 A town containing \$541,250 taxable real estate and \$15,620 personal property, levies a tax of .009 %. If 2% is paid for collecting, what is the net amount realized from the tax?

2. In a school section the valuation of the taxable property is \$752,400, and it is proposed to repair the school-house and ornament the grounds at an expense of \$5,000. If old material sells for \$673.70, what will be the rate per cent. of taxation, and what will be B's tax, whose property was valued at \$9,400?

3. A tax of \$11,466, besides the cost of collecting at $2\frac{1}{2}$ %, is to be raised in a certain town. The polls, 560 in number, are taxed \$1 each. The real estate is assessed at \$1,270,000, and the personal property at \$130,000. Determine the rate, make an assessors' table for that rate, and find A's tax for 2 polls, \$2,300 real estate, and \$1,400 personal property ?

4. The cost of maintaining the public schools of a city during the year 1888, was \$112,000, and the taxable property of the city was \$44,800,000. How many mills on a dollar must be assessed for school purposes? If 10% of the tax assessed cannot be collected, how many mills on a dollar must then be assessed?

5. The total assessed value of a town, real and personal, is \$630,000, and the town expenses are \$3,918.95. How much tax must be collected to provide for town expenses and allow 3% for collecting? If the same town contains 310 polls, taxed \$1.50 each, what will be the rate of taxation, and how much will be the tax of a man who pays for two polls and owns property assessed at \$14,500 ?

6. A tax of \$13,943.20 is assessed upon a town containing 860 taxable polls; the real estate is valued at \$2,708,000, and the personal property at \$151,600. If the polls be taxed \$1.25 each, what will be the rate of property taxation, and what will be the tax of Peter Parley, who pays for three polls, and has real and personal estate valued at \$23,750?

7. The assessed value of a town is, on real estate, \$1,197,500, and on personal property, \$432,500. A poll tax of \$.50 per head is assessed on each of 1,870 persons. The town votes to raise \$8,000 for schools, \$1,500 for highways, \$1,500 for salaries, \$1,000 for support of poor, and \$310 for contingent expenses. How much tax will a milling company have to pay on a mill valued at \$46,500, and stock at \$19,750?

INTEREST.

INTEREST.

326. Interest is money paid for the use of money.

327. The Principal is the money for the use of which interest is paid.

328. The Amount is the sum of the principal and interest.

329. The **Rate** is the per cent. of the principal paid for its use for 1 year, or a specified time.

Nore.-When the rate is given, it is to be understood in this work to mean rate per annum, unless otherwise specified.

330. Legal Interest is the rate fixed by law for cases in which no rate is specified in the agreement between the parties interested.

In all the Provinces of Canada the legal rate is 6 %.

331. Usury is a higher rate than the legal rate.

332. In computing interest, a legal year is 12 months or 365 days.

333. Simple Interest is the interest on the principal only.

ACCURATE INTEREST,

(12 months or 365 days to a year).

334. To find the interest on a sum of money for a given number of years, or fraction of a year, at a given rate.

ERAMPLE 1.-Find the interest on \$650 for 2 years at 4 %.

| a | |
|---|--|
| SOLUTION 1. | EXPLANATION. |
| 650 Principal <u>04</u> \$26.00 Int. for 1 yr. <u>2</u> \$52.00 " 2 yrs. Solution 2. | Interest for 1 year is 4% of the principal $\$650 = \$650 \times .04 =$ \$26.00, and the interest for 2 years is twice the interest for 1 year, or $\$26.00 \times 2 = \52.00 . |
| \$6.50 is int. for 1 yr. at 1%. | SOLUTION 3. |
| \$26.00 " " " 4%. | \$6.50 8 = 4 × 2 |
| 2 \$52.00 " " 2 yrs. " 4%. | \$52.00 |

EXAMPLE 2.-Find the interest on \$960 for 3 yrs. 4 mos., at 6%.

| SOLUTION 1. | SOLUTION 2. | SOLUTION 3. |
|---------------------------------|----------------|------------------------------|
| \$960 | \$9.60 | \$9.60 |
| .06 | 6 | $20 = 6 \times 3\frac{1}{8}$ |
| \$57.60 Int. for 1 yr. | \$57.60 | \$192.00 |
| | 8 1 | |
| \$192.00 " " 31 yrs.(3 yrs. 4 m | 108.) \$192.00 | |

Nore 1.--1% of a number is found by removing the decimal point in the number, 2 places to the left.

2. The result will be the same in Ex. 1, whether we multiply by 4 and then by 2, as in Solution 2, or by 8 (4 \times 2), as in Solution 3.

EXERCISE 72.

Find the interest for one year of-

| 1. | \$450 at 41%. | 6. \$2,630 at 41%. | 11. \$7,428 at 51%. |
|------|----------------|---------------------|---------------------|
| 2. | \$680 at 31 %. | 7. \$4,920 at 5%. | 12. \$9,654 at 6 %. |
| 8. | \$960 at 71%. | 8. \$5,000 at 33 %. | 13. \$7,851 at 61%. |
| 4. | \$840 at 51%. | 9. \$3,720 at 31%. | |
| 5. (| 1,720 at 61%. | 10. \$4,680 at 41%. | |

Find the interest and amount-

a n

s

| | PRINCIPAL. | BATE. | TIME. |
|-----|-------------|-------|--|
| 16 | \$600.00, | 5%, | 2 yrs. |
| 17 | | 6%, | |
| 18 | \$500.00, | 7%, | 2 yrs. 6 mos. 5 yrs. |
| 19 | \$950.00, | 8 (, | |
| 20 | \$800.00, | 9%, | 3 yrs. 3 mos. 6 yrs. |
| 21 | \$740.00, | 81 %, | 7 yrs. |
| 22. | \$1,320.00, | 10%, | 2 yrs. 10 mos. |
| 23. | | 12%, | 8 yrs. 9 mos. |
| 24. | \$475.80, | 61% | 4 yrs. 6 mos. |
| 25. | \$363.20, | 21% | 3 yrs. 8 mos. |
| 26. | \$1,020.00, | 34%, | 1 yr. 7 mos. |
| 27. | \$4,075.00, | 6%, | 2 yrs. 4 mos. |
| 28. | \$4,028.75, | 4%, | 5 yrs. |
| 29. | \$4,026.00, | 8%, | 8 yrs. 2 mos. |
| 80. | \$270.36, | 31%, | 1 yr. 11 mos. |
| 81. | \$840.00, | 9%, | 1 yr. 9 mos. |
| 82. | \$100.00, | 6%, | 2 yrs 7 mos. |
| 83. | \$900.00, | 5%, | 3 yrs. 6 mos. |
| 84. | \$360.00, | 7%, | 5 yrs. 4 mos. |
| 35. | \$750.80, | 4%, | 2 yrs. 7 mos. |
| 86. | \$475.80, | 3%, | 6 yrs. 3 mos. |
| 87. | \$328.00, | 61%, | 2 yrs. 5 mos. |
| 88. | \$474.90, | 81%, | 4 yrs. 6 mos. |
| 89. | \$640.80, | 51 %, | 1 yr. 3 mos. |
| 40. | \$143.33, | 51%, | |
| 41. | \$360.96, | 12%, | 6 yrs. |
| 42: | \$796.00, | 11 %, | 2 yrs. |
| 48. | \$1,800.00, | 13 %, | 83 yrs. |
| 44. | \$1,080.00, | 10%, | 41 yrs. |
| 45. | \$894.00, | 41%, | 2 ¹ / ₅ yrs. 3 ¹ / ₂ yrs. |
| | | | a v |

335. To find the interest on a sum of money, for a given number of days, at a given rate.

| SOLUTION 1. | on \$850 for 62 days at 5 %. |
|--|--|
| $\begin{array}{c} \$8.50\\ 5\\ \$42.50\\ 1nt. \text{ for 1 yr.}\\ \hline \\ 365 \\ 2\overline{035.00} \\ (\$7.21 + or \\ \$7 \\ 72. \end{array}$ | Solution 2. CANCELLATION METHOD. $\frac{8.50 \times 3 \times 62}{363} = \frac{52700}{73} = $7.22.$ 78 |

EXPLANATION.

Sixty-two days is $\frac{42}{365}$ of 1 year. The interest for 62 days is therefore frage of the interest for 1 year, and this may be found by multiplying the interest for 1 year (\$42.50) by 62 and dividing the result by 365, as in Solution 1, or by cancellation, as in Solution 2.

EXAMPLE 2.-Find the interest on \$3,250 from April 16th. 1889, to June 18th, 1891, at 6 % per annum.

(From April 16th, '89, to June 18th, '91, is 2 years and 63 days.)

SOLUTION 1.

\$4

| \$32.50 | | | | | | | Soluti | ON 2. | |
|-----------------|-------|---|---|---|-----------|---|----------|----------|------------|
| 6 | 32.50 | × | 6 | × | 83 365 | = | 33.66 | Int. for | 63 da. |
| 195.00 | 32.50 | × | 6 | × | | | 390.00 | | 2 yrs. |
| 2363 423.66. | | | | | | | \$423.66 | | yrs. 63 da |

336. It is the custom with banks when the time is given in months, to consider them calendar months in reference to the maturity of the paper, but even then they compute the discount by days.

Time table, showing the number of days:

| | TO THE CORRESPONDING DAY OF | | | | | | | | | | | | |
|--|-----------------------------|--|---|--|---|---|---|---|---|--|--|---|--|
| FROM ANY DAY OF | 1 Jan. | 2 Feb. | 3 Mar. | 4 Apr. | 5 May | 6 June | 7 July | 8 Aug. | 9 Sept. | 10 Oct. | 11 Nov. | 12 Dec | |
| January February Maron April July July Septembor. October November . December . | 306 275 245 214 | $\begin{array}{r} 31 \\ 365 \\ 337 \\ 306 \\ 276 \\ 245 \\ 215 \\ 184 \\ 153 \\ 123 \\ 92 \\ 62 \end{array}$ | 59 28 365 334 204 273 243 212 181 151 120 90 | 90 59 31 365 335 304 274 243 212 182 151 121 | 120 89 61 30 365 334 304 273 242 212 181 151 | 151 120 92 61 31 865 935 304 273 243 212 182 | 181 150 122 91 61 30 365 334 303 273 242 212 | 212 181 153 122 92 61 31 365 334 304 273 243 | 243 212 184 153 123 92 62 31 965 835 835 835 804 274 | 273 242 214 183 153 153 122 92 61 30 365 834 804 | 304 273 245 214 184 153 123 123 92 61 91 965 835 | 334 303 275 244 214 183 153 122 91 61 30 365 | |

1. How many days from May 13th to August 23rd?

EXPLANATION.

Find "May in the column of months at the left; and on the same line under "August " find 92, which is the number of days from any day in May to the same day in August. But August 23 is 10 days more than August 13, and 92 + 10 = 102 days. Ans.

Note 1.—If the required date be earlier in the month than the date from which time is counted, subtract the difference from the tabular number.

2. If in Leap Year, and the month of February be included in the time reckoned, add 1 day to the number of days found by the table.

EXERCISE 73.

Find interest on-

| PRINCIPAL. | TIME. | RATE. | PRINCIPAL. | TIME. | RATE. |
|----------------------------|--------------------|------------|--------------------------------|---------------------|---------------|
| 1. \$3,600, 2. \$4,500, | 65 da., 80 da., | 5%. 7%. | 7. \$340.80, 8. \$424.40. | 130 da., 67 da., | 51%. |
| 3. \$800, 4. \$750, | 90 da., 45 da., | 8%. | 9. \$625.30, | 48 da., | 6 %. 3½ %. |
| 5. \$9,860, 6. \$4,350, | 135 da., | 6%. | 10. \$426.50, 11. \$370.75, | 292 da., 73 da., | 4 %. 7 %. |
| ο. φ±,500, | 219 da., | 31 %. | 12. \$420.80. | 60 da | 8% |

Find the amount-

| F | RINCIPAL. | RATE. | | TIME. |
|-------------|-----------|-------|------|-----------------------------------|
| 13. | \$542.00, | 7%, | Fron | n 1888, Oct. 27, to 1890, May 12. |
| 14. | \$684.00, | 8%, | ** | 1887, Sept. 19, to 1889, June 1. |
| 15. | \$960 00, | 9%, | ** | 1882, Dec. 31, to 1892, Oot 1. |
| 16. \$ | 1,100.00, | 10%, | 61 | 1889, Jan. 1, to 1892, Dec. 20. |
| 17. \$ | 1,186.20, | 11%, | ** | 1885, April 1, to 1886, July 28. |
| 18. \$ | 1,260.48, | 12%, | ** | 1888, Aug. 31, to 1893,' Nov. 1. |
| 19. \$1 | 1,040.25, | 8%, | | 1890, Feb. 20, to 1891, May 10. |
| 20. \$1 | .097.76, | 6%, | ** | 1885. Mar. 15, to 1885, Jan. 15. |
| 21. | \$976.80, | 7% | ** | 1889 June 19, to 1889, April 7. |
| 22. | \$896.84, | 9%, | | 1887, Nov. 24, to 1887, Nov. 30. |
| 23. \$1 | ,272.24, | 10%, | | 1891, Sept. 27, to 1892, Dec. 9. |
| 24. \$1 | ,284.96, | 12%, | | 1890, Dec. 8, to 1891, May 1. |
| 25. \$1 | ,200.00, | 11%, | ** | 1888, Dec. 25, to 1890, May 28. |
| 26 . | \$989.00, | 12%, | ** | 1889, Mar. 21, to 1890, June 30. |

27. A note for \$560.60, dated May 5th, 1881, was paid Dec. 31st, 1882, with interest at 7%. What was the amount?

28. If I have the use of \$275 for 4 years 10 months from Jan. 12th, 1883, what amount must I return to the owner, allowing 6% interest, and what will be the date of maturity?

efore the s in

9, **to**

da

is in hey

ine in an 157

29. Required the amount of \$408.60 from Aug. 20th to Dec. 18th, 1886, at 10%?

30. What is the interest on a note for \$515.62, dated March 1st, 1888, and payable July 16th, 1885, at 7%?

31. What is the value of a note of \$65.75, due with interest for 1 year 2 months, at $6\frac{1}{2}$ %?

32. If a person borrow \$875 at 5%, what will be due the lender at the end of 2 years 6 months?

33. A man sold his house and lot for \$12,500; the terms were, \$4,000 in cash on delivery, \$3,500 in 9 months, \$2,600 in 1 year 6 months, and the balance in 2 years 4 months, with 6% interest. What was the whole amount paid?

ted.

vith

the

ms 300 hs,

SIX PER CENT. METHOD.

337. The Six Per Cent. Method is formed on e basis of 360 days to the year and 30 days to the month.

338. At 6% per annum the interest of \$1.

For 1 yr. 12 mo., or **960 da.**, is 6c. = .06 of the principal. For $\frac{1}{5}$ yr. 2 mo., or 60 da., is 1c. = .01 of the principal. For $\frac{1}{12}$ yr. 1 mo., or 30 da., is 5m. = .005 of the principal. For $\frac{1}{5}$ mo., or 6 da., is 1m. = .001 of the principal. For $\frac{1}{30}$ mo., or 1 da., is $\frac{1}{5}$ m. = .000 $\frac{1}{5}$ of the principal.

Hence the following-

PRINCIPLES.

339. 1. The interest of \$1 at 6% is half as many cents as there are months in the given time.

2. The interest of \$1 at 6% is one-sixth as many mills as there are days in the given time.

3. The interest for 60 days at 6% is found by removing the decimal point two places to the left in the principal.

4. The interest for 30 days at 6 % is found by removing the decimal point two places to the left in the principal and dividing the result by 2.

5. The interest for 6 days at 6% is found by removing the decimal point 8 places to left in the principal.

6. The interest for 1 day at 6% is found by removing the decimal point 3 places to right in the principal and dividing the result by 6.

340. To find the interest for any number of years, months and days at 6%.

1.59

SIX PER CENT. METHOD.

EXAMPLE 1.—What is the interest on \$450.75 for 1 yr. 3 mos. 21 da. at 6 % ?

SOLUTION 1.

| | Int. | on | \$1 | for | 15 1 | mos. | - | \$.075. | (Principle 1) | |
|---------|---------|-------|-------|------|-------|-------|---|----------|---------------|--|
| | ** | •• | \$1 | 64 | 21 | " | = | .0035. | (Principle 2) | |
| Int. on | \$1 fo: | r 1 : | vr. 1 | 3 mo | s. 21 | l da. | = | \$.0785. | | |

.: Int. on \$450.75 for 1 yr. 3 mos. 21 da. = \$450.75 × .0785 = \$35. 383875

| So | LUT | ION | 2. |
|----|-----|-----|----|
| | | | |

| 1 yr. 3 1 \$4.5075 | | . 21 da. Int. for | | | a. (Principlo 3) | SHORTER PROCESS. \$4.508 |
|------------------------------|---|----------------------|-----|-----|---------------------|-----------------------------|
| \$31.5525 | = | 66 | 420 | | (60 × 7) | \$81.556 |
| 2.25375 | = | 66 | 30 | ** | $(60 \div 2)$ | 2.254 |
| 1.126875 | = | 44 | 15 | 44 | $(30 \div 2)$ | 1.127 |
| .45075 | = | 66 | 6 | ** | (Principle 5) | .451 |
| \$35.383875 | = | Int. for | 471 | da. | st | \$35.388 |

Note 1.—For business purposes it is sufficiently exact to carry the work to mills, as in the shorter process.

2. In this process when the decimal in the fourth places is less than 5 it is rejected; when 5 or greater than 5, the figure in the third decimal place is increased by one, and the decimals to the right of the third decimal place are rejected.

341. To find the interest at any other rate than 6% by this method, first find the interest at 6%, and then increase or diminish the result by as many sixths as the given rate is units greater or less than 6%. Thus, for 7% add $\frac{1}{6}$, for 8% add $\frac{2}{6}$ or $\frac{1}{3}$, for 4% subtract $\frac{2}{3}$ or $\frac{1}{4}$, etc.

EXERCISE 74.

Find the interest at 6 % of-

- 1. \$267.27 for 6 mo. 24 da.
 12. \$4,0

 2. \$146.18 for 1 yr. 21 da.
 13. \$68

 3. \$256.84 for 2 yr. 4 mo. 12 da.
 14. \$1,8

 4. \$597.25 for 7 mo, 18 da.
 15. \$460

 5. \$418.75 for 1 mo. 25 da.
 16. \$1,0
- 6. \$309,18 for 2 yr. 24 da.
- 7. \$38.90 for 1 yr. 1 mo. 6da.
- 8. \$146.48 for 9 mo. 10 da.
- 9. \$275.50 for 11 mo. 13 da.
- 10. \$1,298 for 3 yr. 1 mo. 27 da.
- 11. \$2,000 for 2 yr. 7 mo. 24 da.

- 12. \$4,010 for 1 yr. 1 mo. 13 da.
- 13. \$680 for 2 yr. 6 mo. 10 da.
- 14. \$1,895 for 1 yr 7 mo. 7 da.
- 15. \$468 for 5 yr. 5 mo. 1 da.
- 16. \$1,000 for 11 yr. 1 mo. 20 da.
- 17. \$645 for 4 yr. 4 mo. 5 da.
- 18. \$500 for 3 yr. 1 mo. 27 da.
- 19. \$895 for 5 yr. 11 mo. 11 da.
- 20. \$1650 for 1 yr. 10 mo. 23 da.
- 21. \$1,463 for 9 yr. 1 mo. 9 da.
- 22. \$365 for 4 yr. 1 mo. 25 da.

SIX PER CENT. METHOD.

Find the interest and amount-

la.

5

18

nal

ď

y

r

8

| | PRINCIPAL. | RATE. | TIME. | | PRINCIPAL | RATE | . TIME. |
|----|----------------|-------|---------------|-----|-------------|------|---------------------|
| 2 | 8. \$1,080.50, | 7%, | 1 yr. 9 mo. | 35. | \$1,248.00, | | 9 mo. 25 da. |
| 2 | 4. \$420.25, | 8%, | 2 yr. 9 mo. | 36. | | | 1 yr. 9 mo. 15 da. |
| 2 | 5. \$960.00, | 9%, | 3 yr. 4 mo, | 37. | | | 1 yr. 9 mo. 24 da. |
| | 3. \$576.48, | | | 38. | \$1,296.00. | | 2 yr. 3 mo. 9 da. |
| 27 | | | 5 yr. 10 mo. | | \$1,080.00, | | 2 yr. 9 mo. 21 da. |
| | 3. \$1,200.00, | | 6 yr. 3 mo. | 40. | \$1,800.00, | 10%. | 3 yr. 6 mo. 15 da. |
| 29 | | | 12 yr. 6 mo. | 41. | | | 4 yr. 7 mo. 18 da. |
| 30 | | | 8 mo. 16 da. | 42. | | | 5 yr. 10 mo. 6 da. |
| 31 | | 8%, | 17 mo. 18da. | 43. | | 7%. | 7 yr. 9 mo. 27 da. |
| 32 | \$600.60, | 10%, | 23 mo. 14 da. | 44. | \$869.44, | 9%, | 8 yr. 4 mo. 17 da. |
| 39 | | | 40 mo. 6da. | 45. | \$1,126.56, | 11%, | 10 yr 5 mo. 1 da. |
| 34 | . \$894.00, | 7%, | 14 mo. 17 da. | 46. | \$1,295.28, | 8%, | 13 yr. 4 mo. 29 da. |

342. To find the interest for any number of days at 6%.

EXAMPLE 1.-Find the interest on \$672 for 216 days at 6 %.

 SOLUTION 1.

 \$6.72
 = Int. for 60 da.
 (Principle 3)

 \$20.16
 = "180 " (60×3)

 3.36
 = "30 " ($60 \div 2$)

 .672
 = "6 " (Principle 5)

 \$24.192
 = Int. for 216 da.

| SOLUTION 2. | EXPLANATION. |
|--|--|
| \$672 .036 4032 2016 \$24.192. | By Principle 2, the interest on \$1 for 216 days = 36 mills = $$.036$. \therefore Interest on \$672 for 216 days = $$672 \times .036 =$ \$24.192. |
| | #44.192. |

SOLUTION 3.

8.672 + 6 = **\$.112** = Int. for 1 da. /Principle 6) ∴ **\$.112** × 216 = **\$24.192** = " 216 da.

EXAMPLE 2.-Find the interest on \$760.48 for 174 days at 6 %.

| BOLUTI | | | | | | SHORTER PROCESS |
|------------|---|----------|------|-----|---------------|-----------------|
| \$7.0019 | = | Int. for | 60 | da. | (Principle 3) | 7.605 |
| \$22.9144 | = | 66 | 180 | | (60 × 3) | 22.815 |
| .76048 | = | ** | 6 | ** | (Principle 5) | .760 |
| \$22.05392 | - | Int for | 174 | 3. | (| |
| | | | 1121 | 40. | | \$22.055. |

5

SIX PER. CENT METHOD.

the second secon

EXERCISE 75.

Find the interest on-

| 1. | \$1,750.00, for | 15 days, at | 6%. | 18. | \$5,178.00, for 9 days, at 9 %. |
|------------|-----------------|--------------|-------|-----|-----------------------------------|
| 2. | \$1,125.00, for | 24 days, at | 7%. | 19. | \$732.00, for 11 days, at 6%. |
| 3. | \$742.50, for | 30 days, at | .6 %. | 20. | \$1,174.51, for 49 days, at 5%. |
| 4. | \$900.00, for | 95 days, at | 71%. | 21. | \$340.00, for 70 days, at 10%. |
| 5. | \$660.00, for | 63 days, at | 8%. | 22. | \$1,478.00, for 80 days, at 6%. |
| 6. | \$136.42, for | 33 days, at | 9%. | 23. | \$2,150.00, for 96 days, at 41 %. |
| 7. | \$1,000.00, for | 21 days, at | 10%. | 24. | \$1,200.00, for 53 days, at 6%. |
| 8. | \$2,000.00, for | 12 days, at | 5%. | 25. | \$1,500.00, for 87 days, at 7%. |
| 9. | \$351.00, for | 40 days, at | 41%. | 26. | \$420.00, for 41 days, at 5%. |
| 10. | \$1,368.00, for | õ0 days, at | 3%. | 27. | \$360.00, for 81 days, at 6%. |
| 11. | \$93.00, for | 150 days, at | 6% | 28. | \$2,347.50, for 18 days, at 7%. |
| 12. | \$550.00, for | 75 days, at | 7%. | 29. | \$1,112.4°, for 25 days, at 8%. |
| 13. | \$842.50, for | 45 days, at | 6%. | 30. | \$1,300.00, for 13 days, at 6%. |
| 14. | \$800.00, for | 27 days, at | 5%. | 31. | |
| 15. | \$1,725.00, for | 57 days, at | 9%. | 32. | \$195.50, for 33 days, at 10 %. |
| $16 \cdot$ | \$125.00, for | 55 days, at | 6%. | 33. | \$1,050.00, for 43 days, at 7%. |
| 17. | \$3,741.85, for | 6 days, at | 7%. | 84. | \$1,560.00, for 44 days, at 71 % |

Find the interest in-

| | PRINCIPAL 1 | | ROM | Т | D | RATE. |
|-----|-------------|-------|-----------|-------|-----------|-------|
| 35. | \$35.61, | Nov. | 11, 1891, | Dec. | 15, 1893, | 6% |
| 36. | \$50.00, | Sept. | 4, 1890, | Jan. | 1, 1892, | 31 %. |
| 37. | \$97.86, | May | 17, 1886, | Dec. | 20, 1893, | 7%. |
| 38. | \$325.28, | June | 20, 1882, | Sept. | 4, 1884, | 8%. |
| 89. | \$154.75, | April | 10, 1888. | Nov. | 24, 1888, | 6%. |
| 40. | \$861.50, | June | 3, 1889, | March | 25, 1890, | 5% |

Find the amount of-

dia

| 41. \$450.80, | March 6, 1893, | Dou. | 20, 1893, | ٥%. |
|-----------------|----------------|------|-----------|-----|
| 42. \$1,500.00, | May 5, 1894, | Jan. | 20, 1825, | 4%. |
| 43. \$127.36, | Dec. 12, 1889, | July | 3, 1891, | 41% |

ACCURATE INTEREST.

(12 months or 365 days to a year.)

343. Since interest in Canada is reckoned upon a basis of 365 days to a year, the interest found by the "Six Per Cent. Method," which is based upon the supposition that 360 days make a year and 30 days a month, is not strictly accurate.

344. Since the year contains 365 days, the interest, found by the Six Per Cent. Method for 360 days to the year, is $\frac{5}{365}$ or $\frac{1}{75}$ part of itself too large.

345. In many States of the American Union interest is reckoned on the basis of **360** days to the year, and many people in Canada still reckon the interest on small amounts on this basis.

346. On account of the shortness of the Six Per Cent. Method, many accountants prefer to reckon interest by this method, and to then make the necessary deduction of $\frac{1}{78}$ of elf.

EXAMPLE .- Find the accurate interest on \$750 for 96 days at 8 %.

SOLUTION.

\$7.50 = Int. for 60 da. at 6 %. 3.75 = 66 30 " 44 75 = 66 6 66 ** \$12.00 = 66 96 41 6%. 4.00 \$16.00 = 64 96 " 8%. Art. 341. \$16.00 - 1/18 of \$16.00 = \$15.78. Accurate interest.

EXERCISE 76.

Find the interest at 6% on-

| 1. | \$2,500 for 75 days. | 5. \$8,360 for 78 days. |
|----|----------------------|--------------------------|
| 2. | \$750 for 48 days. | 6 61 700 A. TI 3 |
| 9 | \$6,253 for 96 days. | 6. \$4,780 for 51 days. |
| 4 | V0.200 101 90 Lays. | 7. \$3,654 for 48 days. |
| 4. | \$4,525 for 47 days. | 8. \$9,875 for 158 days. |

Find the interest and amount of-

| 9. \$850.00 for 63 days at 6 %. | 18. \$670.00 for 78 days at 5%. |
|-----------------------------------|-------------------------------------|
| 10. \$945.50 for 33 days at 6%. | 19. \$785.00 for 45 days at 7%. |
| 11. \$378.68 for 75 days at 6 %. | 20. \$1,200.00 for 68 days at 5%. |
| 12. \$354.75 for 130 days at 6%. | 21. \$2,500.00 for 93 days at 8%. |
| 13. \$510.00 for 63 days at 7%. | 22. \$1,935.50 for 75 days at 5%. |
| 14. \$615.00 for 93 days at 6 %. | 23. \$2,136.88 for 70 days at 1%. |
| 15. \$450.00 for 78 days at 5 %. | 24. \$1,000.00 for 73 days at 6 %. |
| 16. \$120.00 for 96 days at 71 %. | 25. \$2,000.00 for 146 days at 9 %. |
| 17. \$353.00 for 80 days at 10%. | |

Find the interest of-

| PRINCIPAL. | | TIME. | RATE. |
|------------|-----------|---------------------------|------------------------------|
| 27. \$450, | From | Aug. 10 to Nov. 8, 1885, | 6%. |
| 28, \$720, | 44 | Jan. 25 to April 7, 1885, | 7%. |
| 29. \$960, | ** | Feb. 3 to Mar. 19, 1884, | 8%. |
| 30. \$540, | ** | April 8 to May 18, 1890, | 9%. |
| 31. \$100, | #5 | Jan. 30 to Mar. 6, 1892. | 4%. |
| 82. \$900, | 66 | Feb. 12 to Mar. 4, 1893, | 71%. |
| 83. \$240, | ** | May 31 to Nov. 27, 1895, | 10%. |
| 34. \$333, | 66 | Aug. 1 to Nov. 29, 1886, | 5% |
| 85. \$672, | 66 | Feb. 28 to Oct. 25, 1880, | 43%. |
| 36. \$60, | 46 | June 19 to Nov. 10, 1881, | [±] ³ %. |
| 37. \$600, | ** | July 4 to Oct. 20, 1889, | 3%. |
| 88. \$630, | 66 | Feb. 1 to Aug. 20, 1889, | |
| 39. \$480. | ** | Jan. 21 to Dec. 2, 1891, | 57%. |
| 40. \$270, | 64 | May 10 to July 29, 1894, | 5%. |
| 41. \$386, | ** | Oot. 13 to Dec. 12, 1895, | 6%. 9%. |

42. A person borrows \$3,754.45, being the property of a minor who is 15 years 3 months old. He retains it until the owner is 21 years old. How much money will then be due at 6%?

43. A note for \$710.50, with interest after 3 months at 7%, was given Jan. 1st, 1884, and paid Aug. 12th, 1886. What was the amount due?

44. A speculator borrowed \$9,675, at 6 %. April 15th, 1884, with which he purchased flour at \$6.25 a barrel. May 10th, 1885, he sold the flour at $7\frac{3}{5}$ a barrel, cash. What did he gain by the transaction?

45. A man, engaged in business with a capital of \$21,840, is making $12\frac{1}{2}$ % per annum on his capital; but on account of ill health he quits his business, and loans his money at $\frac{3}{4}$ % a month. How much does he lose in 2 years 5 months by the change?

46. Bought 4,500 bushels of wheat at $1.12\frac{1}{2}$ a bushel, payable in 6 months; I immediately realized for it 1.06 a bushel, cash, and put the money at interest at 10%. At the end of the 6 months I paid for the wheat. Did I gain or lose by the transaction, and how much?

347. To find the principal, the rate, time, and interest being given.

EXAMPLE 1.-What principal will yield \$44.80 interest in 2 yrs.

 $\begin{array}{c} \text{Solution 1.} \\ \$1.00 \\ \hline \begin{array}{c} .04 \\ .04 \\ .04 \\ .09 \\ \hline \begin{array}{c} .09 \\ 1 \\ .09 \\ 1 \\ \end{array} \right) 44.80 \\ \hline \begin{array}{c} .09 \\ 1 \\ .09 \\ 1 \\ \end{array} \right) 44.80 \\ \hline \begin{array}{c} .09 \\ 1 \\ .09 \\ 1 \\ \end{array} \right) 44.80 \\ \hline \begin{array}{c} .09 \\ 1 \\ .09 \\ 1 \\ \end{array} \right) 44.80 \\ \hline \begin{array}{c} .09 \\ 1 \\ .09 \\$

Solution 2. $4\% \times 2\frac{1}{3} = 9\frac{1}{3}\%$ $9\frac{1}{3}\%$ of the principal = 844.80 \therefore the principal = $44.80 \times \frac{100}{9\frac{1}{3}}$ = 8480.

SOLUTION.

 1_{73} % of the principal = \$45.60

= \$4,380.

 $5\% \times \frac{76}{365} = 1.3\%$

: the principal = $$45.60 \times$

EXPLANATION. The interest on \$1 for 2 yrs. 4 mos. at 4 % is \$.09¹₃, therefore \$44.80 must be the interest on as many dollars at \$.09¹₃ is contained in \$44.80 or \$480. Ans.

EXPLANATION.

The interest each year = 4% of the principal, and for $2\frac{1}{3}$ years = 4% × $2\frac{1}{3}$ = $9\frac{1}{3}$ % of the principal, and therefore $9\frac{1}{3}$ % of the principal = \$44.80.

EXAMPLE 2.- On what sum of money is \$45.60 the interest for 76 days at 5 %.

100

13

EXPLANATION.

Interest for each year = 5% of the principal, and for 76 days = 5% × $\frac{7}{3}\frac{6}{3}$ = $1\frac{4}{73}$ of the principal and therefore $1\frac{4}{73}$ % of the principal = \$45.60.

RULE.

Divide the given interest by the interest on \$1 for the given time and rate.

EXERCISE 77.

Find the principal-

| RATE. | TIME. | INTEREST. | RATE. | TIME. | INTEREST. |
|----------------------|--------|--------------------|----------|---------|-----------|
| 1. 3½%, | 1 yr., | \$45]. | 7. 5% | 7 yrs., | \$29.75. |
| 2. 51%, | 1 " | \$41 <u>1</u> . | 8. 31%, | 41 ** | \$94.50. |
| 3. 41 %, | 1 " | \$251. | 9.4%, | 13 " | \$68.25. |
| 4. 33%, | Å " | \$3 § . | 10. 41%, | 11 " | \$47.25. |
| 5.8%, | ₽ ·· | \$18. | 11. 6%, | 52 ** | \$170.00. |
| 6. 2 1 %, | 6 " | \$521. | 12. 31%, | 41 " | \$136.00. |

Find the principal-

| | INTEREST. | RATE. | | TIME. |
|-----|---------------------|-------|------|---------------------------------|
| 13. | \$42.70, | 7%, | From | Jan. 1, 1886, to Sept. 1, 1887. |
| 14. | \$197.80, | 8%, | 64 | Jan. 1, 1887, to July 12, 1889. |
| 15. | \$26.08, | 6%, | 66 | Jan. 1, 1888, to Sept. 9, 1890. |
| 16. | \$60.75, | 5%, | 66 | Jan. 1, 1890, to Oct. 10, 1891. |
| 17. | \$987.75, | 9%, | 66 | Jan. 1, 1890, to July 1, 1891. |
| 18. | \$366.32, | 10%, | 66 | Jan. 1, 1888, to Oct. 18, 1890. |
| 19. | \$90.06 + | 11%, | 61 | Jan. 1, 1892, to July 1, 1894. |
| 20. | \$561.56, | 12 %, | 66 | Jan. 1, 1889, to Oct. 1, 1893. |
| 21. | \$445.19, | 7%, | 61 | Jan. 1, 1888, to July 24, 1893. |
| 22. | \$277.76, | 8%, | 66 | Jan. 1, 1892, to Nov. 15, 1895. |
| 23. | \$315.64 + | 5%, | 66 | Jan. 1, 1887, to Aug. 6, 1892. |
| 24. | \$95.97, | 6%, | | Jan. 1, 1891, to Nov. 1, 1893. |
| 25. | \$700.70, | 9%, | ** | Jan. 1, 1890, to Oct. 10, 1899. |
| 26. | \$1,150. 86, | 12%, | ec , | Jan. 1, 1880, to July 20, 1887. |

34%. To find the principal, the amount, time and rate being given.

EXAMPLE 1.-What principal will amount to \$760.20 in 2 yrs. 7 mos. at 8%?

| SOLUTION 1. | |
|--|--|
| $ \begin{array}{c} \$1.00\\ .08\\ .08\\ .08\\ \$1.20\$\\ \$1.20\$\\ \$760.20\\ .3\\ 3\\ 3\\ 3\\ 3\\ 3\\ 3\\ 3\\ 3\\ 3\\ 3\\ 3\\ 3\\ 3$ | EXPLANATION. The amount of \$1 for 2 yrs. 7 mos. at 8% is \$1.203, therefore the principal will be as many dollars as \$1.203 is contained times in \$760.20 or \$630. Ans. |

EXPLANATION.

SOLUTION 2. The principal = \$760.20 x 100% + $8\% \times 2\frac{1}{12} = 120\frac{3}{5}\%$ mos. = $120\frac{3}{5}\%$ of the principal = \$760.20 x $\frac{100}{120\frac{3}{5}}$ of the principal = \$760.20 x $\frac{100}{120\frac{3}{5}}$ of the principal = \$630. Ans.

Interest for 1 year = 8% of the principal and for 2 yrs. 7 mos. = 8% × $2\frac{7}{12}$ = 203% of the principal, hence the amount = $\frac{100}{1203}$ of the principal + 203% of the principal, therefore 1203% of the principal = \$760.20.

EXAMPLE 2.—What principal will amount to \$2,285.60 in 152 days at 5 % ?

EXPLANATION.

| $\frac{100\% + 5 \times \frac{1}{3}\frac{2}{5}}{102\frac{6}{73}\%} = \frac{102\frac{6}{73}\%}{102\frac{6}{73}\%}$ of the principal = \$2,235.60 | the |
|---|--------------|
| $\therefore \text{ the principal} = \$2,235.60 \times 100$ | 5% |
| $\frac{100}{102\frac{6}{73}} = $2,190.$ Ans. | pal. prii |

SOLUTION.

Interest for each year = 5% of the principal, and for 152 days = $5\% \times \frac{152}{3} = 2_{73}^{-3}\%$ of the principal, and therefore $102_{73}^{-3}\%$ of the principal = \$2,235.60, the amount.

RULE.

Divide the given amount by the amount on \$1 for the given time and rate.

EXERCISE 78.

What sum must be put out at interest for-

| 1. | 2 | years | at 4% to | amount | to \$540 |
|------|-----|--------|----------|--------|----------------------------|
| 2. | 4 | ** | 6% | | |
| 8. | 6 | ** | 21% | 64 | \$2,480.00. \$2,760.00. |
| ` 4. | 8 | ** | 3% | ** | |
| 5. | 10 | ** | 7% | ** | \$87.20. \$342.00. |
| 6. | 8 | 44 | 5% | " | |
| 7. | 21 | ** | 2% | " | \$616.00. |
| 8. | 31 | 48 | 6% | 6.6 | \$53.00. |
| 9. | 71 | •6 | 8% | " | \$120.00. |
| 10, | 41 | " | 3% | " | \$960.00. |
| 11. | 94 | | 1% | ** | \$1,353.00. |
| 12. | 63 | ** | 5% | 44 | \$175.60. |
| 13. | • | . 1 | | | \$360.00. |
| | | | o, at 4% | 44 | \$1,011.00. |
| 14. | | | 0. " 6% | 66 | \$114 50. |
| 15. | 3 у | r. 7 m | 0. " 8% | 16 | \$386.00. |
| 16. | 13 | r. 8 m | 0. " 3% | 4. | \$945.00. |
| 17. | 2 y | r. 2 m | 0. " 63% | " | \$1,030 00. |
| | | | | | |

| 1 yr. 6 | mo. at | 31% | to amour | nt to \$840.00. |
|------------|--|--|--|--|
| 2 yr. 8 | mo. " | 8% | 44 . | \$1,092.00. |
| | | | ** | \$940.00. |
| - J | | | ** | \$972.00. |
| - | | | 66 | \$1,185.00. |
| | 66 | 6% | 66 | \$1,470.80. |
| | | | 66 | \$1,098.60. |
| | ** | 3] % | 44 | \$2,923.36. |
| | | | 66 | \$1,842.40. |
| | | | 66 | \$4,441.20. |
| - | ** | 3% | 44 | \$2,246.70. |
| | ** | 6% | * ** | \$2,586.50. |
| | ** | $2\frac{1}{2}\%$ | 64 | \$3,318.75. |
| | | | ** | \$755.00. |
| | | | 66 | \$516.95. |
| | ** | $3\frac{1}{3}\%$ | 66 | \$593.28. |
| 312 da. | ** | $6\frac{2}{3}\%$ | ss 1 | \$462.96. |
| | 2 yr. 8 1 yr. 9 5 yr. 2 3 yr. 1 45 da. | 2 yr. 8 mo. " 1 yr. 9 mo. " 5 yr. 2 mo. " 3 yr. 1 mo. " 45 da. " 12 da. " 12 da. " 87 da. " 102 da. " 318 da. " 75 da. " 150 da. " 200 da. " 85 da. " | 2 yr. 8 mo. " 8% 1 yr. 9 mo. " 10% 5 yr. 2 mo. " 10% 3 yr. 1 mo. " 6% 16 da. " 7_{1} % 12 da. " 3_{1} % 87 da. " 4% 102 da. " 5% 318 da. " 3% 75 da. " 6% 150 da. " 2_{1} % 85 da. " 5% 174 da. " 3_{1} % | 2 yr. 8 mo. " 8% " 1 yr. 9 mo. " 10% " 5 yr. 2 mo. " 12% " 3 yr. 1 mo. " 6% " 45 da. " 6% " 16 da. " $7\frac{1}{2}\%$ " 12 da. " $3\frac{1}{3}\%$ " 87 da. " 4% " 102 da. " 5% " 118 da. " 3% " 150 da. " $2\frac{1}{3}\%$ " 200 da. " $6\frac{1}{5}\%$ " 150 da. " 5% " |

349. Find the time, the principal, interest and rate being given.

EXAMPLE 1.-In what time will \$607.50 produce \$125.55 interest at

8%?

1

| BOLUTION. | EXILANATION. |
|---|---|
| $\begin{array}{l} 6.075 \\ \underline{8} \\ \overline{48.60} = \text{Int. for 1 yr. at 8 \%.} \\ 48.60 \) \ 125.55 \ (\ 2_{17}^{-7} \\ \text{yr. } \times \ 2_{17}^{-7} = 2 \ \text{yrs. 7 mos. Ans.} \end{array}$ | The interest for 1 year at 8% is \$48.60, but the interest is $2\frac{1}{72}$ times \$48.60. \therefore the time = $2\frac{1}{72}$ times 1 year = 2 yrs 7 year |

EXAMPLE 2. - In what time will \$584 p oduce \$6.72 interest at 4 %?

| EXPLANATION. |
|--|
| The interest for 1 year at 4% \$23.36, but the interest is ly $\frac{5}{3}\frac{2}{3}$ of this s and : e time is $\frac{5}{3}\frac{2}{3}\frac{2}{3}$ o year = $\frac{2}{3}\frac{2}{3}$ of 365 days = 105 days. |
| |

Divide the given interest by the interest of the principal for 1 year at the given rate.

Notes 1.—If the quotient consists of a fraction, or of a whole number and a fraction, reduce the fractional parts to days by multiplying the fraction by 365

2. If the amount is given instead of the interest, find the part omitted and proceed as above.

3. At 190%, any sum of money will double itself in 1 year; therefore, any per cent. will require as many years to double the principal as the given per cent. is contained times in 100%.

EXERCISE 79.

Find the time-

| | PRINCIPAL. | BATE. | INTEREST. | | PRINCIPAL. | RATE. | INTEREST. |
|-----|-------------|-------|----------------------|-----|-------------|-------|--------------|
| 1. | \$840.00, | 31 %, | \$70. | 12. | \$645.75, | 9%, | \$206.64. |
| 2. | \$1,050.00, | 4%, | \$136 4 . | 13, | \$727.35, | 12%, | \$418.954. |
| 3. | 320 mark, | 41%, | 72 m. | 14. | \$866.40. | 11 %, | \$347.065. |
| 4. | 180 lire, | 5%, | 411. | 15. | \$978.60, | 10 %, | \$518.658. |
| 5. | \$4,000.00, | 5%, | \$50. | 16. | \$998.52, | 5%, | \$185.145. |
| 6. | \$650.00, | 4%, | \$78. | 17. | \$1,092.24, | 7%, | \$338.958. |
| 7. | \$820.00, | 5%, | \$215 1 . | 18. | \$1,129,32, | 9%, | \$582.729. |
| 8, | \$450.00, | 4%, | 5¢. | 19. | \$1,192.80. | 8%, | \$751.464. |
| 9. | \$896.00, | 6%, | \$80.64. | 20. | \$1,200.00. | 6%, | \$1,200.00. |
| 10. | \$768.00, | 7%, | \$144.853. | 21. | \$1,268.40. | 12% | \$1,268.40. |
| 11. | \$984.00, | 8%, | \$288.64. | 22, | \$1,288.88, | | \$1,261.142. |
| | PRINCIPAL. | RATE. | AMOUNT. | | PRINCIPAL. | BATE. | AMOUNT. |
| 23. | \$1.460.00, | 6 %, | \$1,470.80, | 2 | 7. \$4,380, | 5% | \$4,441.20. |
| 24. | \$1,095.00, | 71%, | \$1,098.60. | | 8. \$2,190. | 31% | \$2.246.70. |
| 25. | \$2,920.00, | 31%, | \$2,923.36. | | 9. \$2,555, | 6%, | \$2,586,50. |
| 26. | \$1,825.00, | 4%, | \$1,812.40, | | 0. \$3,285, | 21%, | \$3,318.75. |

27. B. loaned \$1,600 at 6% until it amounted to \$2,000. What was the time?

28. Mr. Roper paid \$48 interest. For what period did he pay it, the principal being \$640, and the rate 5%?

29. Borrowed Jan. 1st, 1889, \$60 at 6%, to be paid as soon as the interest amounted to one-half the principal. When is it due?

30. May 18th a speculator bought 1,606 bushels of wheat at \$1.00 a bushel. He afterwards sold the whole for \$1,658.80 cash, his profit being equivalent to 6% per annum on the amount invested. What was the date of the sale?

31. In what time will any sum of money double itself at 4 %, 5 %, 6 %, 8 % and 10 % per annum?

350. To find rate, when principal, interest, and time are given.

EXAMPLE.-At what rate will \$1,248 in 2 years 5 months produce \$135.72 interest?

SOLUTION.

EXPLANATION.

12.48 = Int. for 1 yr. at 1% The interest on \$1,248 for 25 \$30.16 =Int. for $2\frac{5}{12}$ yrs. at 1%. \$30.16) \$135.72 (41 1% × 41 = 41%. Ans.

2 yrs. 5 mos. at 1 % = \$30.16, but the interest is 41 times as great as \$30.16. .: the rate per cent. is 41 times 1% = 41%.

EXPLANATION.

\$1,248.00 expresses what frac-

| Solution 2. | | | | | | | |
|------------------------|---|---------------------------|---|-------|---|------|--|
| \$135.72 \$1,248.00 | × | $\frac{1}{2\frac{5}{12}}$ | × | 100 % | - | 43%. | |

tion the interest is of the principal for 25 years; this fraction divided by 25 expresses what fraction of the principal the interest is for 1 year; this latter fraction is expressed as per cent. by multiplying by 100.

EXAMPLE 2.- At what rate will \$4,380 in 76 days, produce \$45.60 interest?

| SOLUTION 1. | EXPLANATION. | | |
|---|--------------------------------------|--|--|
| 43.80 = Int. for 1 yr. (365 da.) at 1 % | Interest on \$4,380 for 76 days | | |
| \$9.12 = "76 da. at 1 % | at $1\% = \$9.12$, but the interest | | |
| \$9.12) \$45.60 (5 | is 5 times as great as 9.12 . the | | |
| 1 % x 5 = 5%. Ans. | rate is 5 times $1\% = 5\%$. | | |

EXPLANATION. \$45.60

SOLUTION 2. \$45.60 $\frac{1}{\frac{76}{365}} \times 100\% = 5\%$. Ans. \$4,380.00

\$4,880.00 expresses what fraction of the principal the interest is for 365 year; this fraction divided by $\frac{76}{365}$ expresses what fraction of the principal is for 1 year; this latter fraction is expressed as per cent. by multiplying by 100.

RCLN.

Divide the given interest by the interest of the principal at 1% for the given time.

Norg .--- If the amount be given instead of the interest, find the part omitted and proceed as above.

Find the rate-

of

le

r

e

ıt

e

r 8 r

EXERCISE 80.

| | PRINCIPAL. | | . TIME. | | PRINCIPAL. | INTERES | T. TIME. |
|-----|-------------|-----------|--------------|-----|-------------|-----------|-------------|
| 1 | | | 1 yr. | 21. | \$1,231.36, | \$923 52, | |
| 2 | | | 10 yr. | 22. | | \$18.00, | 8 yr. 4 mo. |
| 3 | | | 5 yr. | | \$8,450.00, | \$148.00, | 9 mo. |
| 4 | | | 31 yr. | 24. | | \$26.92, | 3 mos. |
| 5. | \$500.00, | \$60.00, | 2 yr. | 25. | | \$93.73, | 1 yr. 4 m. |
| 6. | | \$81.00, | 3 yr. | 26. | ·····, | \$186.00, | 1 yr. 3 m. |
| 7. | \$600.00, | \$39.00, | 11 yr. | 27. | | | 2 yr. 7 m. |
| 8. | \$120.00, | \$18.00, | 21 yr. | 28. | | \$40.80, | 1 yr. 5 m. |
| 9. | \$2,000.00, | \$90.00, | 1 yr. | 29. | ****** | \$70.50, | 3 yr. 11 m. |
| 10. | \$4,000.00, | \$340.00, | 2 yr. | 80. | | \$24.96, | 312 da. |
| 11. | \$2,500.00, | | 21 yr. | 31. | \$511,00, | \$9.28, | 174 da. |
| 12 | \$3,600.00, | \$306.00, | 1 5 yr. | 32. | | \$5 95, | 85 da. |
| 18. | \$4,850.00, | \$582.00, | 3 yr. | 83. | \$1,460.00, | \$10.80, | 45 da. |
| | \$3,500.00, | \$315.00, | 1 <u>1</u> . | 34. | - ,, | \$3.60, | 16 da. |
| 15. | | \$88.80, | 1 yr. 6 m. | | | \$3.36, | 12 da. |
| 16. | | \$171.98, | 2 yr. 8 m | 35. | | \$17.40, | 87 da. |
| 17. | \$897.50, | | | | \$4,380.00, | \$61,20, | 102 da. |
| | \$1,224.72, | | 3 yr. 6 m | | \$2,190.00, | \$56.70, | 818 da. |
| | \$1,152.00, | - | 5 yr. 7 m. | | \$2,555.00, | \$31.50, | 75 da. |
| 20. | \$867.40, | | 3 yr. 10 m. | | \$3 285.00, | \$33.75, | 150 da. |
| | W001.40, | po20.94, | 7 yr. 4 m. | 40. | \$730 00, | \$25.00, | 200 da. |
| | | | | | | | |

41. A house bought for \$12,500 paid \$1,000 rent. If \$200 were paid for taxes and repairs what rate of interest did the purchase money yield ?

331. Compound Interest is the interest of the principal and of the unpaid interest after it becomes due.

Nores 1.—The simple interest may be added to principal annually semi-annually, or quarterly, as the parties may agree.

2. Compound interest can not be collected by law, except as per written agreement, but a creditor may receive it without incurring the penalty of usury.

3. In the Post Office Savings Banks, interest is calculated to the thirtieth day of June in every year, and is then added to and becomes part of the principal money, unless withdrawn.

4. Some Savings and Loan Companies compound interest semiannually.

352. To compute compound interest when the principal, rate and time are given.

EXAMPLE 1.—Find the compound interest on \$2,000 for 3 years at 5 %.

SOLUTION 1.

| Principal | 10.000 |
|---------------------------------------|------------|
| Int. for 1st yr. (\$2.000 × .05) | . 2,000.00 |
| Amt for 1 yr on the Drive 1 | 100.00 |
| Amt. for 1 yr., or 2nd Principal | \$2,100.00 |
| x_{110} for 2 hd yr. (2,100 x .(0)) | |
| Amt. for 2 yrs., or 3rd Principal | 100 00 |
| Int. for 3rd. yr. (32,205 × .05) | |
| Amt for 2rd | 110.25 |
| Amt. for 3rd yr. | \$2,315.25 |
| original I fincipal to be subtracted | 2,000.00 |
| Compound Interest for 3 yrs | \$315.25 |
| | 8315 25 |

SOLUTION 2. \$2,000 1.05Amt. of \$1 for 1 yr.

| 1.05 | Amt. of \$1 for 1 yr. | 1.05 |
|------------|---------------------------|------------|
| \$2.100 | Amt. of \$2,000 for 1 yr. | 1.1025 |
| 1.05 | | 1.1025 |
| \$2,205 | Amt. of \$2.100 for 1 yr. | 1.157625 |
| 1.05 | | 2000 |
| \$2,315.25 | Amt of \$2,205 for 1 yr. | \$2,315.25 |
| 2,000 | Principal. | 2,000 |
| \$315.25 | Compound Interest. | |
| | | \$315.25 |

 $\mathbf{E}_{\text{XAMPLE 2.}}{-}\mathrm{Find}$ the compound interest on \$1,000 for 2 years 3 months at 8%.

| Solution 1. | | SOLUTION 2. | | |
|---|--|---|------|--|
| \$1,000 80 \$1,080 86.40 \$1,166.40 | Principal. Int. 1st yr. Amt. 1st yr. Int. 2nd yr. Amt. 2nd yr. | \$1,000 <u>1.08</u> \$1,080 <u>1.08</u> \$1,166.40 Aint. of \$1 for 1 | yr. | |
| \$1,000 | | 1.02 Amt. of \$1 for 3 n \$1,189.728 1.000 \$189.728 | nos. | |

| 1,000 | rincipai. | \$1,000 | |
|-----------|------------------------|-------------|------------------------|
| 80 | Int. 1st yr. | 1.08 | Amt. of \$1 for 1 yr. |
| 1,080 | Amt. 1st yr. | \$1,080 | |
| 86.40 | Int. 2nd yr. | 1.08 | |
| 1,166.40 | Amt. 2nd yr. | \$1,166.40 | |
| | | 1.02 | Amt. of \$1 for 3 mos. |
| ,189.728 | Int. for 3 yrs. 3 mos. | \$1,189.728 | 8 |
| ,000 | Principal. | 1,000 | |
| \$189.728 | Compound Interest. | \$189.72 | 8 |
| | | | |

| Solution 3. |
|-------------|
| 1.08 |
| 1.08 |
| 1.1664 |
| 1.02 |
| 1.189728 |
| 1000 |
| \$1189.728 |
| \$1000 |
| \$189.728 |

353. The use of the following table will greatly shorten calculations in compound interest.

ıci-

lly

ten y of

the nes

mi-

n-

irs

178

SOLUTION 3.

1.05

. ..

TABLE.

Showing the amount of \$1 or \pounds 1, at different rates for any number of years from 1 to 40.

| Yrs | 1 per et. | . 13 per ct. | 9 per ct. | 21 per ct. | 3 per ct. |
|----------------------------|---|--|--|--|--|
| 1 2 3 4 5 | 1.0100 000 1.0201 000 1.0303 010 1.0406 040 1.0510 101 | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | $\begin{array}{c} 1.0200 \ 000 \\ 1.0404 \ 000 \\ 1.0612 \ 080 \\ 1.0824 \ 321 \\ 1.1040 \ 808 \end{array}$ | 1.0250 000 1.0506 250 1.0768 906 1.1038 128 1.1314 082 | 1.0300 000 1.0609 000 1.0927 270 1.1255 088 1.1592 740 |
| 6 7 8 9 10 | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{c} 1.0934 \ 433 \\ 1.1098 \ 450 \\ 1.1264 \ 926 \\ 1.1433 \ 900 \\ 1.1605 \ 408 \end{array}$ | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | $\begin{array}{cccccccc} 1.1596 & 934 \\ 1.1886 & 857 \\ 1.2184 & 029 \\ 1.2438 & 629 \\ 1.2800 & 845 \end{array}$ | 1.1940 523 1.2298 738 1.2667 700 1.3047 731 1.3439 163 |
| 11 12 13 14 15 | 1.1156 683 1.1268 250 1.1380 933 1.1494 742 1.1609 690 | 1.1779 489 1.1956 182 1.2135 524 1.2317 557 1.2502 321 | 1.2433 743 1.2682 417 1.2936 066 1.3194 787 1.8458 683 | 1.3120 866 1.3448 888 1.3785 110 1.4129 738 1.4482 981 | 1.3842 338 1.4257 608 1.4685 337 1.5125 897 1.5579 674 |
| 16 17 18 19 20 | 1.1725 786 1.1843 044 1.1961 475 1.2081 690 1.2201 900 | 1.2689 855 1.2850 203 1.3073 406 1.3269 507 1.3468 550 | $\begin{array}{r} 1.3727 \hspace{0.1cm} 857 \\ 1.4002 \hspace{0.1cm} 414 \\ 1.4282 \hspace{0.1cm} 462 \\ 1.4568 \hspace{0.1cm} 111 \\ 1.4859 \hspace{0.1cm} 474 \end{array}$ | $\begin{array}{c} 1.4845 & 056 \\ 1.5216 & 182 \\ 1.5596 & 587 \\ 1.5986 & 501 \\ 1.6386 & 164 \end{array}$ | 1.6047 064 1.6528 476 1.7024 330 1.7535 060 1.8061 112 |
| 21 22 23 24 25 | $\begin{array}{c} \textbf{1.2323} & \textbf{919} \\ \textbf{1.2447} & \textbf{159} \\ \textbf{1.2571} & \textbf{630} \\ \textbf{1.2697} & \textbf{346} \\ \textbf{1.2824} & \textbf{320} \end{array}$ | 1.3670 578 1.3875 637 1.4083 772 1.4295 028 1.4509 454 | 1.5156 663 1.5459 796 1.5768 992 1.6084 372 1.6406 059 | 1.6795 818 1.7215 714 1.7646 106 1.8087 259 1 8539 441 | 1.8602 945 1.9161 034 1.9735 865 2.0327 941 2.0937 779 |
| 26 27 28 29 30 | 1.2925 563 1.3082 089 1.3212 910 1.3345 039 1.3478 490 | 1.4727 095 1.4948 002 1.5172 222 1.5399 805 1.5630 802 | 1.7068 864 1.7410 242 1.7758 446 | 1.9478 000 1.9964 950 2.0464 073 | 2.1565 912 2.2212 890 2.2879 276 2.3565 655 2.4272 624 |
| | 1.4025 770 | 1.6103 243 1.6344 792 1.6589 964 | 1.8845 405 1.9222 314 1.9606 760 | 2.1500 067 2.2037 569 2.2588 508 2.3153 221 | 2.5000 803 2.5750 827 2.6523 352 2.7319 053 2.8138 624 |
| 37 38 39 | 1.4450 765 1.4595 272 1.4741 225 | 1.7347 766 1 1.7607 983 1 1.7872 103 1 | $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | 2.4325 353 2.4933 487 2.5556 824 2.6195 744 | 2.8982 783 2.9852 266 3.0747 884 3.1670 269 3.2620 377 |

TABLE.

| Yrs | 5. 34 per o | et. 4 per ct. | 41 per el | . 5 per ct. | 51 per ct |
|----------|---|---|---|--|----------------|
| 1 | | 0 1.0400.000 | The second se | | |
| 2 | | 0 1 1.0816 000 | 1.0920 250 | | 1.055 • |
| 3 | | 8 1 1 19.19 640 | 1.1411 661 | 1.1025 000 | 1.113 |
| 4 | | 0 1.1698 585 | 1 1095 100 | 1.1576 250 | 1.174 |
| 5 | 1.1876 86 | 3 1.2166 529 | 1.2461 819 | $\begin{array}{c}1\ 2155\ 063\\1.2762\ 816\end{array}$ | 1.239 |
| 6 | 1.2292 55 | 1 | | 1.2102 010 | 1.307 |
| 7 | | | 1.3022 601 | 1.3400 956 | 1.379 |
| 8 | 1.3168 09 | Letter of the | 1.3608 618 | 1.4071 004 | 1.455 |
| 9 | 1.3628 97 | $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | 1.4221 006 | 1.4774 554 | 1.535 |
| 10 | 1.4105 98 | | 1.4860 951 | 1.5513 282 | 1.619 |
| | 1 | | 1.5529 694 | 1.6288 946 | 1.708 |
| 11 | 1.4599 697 | 1.5394 540 | 1.6228 530 | 1 | |
| 12 | 1.5110 686 | 1,6010 399 | 1.6958 814 | 1.7103 394 | 1.802 |
| 13 | 1.5639 560 | 1.6650 735 | 1.7721 961 | 1.7958 563 | 1.901 |
| 14 | 1.6186 945 | 1 7316 764 | 1.8519 449 | 1.8856 491 | 2.006 |
| 15 | 1.6753 488 | 1.8009 435 | 1.9352 824 | 1.9799 316 | 2.116 |
| 10 | | | 1.5552 824 | 2.0789 282 | 2.232 |
| 16 17 | 1.7339 860 | | 2.0223 701 | 2.1828 746 | |
| | 1.7946 755 | 1.9479 005 | 2.1133 768 | 2.2920 183 | 2.855 |
| 18 19 | 1.8574 892 | 2.0258 165 | 2.2084 787 | 2.4066 192 | 2.485 |
| 20 | 1.9225 018 | 2.1068 491 | 2.3078 603 | 2.5269 502 | 2.621 |
| 20 | 1.9897 888 | 2.1911 231 | 2.4117 140 | 2.6532 977 | 2.766 |
| 21 | 0.0504.044 | | | 2.0002 911 | 218 |
| 22 | 2.0594 314 | 2.2787 680 | 2.5202 411 | 2.7859 626 | 9 070 |
| 23 | $\begin{array}{c} 2.1315 \ 115 \\ 2.2061 \ 144 \end{array}$ | 2.3699 187 | 2.6336 520 | 2.9252 607 | 3.078 3.248 |
| 24 | 2 2833 284 | 2.4647 155 | 2.7521 663 | 3.0715 238 | |
| | 9 9699 449 | 2 2033 041 | 2.8760 138 | 3.2250 999 | 3.426 8.615 |
| | 2.3632 449 | 2 6658 363 | 8.0054 344 | 3.3863 549 | 8.813 |
| 26 | 2.4459 585 | 1. 1 | | | 0.015 |
| 27 | 2.5315 671 | | 8.1406 790 | 3.5565 727 | 4.023 |
| 28 | 2.6201 719 | | 5.2820 095 | 3.7334 563 | 4.244 |
| 29 | 2.7118 779 | 2.9987 033 3.1186 514 | 5.4296 999 | 3.9201 291 | 4.478 |
| 0 | 2.8067 937 | | .5840 364 | 4.1161 356 | 4.724 |
| | | 0.2405 975 3 | .7453 181 | 1 9010 404 | 4.984 |
| 31 9 | 2.9050 314 | 3.3731 334 8 | | | |
| 2 | 3.0067 075 (| | .9188 574 | 4-5380 395 | 5.258 |
| 3 3 | 3.1119 423 | | .0899 810 | .7649 415 | 5.547 |
| 1 3 | 3.2208 603 | | 2740 301 | 5.0031 885 | 5.852 |
| 5 3 | .3335 904 | | 4663 615 | 5.2533 480 | 6.174 |
| 1 | | 4 | 6673 478 5 | | 6.514 |
| 6 3 | .4502 661 | 4.1039 325 4. | 8773 784 5 | | |
| 7 3 | .5710 254 | | | .7918 161 | 3.872 |
| 3 3 | .6960 113 | | | | 1.250 |
| 9 3. | .8253 717 | 4.6163 659 5 | | .3854 773 1 7 | .649 |
| 0 3. | 9592 597 | | | | 3.0 69 |
| | | | 100 040 1 | .0399 887 8 | .513 |

*Nore.-As the 51 table is seldom used in business, we only extend it three figures.

of

1

1 _____ 1

| 1 | ' A | в | Ľ | R | |
|---|------------|---|---|---|--|
| | | | | | |

| Yrs | . 6 per ct | . 7 per et. | 8 per ct. | 9 per et. | 10 per ct |
|-----------------|--------------------------|--------------|-----------------|-------------|----------------------------|
| 1 | | | 1.0800 000 | 1.0900 000 | 1 1000 000 |
| 2 | 1.1236 000 | | 1.1664 000 | | |
| 3 | 1.1910 160 | | 1.2597 120 | | 1.2100 000 1.3310 000 |
| 4 | 1.2624 770 | | 1.3604 890 | | 1.4641 000 |
| 5 | 1.3382 256 | 6 1.4025 517 | 1.4693 281 | 1.5386 240 | 1.6105 100 |
| 6 | 1.4185 191 | | 1.5668 743 | 1.6771 001 | 1.7715 610 |
| 7 | 1.5036 308 | | 1.7138 243 | 1.8280 391 | 1.9487 171 |
| 89 | 1.5938 481 | | 1.8509 302 | 1.9925 626 | 2.1435 888 |
| 10 | 1.6894 790 | | 1.9990 046 | 2.1718 933 | 2.3579 477 |
| 10 | 1.7908 477 | 1.9671 514 | 2.1589 250 | 2.3673 637 | 2.5937 425 |
| 11 | 1.8982 986 | | 2.3316 390 | 2.5804 264 | 2.8531 167 |
| $\frac{12}{13}$ | 2.0121 965 | | | 2.8126 648 | 3.1384 284 |
| 14 | 2.1329 283 | | | 3.0658 046 | 3.4522 712 |
| 15 | 2.2609 040 2.3965 582 | | 2.9371 936 | 3.3417 270 | 3.7974 983 |
| | | 2.7590 315 | 3.1721 691 | 3.6424 825 | 4.1772 482 |
| 16 | 2.5403 517 | 2.9521 638 | 3.4259 426 | 8.9703 059 | 1 5010 500 |
| 17 | 2 6927 728 | 3.1588 152 | | 4.3276 334 | 4.5949 730 |
| 18 | 2.8543 392 | 3.3799 323 | 3. 960 195 | 4.7171 204 | 5.0544 703 5.5599 173 |
| 19 | 3.0255 995 | 3.6165 273 | 4 3157 011 | 5.1416 613 | 6.1159 390 |
| 20 | 3.2071 355 | 3.8696 840 | 4 5609 571 | 5.6044 108 | 6.7275 000 |
| 21 | 3.3995 636 | 4.1405 624 | 8.0338 337 | 6.1088 077 | 7 4000 400 |
| 22 | 3.6035 374 | 4.4304 017 | 5.4365 404 | 6.6586 004 | 7.4002 499 8.1402 749 |
| 23 | 3.8197 497 | 4.7405 299 | 5.8714 637 | 7.2578 745 | 8.9543 024 |
| 24 | $4.0489 \ 346$ | 5.0723 670 | 6.3411 807 | 7.9110 832 | 9.8497 327 |
| 2.5 | 4.2918 707 | 5.4274 326 | 6.8484 752 | 8.6230 807 | 10.8347 059 |
| 26 | 4.5493 830 | 5.8073 529 | 7.3963 532 | 9.3991 579 | 11 0101 505 |
| 27 | 4.8223 459 | 6.2138 676 | | | 11.9181 765 13.1099 942 |
| 28 | 5.1116 867 | 6.6488 384 | | | 14.4209 936 |
| 29 | 5.4183 879 | 7.1142 571 | | | 15.8630 930 |
| 30 | 5.7434 912 | 7.6122 550 | 10.0626 569 | | 17.4494 023 |
| 31 | 6.0881 006 | 8.1451 129 | 10.8676 694 | 14.4617 695 | 19.1943 425 |
| 32 | 6.4533 867 | 8.7152 708 | 11.7370 830 | | 21.1137 768 |
| 33 | 6.8405 899 | 9.3253 398 | 12.6760 496 | | 23.2251 544 |
| 34 | 7.2510 253 | 9.9781 135 | 13.6901 336] ; | | 25.5476 699 |
| 5 | 7.6860 868 | 10.6765 815 | | | 28.1024 369 |
| 6 | 8.1472 520 | 11.4239 422 | 15.9681 718 | 22.2512 250 | 30.9126 805 |
| 17 | 8.6360 871 | 12.2236 181 | | | 34.0039 486 |
| 8 | 9.1542 524 | | | | 37.4043 434 |
| 9 | 9.7035 075 | 13.9948 204 | | | 1.1447 778 |
| 0 1 | 0.2857 179 | | | | 5.2592 556 |
| | | | | 4 200 4 | 0.2092 006 |

Norgs 1.-If each of the numbers in the table be diminished by 1, the remainder will denote the compound interest of \$1, instead of its

2. If interest is compounded semi-annually, take 1 the given rate and twice the number of years; if compounded quarterly, take 1 the given rate for 4 times the number of years, etc.

3. The amount for any number of years not e^{i} computed by finding the products of the amount or any two numbers of years whose sum equals the given time.

4. To find the amount of any given principal at compound interest,

multiply the principal by the amount of \$1 for the time and rate. 5. If the time contains parts of a period, as months or days, find the amount due for the full periods, and to this add its interest for the

EXERCISE 81.

Find the amount and the compound interest of-

1. \$312 for 3 years at 6%; \$800 for 4 years at 4%.

2. \$640 for 4 years at 5%; \$376 for 3 years 8 months and 15 days at 6%.

3. \$1,200 for two years 4 months at $4\frac{1}{2}$ %; for 3 years 8 months at 7 %.

4. \$400 for 1 year 6 months at 7%, payable semiannually.

5. \$2,000 for 1 year at 8%, payable quarterly.

6. \$1,000 for 28 years at 7%.

7. \$750 for 12 years at 3%.

8. \$920 for 8 years at 5%.

0

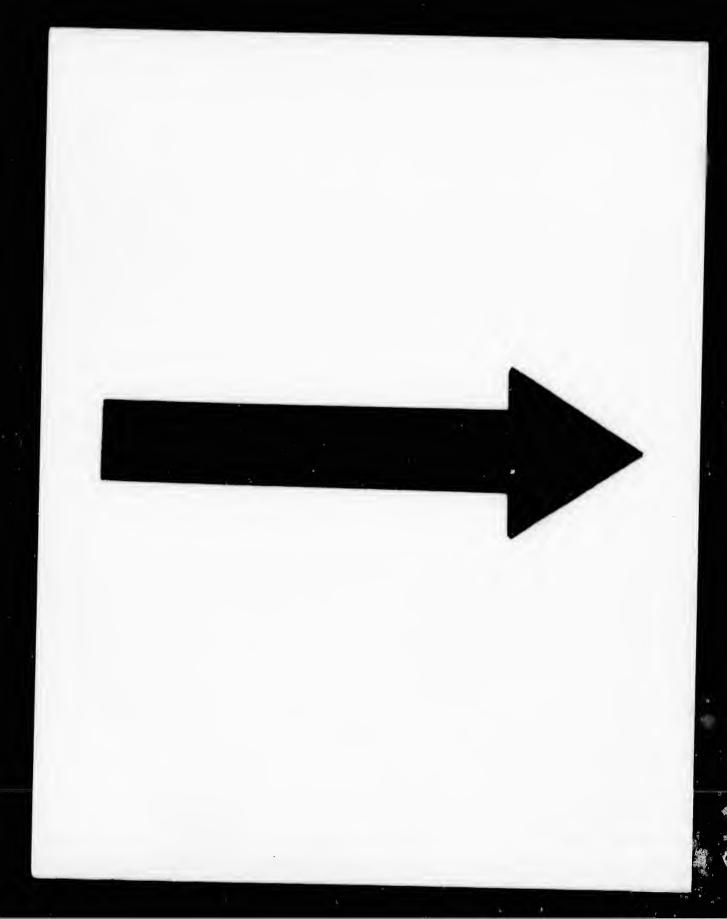
õ

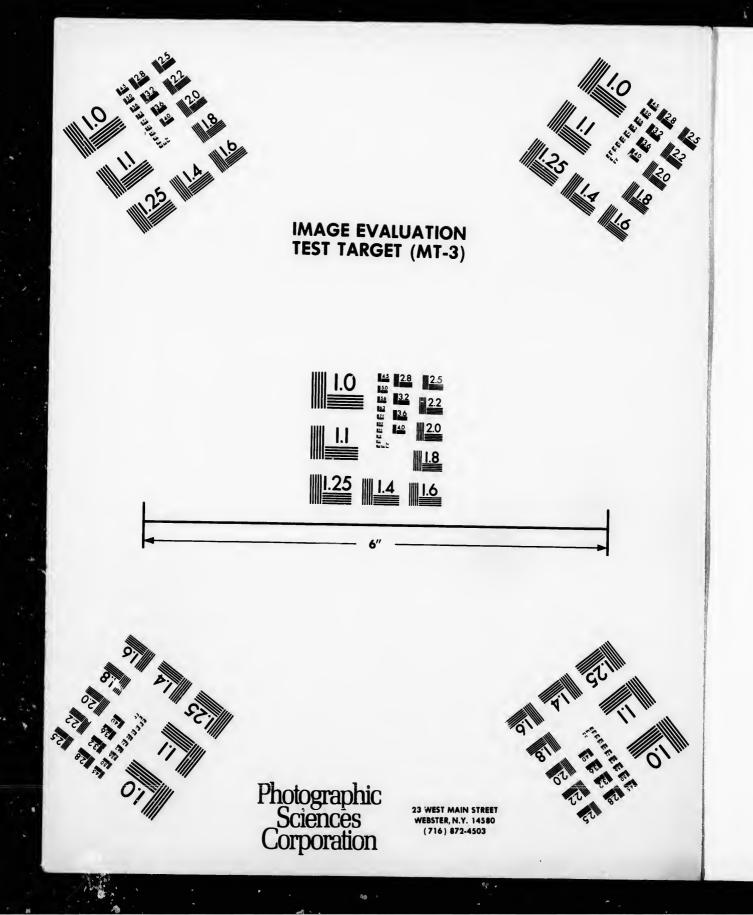
9. \$2,600 at 6%, from Jan. 1st, 1870, to Jan. 1st, 1894.

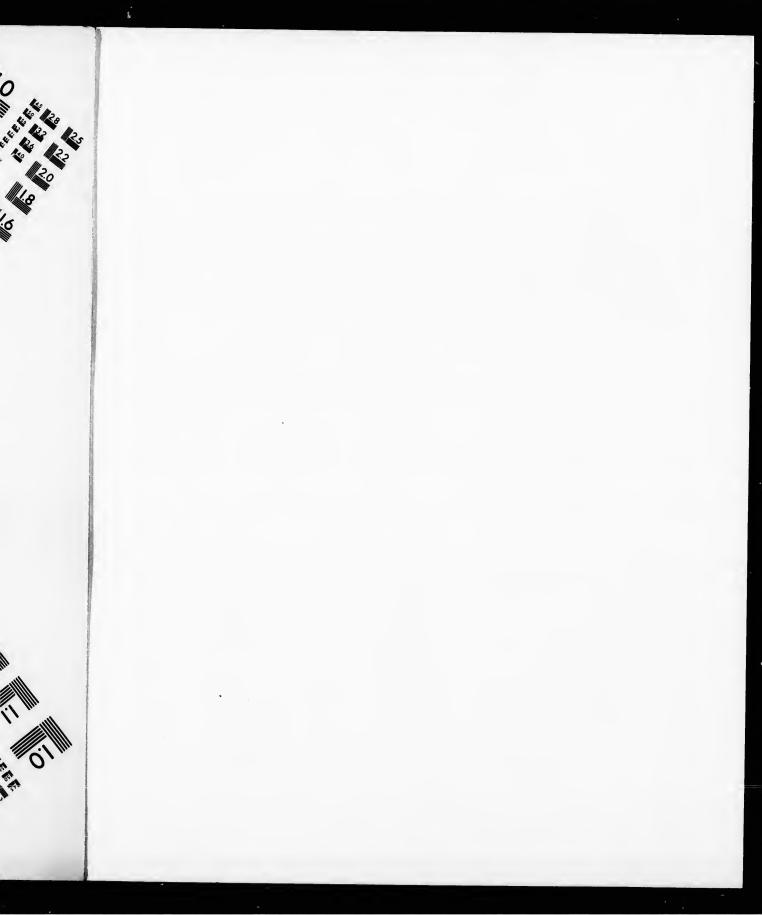
10. \$1,410 at 8%, from March 30th, 1889, to August 15th, 1894.

11. What is the amount of \$3,500 for 5 years at 5% compound interest?

12. What is the amount of \$1,850 for 12 years at 7%?







13. What is the compound interest of \$1,469 for 15 years at at 3%.

14. What is the compound interest of \$2,500 for 24 years at 6%.

15. What is the compound interest of \$1,650 for 80 years at $3\frac{1}{2}$ %.

16. What is the amount of \$1,800 for 8 years at 6% compound interest, payable semi-annually?

17. What is the amount of 1,500 for 2 years, at 12% compound interest, payable quarterly?

18. What is the compound interest of \$5,000 for 2 years, at 6%, if the interest is due annually? If the interest is payable half-yearly? If the interest is payable quarterly?

19. By how much does interest compounded semi-annually exceed simple interest, on \$400, for 2 years 6 months at 7%?

20. What is the amount of \$2,400 from May 1st, 1887, to Jan. 14th, 1890, interest compounded half-yearly, at 5%? What is the amount, if the interest is compounded yearly? What is the amount, at simple interest?

21. What is the compound interest on \$7,325 for 2 years 2 months at 7 % ?

22. Find the compound interest on \$3,333 at 31 % semiannually for 1 year 7 months.

23. What amount was due March 25th, 1886, on \$1,512 horrowed Jan. 25th, 1885, with compound interest at $1\frac{1}{2}$ % quarterly?

24. What is the amount of \$4,615 at compound interest for 2 years 5 months at 8%?

25. Find the amount of \$3,500 at compound interest from Oct. 29th, 1888, to Nov. 15th, 1889, at 2% quarterly.

15

24

80

6%

2%

rs.

is y ?

ıu-

ths

, to %?

y ?

ars

ni-

12

1%

est

est

ly.

26. How much greater, at compound than at simple interest, would be the amount of \$1,568 in 8 years 8 months

27. Find the amount due Sept. 18th, 1889, on \$450, loaned Sept. 18th, 1886. Interest compounded annually at 41 %.

28. What is the interest, compounded every six months, of \$600 from July 1st, 1890, to July 1st, 1894, at 8%?

29. What will \$16,000 invested Jan. 14th, 1888, amount

to Sept. 16th, 1893, at 10%, interest payable half-yearly? 30. How much must a lady invest when her son is 12 years old, that, on arriving at 21, he may have \$25,000, the rate being 6% and the interest compounded semi-

To find the principal or present worth of an amount at compound interest, divide the given amount by the amount of \$1 for the given time and rate at compound interest, (i. e., the same method for finding the present worth as in simple

31. What is the present worth of \$6,086.25 due in 8 years, at 6 % compound interest ?

32. What principal at compound interest will amount to \$2,375.92 at 5 % in 14 years?

88. What is the present worth of \$2,521.81 due in 14 years, at 6 % compound interest ?

34. What principal at 10% will amount to \$265.33 in 10 years, interest payable semi-annually?

85. What sum at compound interest at 4%, interest due annually, will amount to \$1,000 in three years?

36. What sum would have to be put out at 6 %, interest payable every six months, to produce \$543.8456 compound interest in 8 years ?

37. At what rate would \$500 have to be loaned, to amount to \$1079.46 in 10 years, the interest being compounded annually?

DISCOUNT.

DISCOUNT.

354. Discount is an abatement or allowance made from the amount of a debt, a note or other obligation.

355. The term discount is often used without reference to *time* to imply an abatement at a certain rate per cent. on a price asked.

356. When Time enters in as an element, two kinds of Discount are distinguished, viz.: True Discount and Bank Discount.

TRUE DISCOUNT.

357. The Present Worth of a debt, note or other obligation, payable at a future time without interest, is such a sum as, being placed at interest at a legal rate, will amount to the given sum when it becomes due.

358. True Discount is the difference between any sum of money payable at a future time and its present worth, and is equal to the interest on the present worth.

ILLUSTRATION.—Suppose A. owes B. \$106 payable a year hence without interest. The current rate of interest being 6%, the present worth of the debt is \$100, because that sum would amount to \$106 in 1 year at 6%.

The true discount is \$106 - \$100 or \$6, which is evidently the interest on the present worth \$100, for 1 year at 6 %.

359. To find the present worth and true discount, the face of the debt, rate per cent. per annum, and time being given.

TRUE DISCOUNT.

EXAMPLE .- Find the present worth and true discount of a debt of \$1,860 for 6 years at 6 %.

| toroat an | | SOLUTION. | |
|-----------|----------------|-------------------|----------------------------------|
| VOLCES OL | \$1.00 for | 6 years at 6% = | \$.56 |
| . \$1.36 | has for i | its present worth | \$1.00 |
| \$1. | 66 | 44 | . 1.00 |
| \$1,360 | 46 | ** | ⁹ 1.36 100 × 1,360 |
| | 0 1 960 | = \$ | 136 1,000, present v |

t worth. \$1,360 - \$1,000 = \$360, true discount.

181

BULR.

1. Divide the face of the debt by the amount of \$1 for the given time, and the quotient will be the present worth.

2. Subtract the present worth from the face of the debt, and the remainder will be the true discount.

360. To find the true discount of a debt. EXAMPLE.-Find the discount on \$1,781.40, due 4 years hence,

In

interest at 5 %.

| In | terest on \$1 | Solur 00 for 4 | NON. | s at 5 % = \$.20. |
|----|---------------|-------------------|---------|-----------------------------------|
| | \$1.20 ha | s for its | discor | int \$.20 |
| | \$1 4 | • | 66 | .20 1.20 |
| | \$1,781.40 |) " | " | $\frac{1.20}{1.781.49 \times 20}$ |
| | | RUI | = E. | \$296.90, discount. |

Divide the interest of the debt for the given time and rate by the amount of \$1, and the quotient will be the discount.

EXERCISE 82.

Find the present worth and true discount-

1. Of \$475.50 at 7 % due in 2 yr. 9 mo.

2. Of \$661.50 at 7% due in 3 yr. 9 mo.

8. Of \$500 at 5% due in 11 mo.

4. Of \$4,261.33 at 41 % due in 1 yr. 6 mo.

5. Of \$1,575 at 7 % due in 1 yr. 3 mo. 15 da.

6. Of \$860 at 61 % due in 90 da.

7. Of \$678 40 at 41 % due in 16 mo.

8. Of \$715.20 at 31 % due in 1 yr. 4 mo.

9. Of \$990.75 at 10 % due in 73 da.

10. Of \$1,215.45 at 8% due in 219 da.

ıde

rer

ds nd

er is ill

ıy nt

ut of

at st

t,

le

TRUE DISCOUNT.

Find the true discount on-

11. \$1,500 due in 3 yr. 6 mo. at 6 %.

12. \$3,550 due in 90 da. at 7 %.

18. \$4,960.75 due in 18 mo. at 61 %.

14. \$960.40 due in 73 da. at 10%.

15. \$625.13 due in 8 mo. at 73 %.

16. Which is the better, to buy flour at \$8 a barrel, on 6 months' credit, or \$7.50 cash, money being worth 8%?

17. What is the difference between the interest and true discount of \$1,650, at 6%, due in 8 months?

18. Which is worth the most, \$640 in 12 months, \$620 in 6 months, or \$600 cash, money being worth 8%?

19. Bought a farm for \$2,964.12 ready money, and sold it again for \$3,665.20, payable in 1 year, 6 months. How much would be gained in ready money, reckoning true discount at 8 %?

20. Having bought a house for \$5,048 cash, I at once sold it for \$7,000, to be paid in 18 months without interest. If money is worth 8 % per annum, did I gain or lose, and how much?

21. A man bought a flouring mill for \$10,000 cash, or for \$12,000 payable in 6 months, or \$15,000 payable in 1 year 3 months. He accepted the latter offer; did he gain or lose, and how much, money being worth to him 10 %.

22. Goods to the amount of \$510 were sold on 6 months' credit. If the selling price was \$30 less than the goods cost, and money is worth 6% per annum, how much was the loss and the per cent. of loss?

23. A speculator bought 120 bales of cotton, each bale containing 488 pounds, at 9 cents a pound, on a credit of 9 months for the amount. He immediately sold the cotton for \$6,441.60 cash, and paid the debt at 8% discount; how much did he gain?

TRUE DISCOUNT.

24. How much must be discounted for the present payment of a debt of \$8,741.50, \$2,000 of which is on credit for 5 months; \$3,000 for 8 months, and the remainder for 15 months, money being worth 10% per annum?

25. A merchant bought a bill of goods for \$2,150, on 6 months' credit, and the seller offered to discount the bill at 5%, for cash. If money is worth $7\frac{1}{2}$ % per. annum, how much would the merchant gain by accepting the seller's offer.

on

ue

 $\mathbf{20}$

ld)w 8-

ce

t.

ıd

)r

1

n

3'

8

9

f

2

26. A merchant bought a bill of goods on 6 months' credit amounting to \$1,450. What will he gain by present payment of the bill, if allowed 5% off, money being worth $\frac{3}{4}$ % a month?

27. A dealer bought grain to the amount of \$2,700, on 4 months' credit, and immediate y sold it at an advance of 10%. If from the proceeds of the sale he paid the present worth of his debt at a rate of discount of 8% per annum, how much did he gain?

28. After carrying a stock of silk for 4 months, I soli it at an advance of 30% on first cost, extending to the purchaser a credit of one year without interest. If money is worth 5 % per annum, what was my per cent. of profit or loss?

29. Bought a house for \$3,786 ready money, and sold it for \$5,250, payable in 1 year 6 months. How much would be gained in ready money, discounting at the rate of 8%? How much, discounting at the rate of 6%?

30. The asking price of a hardware stock is \$5,460, on which a trade discount of 25%, 15%, and 10% is offered, and a credit of 90 days on the selling price. If money is worth $5\frac{1}{2}$ %, what sum should be discounted for the payment of the bill ten days after its purchase?

BANK DISCOUNT.

361. Bank Discount is a deduction usually made by banks for paying a note before it is due. This deduction is the interest on the face of the note for the time it has to run, including three additional days, called *Days of Grace*.

362. Days of Grace are three days usually allowed for the payment of a note, after the expiration of the time specified in the note.

363. The Proceeds of a note is the amount received by the holder from the bank when the note is discounted. It is the amount of the note at maturity less the interest on that amount for the term of discount.

ILLUSTRATION.—A person holds a note for \$1,000 payable in 73 days, including the days of grace. Wishing to use the money immediately he indorses the note and offers it to his bank for discount. If both maker and indorser are considered responsible, the bank retains the note, and if the legal rate is 6%, deducting \$12 (the interest of \$1,000 for 73 days) pays over the balance \$988 to the holder. The note is thus discounted; the bank discount is \$12; the proceeds are \$988.

364. Negotiable paper commonly includes all orders and promises for the payment of money, the property interest in which may be negotiated or transferred by indorsement.

365. A Promissory Note is a written, or partly written and partly printed, agreement to pay a certain sum of money, either on demand or at a specified time.

366. The Face of a Note is the sum for which it is given.

367. The Maturity of a note is the expiration of the time including days of grace.

185

368. The Time in bank discount is always the number of days from the date of discounting to the date of maturity.

369. The Term of Discount is the time the note has to run after being discounted.

370. Value of a note at its maturity is its face, if it does not bear interest; if the note is given with interest, its value at maturity is its face plus the interest for the time, including days of grace.

Notes 1. In Ontario and Manitoba promissory notes and drafts are governed by commercial law as to days of grace, protest and notice. In these provinces notes do not bear interest, unless expressed on the face, until after maturity, from which period however, the legal rate—six per cent.—can be recovered. If a rate of interest is named on face of note, and in addition to the words, "with interest at the rate of —," the words "until paid" are added, the *named* rate can be collected till date of payment of note, otherwise, without these words (or others of similar import), the expressed rate only during period of currency, and legal rate from maturity till payment can be collected.

2. The person who promises to pay is called the *maker*: the person in whose favour the promise is made is called the *payee*, and the person who writes his name on the back of the note is called an *endorser* and is responsible for the payment of the note.

3. A note is *non-negotiable* when it is made payable only to the person whose name is mentioned in it. Such a note cannot be transferred; it must be held by the payee until it falls due.

4. A note is transferable only when it is made payable to the order of the payee or to bearer.

5. The maker of a note is the one *primarily* liable, but each endorser is liable to succeeding holders in default of payment by the maker. A subsequent endorser is not liable to a prior endorser.

6. When the payee writes only his name it is termed a blank endorsement, and it has the effect of rendering the note payable afterwards to any bona fide holder. The payee thus becomes the endorser and as such is responsible for payment.

7. If the payce writes above his signature, "Pay to the order of A. B." it is called a *full endorsement*. In this case A. B. will have to endorse it before he can negotiate it.

8. If the payee writes above his signature, "Pay to A. B. only," it is termed a *restrictive* endorsement.

le by on is has of

wed

ived ted. rest

ays, y be aker and ays) ied ;

ers rty by

itof

is

he

9. If the endorser does not wish to render himself liable for payment he should write, "Without recourse to me," above his name. This is called a *gualified* endorsement.

10. When a note is made payable to bearer it is negotiable without endorsement, delivery being all that is necessary.

11. In calculating the date of maturity of a note, the three days grace must be allowed after the time expressed, that is, it falls due on the third day after its term has expired. The day on which the note is dated is not counted in computing the date of maturity.

12. When a note becomes due which happens on the third day after the time expressed, it must be presented for payment during business hours at the place mentioned in it. If no place is stated it should be presented at the maker's place of business or at his residence.

13. Should the maker refuse to pay it, the proper demand being made, it is the duty of the holder to give due notice to all the parties to it. He may have it protested if he chooses.

371. A Protest is a declaration in writing by a Notary Public, giving legal notice to the maker and endorsers of a note of its non-payment. In Ontario a note must be protested on the day of its maturity, otherwise the endorsers are released from all obligation to pay the note.

Norze 1. When a note becomes due on Sunday or a legal holiday, it must be paid on the day following.

2. The person paying a note has a right to a receipt, which is usually written on the back of the note.

3. The person who pays a note has a right to it as his voncher, if it is negotiable, but not otherwise.

4. When a note is made payable with interest it bears interest from the date of it, and not merely from its maturity. In such a case the interest is part of the debt.

5. When a note bears interest, the discount is computed on the face of the note with the interest added.

6. When the term of a note is given in months, calendar months are meant and no allowance is made for a deficiency in the number of days in any month. This being the case the student will see that four notes drawn at 2 months and bearing dates, Dec. 28, Dec. 29, Dec. 30, Dec. 31, respectively, will become due on the same day, viz. : March 3rd, of next year.

187

7. When the time is expressed in days, the day of maturity is found by counting forward from the date of the note the number of days named in the note, and the three days of grace. When the time is in months, the day of maturity is found by counting the number of calendar months, and the three days of grace.

372. Banks in discounting notes always reckon discount for an exact number of days from the time of discounting to date of maturity. Thus on a note maturing July 5th, and discounted May 25th, the term of discount would be reckoned as follows: 6 days in May, + 30 days in June + 5 days in July = 41 days.

373. To find the bank discount and proceeds of a note.

EXAMPLE 1 .- Find the bank discount and proceeds of a note for \$684, due 90 days hence, at 7%.

SOLUTION.

The term of discount is 93 days.

Interest of \$684 for 93 days at 7% = \$12.20 = Bank discount.\$684 - \$1220 = \$671.80 =Proceeds.

EXAMPLE 2.-A note of \$375 dated October 23rd, payable in 30 days, with interest at 7%, is disconnted at a bank November 12th at 8%. Find

SOLUTION.

The date of maturity is November 26th.

The note bears interest for 34 days.

| \$3.75 | = | Int. for | r 60 đ | a. at 6%. |
|---------|---|----------|--------|-----------|
| 1.875 | = | 44 | 30 | 44 |
| .1875 | = | ** | 3 | " |
| .0625 | = | ** | 1 | ** |
| 2.125 | = | 66 | 34 | ** |
| .854 | = | ** | ** | 1 |
| \$2.479 | = | Int. for | 34 da | . at 7%. |

\$2.479 (360 da. int.) less 1/3 of \$2.479 = \$2.45 (actual int.)

The amount of note at maturity is \$375 + \$2.45 = \$377.45.

The note is held by the bank from November 12th until November 26th, or 14 days.

yment bis is

thout

grace third ed is

after iness ld be

ade He

7 8 lorust the te.

7, it

ally

t is the

est.

of

are ys

tes 31, ext

| | \$8.7745 | | - | Int. for | 60 da. s. | t 6%. |
|---|----------|---|---|----------|-----------|-------|
| | .7549 | | = | 41 | 12 | |
| | .1258 | + | - | | 2 | 44 |
| | .8807 | | - | 44 | 14 | |
| | .2935 | + | = | | ** | 2 |
| | \$1.1742 | | - | Int. for | 14 da. at | |
| 4 | 11 . | | | | | 0 % |

\$1.174 (360 da. int.) less 73 of \$1.174 = \$1.15 (actual int.)

\$377.45 = Amt. of note at maturity.

1.15 = Disot. for time held by bank.

\$376.30 = Proceeds.

EXAMPLE 3.- A note of \$750 dated August 4th, 1888, payable in f months with interest at 6%, is discounted at a bank October 20th, at 7% Find the proceeds.

SOLUTION.

The date of maturity is February 7th, 1889.

The note bears interest from August 4th, 1888, to February 7th. 1889, or 187 days. -----

| \$7.00 | = | Int. for | 60 | da. at 6% |
|----------|---|----------|-----|-----------|
| 22.50 | = | | 180 | 41 |
| .75 | = | 66 | 6 | 44 |
| .125 | = | 66 | 1 | ** |
| \$23.375 | = | 44 | 187 | 44 |

\$23.375 (360 da. int.) less 1/3 of \$23.375 = \$23.06 (actual int.)

The amount due at maturity is \$750 + \$23.06 = \$773.06.

The note is held by the bank from October 20th, '88, to February 7th, '89, or 110 days.

| \$7.7306 | | = | Int. for | 60 de | . at 6 % |
|-----------|---|---|----------|--------|----------|
| 3.8653 | | = | 48 | 30 | |
| 2.5768 | + | - | 44 | 20 | 66 |
| #14.1727 | | = | ** | 110 | ** |
| 2.3621 | + | = | 44 | 44 | 1 |
| \$16.5348 | | - | Int for | 110.4. | |

int. for 110 da. at 7%. \$16.53 (360 da. int.) less 75 of \$16.53 = \$16.31 (actual int.)

\$773.06 = Amt. of note at maturity.

16.31 = Disct. for time held by bank.

\$756.75 = Proceeds.

EXAMPLE 4 .- Find day of maturity, the time to run, the discount, and proceeds of the following note : **\$1.800**.

OTTAWA, February 3rd, 1889. Five months after date, I promise to pay John Graig, or order, the sum of One Thousand Eight Hundred Dollars, value received, with THOMAS COWAN.

Discounted May 22nd, 1889, at 7%.

SOLUTION.

Date of maturity will be 5 months and 3 days from February 3rd, 1889,or July 6th, 1889.

The time to run will be the interval between the date of discount, May 22nd, and July 6th,-or 45 days.

As the note bears interest, the discount must be computed on the amount of \$1,800, from February 3rd to July 6th, or 153 days. Interest on \$1,800 for 153 days at 6% = \$45.27 +

The amount of note at maturity = \$1,800 + \$45.27 = \$1,845.27.

The note is held by the bank from May 22nd, to July 6th, or 45 days. Interest on \$1,845.27 for 45 days at 7% = \$15.92 = discount. Proceeds = \$1,845.27 - \$15.92 = \$1,829.35.

BULE.

1. For the bank discount, find the interest on the face of the note (or, if the note bears interest, on the amount due at maturity), at the given rate, from the date of discount to the date of maturity.

2. For the proceeds, subtract the bank discount from the face of the note (or, if the note bears interest, from its amount).

EXERCISE 83.

Find the bank discount and proceeds of a note for-

| 4. | \$440.00. | Davahla | in 00 7- | | | .0.1 |
|----|-------------|---------|----------|------------|--------------|------------|
| 2. | \$500.00 | | a sound, | asscounted | at 6% on the | days due |
| | vou.uu, | •• | 60 | 66 | 0.0/ | uay urawn. |
| 8. | \$1,000.00. | 44 | 45 | | 9% | 44 |
| 4. | \$140.25. | 44 | | 66 | 5% | 66 |
| | ******** | | 80 | 46 | 41% | 44 |

Find the date of maturity and proceeds of the following notes:

| 5. | DATE OF NOTE. | | FACE. | DATE OF DISCOUNT. | RATE OF DISCOUNT. | - |
|-----------------------------|---|--|--|---|--------------------------------------|---|
| 6. 7. 8. 9. 10. | January 20 May 7 June 4 July 27 November 1. May 27 | 90 da 60 " 4 mos 60 da 90 " 6 mos | \$2,500 \$1,200 \$3,600 \$8,200 \$6.000 \$4,880 | January 20 May 31 July 18 September 2. November 28 August 15 | 6 %. 7 %. 8 %. 6 %. 5 %. | • |

ble in ϵ at 7%

1889. 01

y 7th.

ount,

89. rder, with LN.

Find the proceeds and date of maturity of the following notes discounted through a broker, his commission being $\frac{1}{2}$ % of the face of the notes:

| | | | 1 | | |
|---|--|-------|--|---|--|
| | DATE OF NOTE. | TIME. | FACE. | DATE OF DISCOUNT. | RATE OF DISCOUNT. |
| $ 11. \\ 12. \\ 13. \\ 14. \\ 15. \\ 16. \\ 16. $ | February 18. June 1 January 10 March 3 May 18 January 3 | 90 da | \$2,000 \$6,000 \$5,500 \$8,700 \$5,280 \$9,000 | February 18. June 12 January 10 April 30 May 18 February 28. | 5%. 6%. 7%. 8%. 4%. 6%. |

17. Find the proceeds of a note of \$850, due in 3 months, at 6%?

18. Find the proceeds of a draft of \$885, on 60 days, at 6 %?

19. Find the maturity, the term of discount and the proceeds of a note of \$5,250, on 60 days, dated July 1st, 1889, and discounted August 21st, 1889, at 5%.

20. Find the difference between the true and bank discount on \$6,000 for 1 year, allowing each 3 days grace, at 7%?

21. A merchant bought \$6,800 worth of goods for cash, sold them on 4 months, at 15% advance, and got the note discounted at 6% to pay the bill. How much did he make?

22. \$652.45. OTTAWA, Jan. 25th, 1889. Five months after date I promise to pay to the order of Charles Barrett six hundred and fifty-two and $\frac{45}{100}$ dollars. value received, with interest at six per cent.

Discounted at 41 %, Mar. 15. WILLIAM KIMBALL.

23. \$215. PETERBOROUGH, Jan. 28th, 1889. Thirty days after date, I promise to pay to the order of James Fogg two hundred and fifteen dollars, value received. Discounted at 6%, Feb. 3rd. JOHN ROGERS.

lowing being

EOF OUNT.

882888

nths,

days,

the 1st.

disace,

ısh, 10te ke ?

of trs.

LL.

of ed. RB.

BANK DISCOUNT.

24. \$2,017.85.

GALT, Jan. 14th, 1889.

TIMOTHY BRUCE.

Three months after date I promise to pay to the order of John Brown two thousand and seventeen and 185 dollars, value received.

Discounted at 10%, Mar. 1st.

25. \$4,760

Guelph, Jan. 1st, 1889.

Ninety days after date I promise to pay to the order of James Pike four thousand seven hundred and sixty dollars, value received.

Discounted at 71%. Feb. 15th. WILL CLEMENT.

26. \$5,000. BRANTFORD, Oct. 4th, 1889. Six months after date I promise to pay to John Adams or order five thousand dollars, value received, with interest at seven per cent.

Discounted at 8%, Dec. 31st.

WILLIAM DUNN.

27. \$9,040.

London, Jan. 19th, 1889.

Sixty days from date I promise to pay to the order of Charles Carroll nine thousand and forty dollars, value received.

Discounted 51 %, Feb. 16th.

JAMES MONROE.

28. \$650..

BERLIN, Nov. 3rd, 1888.

Six months from date we jointly and severally promise to pay to the order of Charles Fall six hundred and fifty dollars, value received, with interest at six per cent.

Discounted at 7 %, Jan. 3rd, 1889.

JOHN HENDERSON. JAMES HENDRICKS.

29. A note for \$3,600 with interest, dated Jan. 15th, 1889, and payable 3 months after date, was discounted at a bank Feb. 15th, the legal rate being 7%; with the proceeds was paid on account 40 % of a bill due that day. How much remained due on the bill?

80. A merchant sold some goods that cost him \$840, at a profit of 12,., and took in payment a four-month note dated May 15th, which after 52 days he got discounted at a bank for 7%. How much did he receive from the bank '

81. A merchant, having sold 200 barrels of flour at \$6.80 a barrel, and having taken in pay lent a 30-day note, found, on getting the note discounted at a bank the day of its date for 7%, that he had realized on the transaction a cash profit equal to 300% on the bank discount. What had the flour cost him per barrel?

32. A person owing for 117 A. 5 sq. rd, of land, which he had bought for \$32 an acre, paid on account the proceeds of a sixty-day note for \$2,000, which he got discounted at a bank, for 7 %, on the day it was drawn. How much remained due?

33. I paid in cash \$950 for an engine, and sold it the same day for \$975, taking a 60-day note, which I discounted at a bank at 8%. What was my gain or loss ?

84. Perkins, Ince & Co's bank account is overdrawn \$11,546.19; they now discount, at 6%, a 90-day note for \$3,975.21; a 60-day note for \$5,514.25; a 30-day note for \$1,546.19; a 20-day note for \$2,546.85; proceeds of all to their credit at the bank. What is the condition of their bank account after they receive credit as above ?

85. W. Darling & Co.'s bank account is overdrawn \$12,915.47; they now discount, at 6%, a 90-day note for \$2,428.40; a 60-day note for \$6,811.25; a 80-day note for \$1,120.50; a 20-day note for \$4,500; a 10-day note for \$1,550.50; Proceeds of all to their credit at the bank. What is the condition of their bank account after they receive the above credits?

n \$840, at ionth note counted at the bank?

flour at day note. the day insaction . What

which he proceeds inted at w much

l it the I disss ?

rdrawn ote for ote for f all to their

lrawn note 7 note te for bank. they

BANK DISCOUNT.

374. To find the face value of a note that shall produce a given sum when discounted at bank.

EXAMPLE.—For how much must a note be drawn, payable in 70 days, that, when discounted at a bank at 8 %, it may yield \$1,968.

SOLUTION. Bank discount of \$1 for 73 days at 8% =\$.016. \$1 - \$.016 = \$.984 proceeds of \$1. \$.984 = proceeds of \$1 \$1 = 1 .. .984 \$1,968 = 1,968 ** = \$2,000. Ans. .984 RULE.

Divide the given sum by the proceeds of \$1 for the given rate and time, and the quotient will be the face value of the

EXERCISE 84.

Find the face of note or draft-

| PROCEEDS. | TERM OF DISCOUNT. | |
|---|---|---|
| 1. \$364.56 2. \$394.40 3. \$118.20 4. \$595.20 5. \$717.80 6. \$796.20 | 90 days 70 60 48 108 30 | RATE OF INTEREST. 8 %. 7 %. 9 %. 6 %. 5 % 10 %. |
| BANK DISCOUNT. 7. \$2.80 9. \$9.80 10. \$4.90 11. \$12.60 12. \$5.94 19. When | TERM OF DISCOUNT. 84 days 135 73 146 66 | RATE OF INTEREST. 5%. 8%. 7%. 6%. 10%. 6%. |

13. What sum, due 73 days hence, at 7%, should be discounted, so that the present payment may be \$900? 14. What is the face of a note at 60 days, the proceeds of which, when discounted at bank at 6%, are \$1,275?

15. If a merchant wishes to draw \$5,000 at bank, for what sum must he give his note at 90 days, discounting at 6%?

16. The avails of a note having 3 months to run, discounted at a bank at 7%, were \$276.84. What was the face of the note?

17. For what sum must a note be drawn at 30 days, to net \$1,200 when discounted at 5%?

18. Find the face of a 6 months' note, the proceeds of which, discounted at 2% a month, are \$496.

19. Owing a man \$575, I give him a 60 day note. What should be the face of the note, to pay him the exact debt, if discounted at $1\frac{1}{2}$ % a month?

20. James T. Fisher buys a bill of merchandise in Montreal at cash price, to the amount of \$1,486.90, and gives in payment his note at 4 months at $7\frac{1}{2}$ %. What must be the face of the note?

375. Given, the rate of interest to find the corresponding rate of bank discount.

SOLUTION.

70 day note = 73 days' time.

Interest on \$100 for 73 days at 10 % = \$2.

: Amount of \$100 = \$102.

\$102 in 73 days gives \$2 interest.

. 100 " 365 " \$9\$1 "

: Rate of discount = $9\frac{1}{51}$ %. Ans.

376. Given, the rate of bank discount, to find the corresponding rate of interest.

EXAMPLE. --- What rate of interest is paid, when a note payable in 70 days is discounted at 10 %?

t bank, for ounting at

run, dist was the

0 days, to

oceeds of

e. What act debt.

ndise in .90, and What

corres-

that his

d the able in

BANK DISCOUNT.

SOLUTION. 10 day note = 73 days' time.

Interest on \$100 for 73 days at 10 % = \$2. : Proceeds of \$100 = \$98.

\$98 in 73 days gives \$2 interest. . 100 " 365

- " \$1018 "
- : Rate of interest = $10\frac{1}{29}$ %. Ans.

EXERCISE 85.

1. What rate of interest is paid, when a note payable in 30 days is discounted at 6%?

2. A speculator discounted a note due in 90 days, at 12 % per annum, what was the actual rate of interest received on

3. If a note payable in 3 months without grace be discounted at 10% per annum, what will be the rate of

4. If a note for \$500, maturing in 96 days, without grace, can be purchased for \$12 less than its face, what is the rate of interest.

5. A broker discounted a note due in 4 months, without grace, at the rate of 6% per annum, what was the actual rate of interest realized on the sum advanced?

6. At what rate should a 3 month's note be discounted to produce 8% interest?

7. What rates of bank discount on 30 day notes correspond to 5, 6, 7, and 10 per cent. interest.

377. The bank discount exceeds the true discount by the simple interest on the true discount.

Bank discount = Interest on principal. True discount = Interest on present worth of principal. " = Interest on (principal-true discount). " = (Interest on principal)-(interest on true discount). ** = (Bank discount)-(interest ou true discount). "

or, Let P = Principal; t = time; r = rate. \therefore P tr = Interest, or bank discount. $\frac{P tr}{1 + tr}$ = True discount. P tr - $\frac{P tr}{1 + tr}$ = Difference B. D. and T. D. = $\left(P - \frac{P}{1 + tr}\right)$ tr. = $\left(\frac{P tr}{1 + tr}\right)$ tr. = Simple interest on the true discount. B. D. on \$100 for 1 yr. at 6% = \$6 T. D. " " " $\frac{96}{1.06} = \frac{96}{106}$ Difference = \$6 - \$ $\frac{6}{1.06} = \frac{96}{106}$ But \$ $\frac{36}{106}$ is the simple interest on \$ $\frac{6}{1.06}$ for 1 year at 6%. = Simple interest on the true discount.

378. If the bank discount or simple interest on a sum of money for a given time and rate is $\frac{a}{b}$ of that sum, then the true discount will be $\frac{a}{a+b}$ of the sum.

If interest = $\frac{a}{b}$ of principal, then \$a is interest on \$b.

: b (i.e. principal) + a (i.e. interest) = b (a + b) = Amount.: b is present worth of (a + b), and a is the true discount of (a + b).

: True discount is $\frac{a}{a+b}$ of principal.

Thus:

Simple interest on \$100 for 1 yr. at 6 % = \$6.

i.e., the interest is 100 of principal.

Then \$6 is interest on \$100.

: \$100 of principal + \$6 of interest = \$106. Amt. : \$100 is present worth of \$106,

and \$6 is true discou. t of \$106.

:. True discount =
$$\frac{6}{106}$$
 of principal, *i.e.*, $\frac{6}{100+6}$ of principal.

EXERCISE 86.

1. The interest is $\frac{2}{5}$ of the principal, and the difference

between the interest and discount is \$8. Find the principal. 2. The interest is \$5, the discount for the same time and rate is \$4. Find the principal.

3. The interest is \$2, and the difference between the

interest and discount is 163 cents. Find the principal.

4. If the interest is r_4^8 of the principal, what fraction of the principal is the true discount?

5. The interest of a certain sum is $\frac{1}{2}$ of the principal. The amount is \$640. Find the principal.

6. The difference between the interest and the discount on a sum of money for $1\frac{1}{2}$ years at 8% is \$18. Find the

7. Reckoning bank discount at 5%, a person would receive \$21 less than the nominal value of a note which has a year to run. What would he receive for the note if true discount were deducted.

8. I have two notes (I year to run) amounting to \$38; both are discounted at 20% one at bank discount, the other at true discount, the entire discount being \$7. Find the face of the note on which bank discount was allowed.

9. The interest on a certain sum for 6 years is \$261, and the discount for the same time is \$180. Find the sum and rate per cent.

10. If \$4 is allowed as 12 months' discount off a bill for \$76, and at the same rate \$7 be allowed off a bill for \$91, for how long was the latter sum discounted ?

11. The interest on a sum of money for 5 years is \$140, and the discount for the same time and rate \$100. Find the sum and rate per cent.

12. The interest on a certain sum of money is \$180, and the discount on the same sum for the same time and same rate is \$150. Find the sum.

st on a at sum,

int. count of

PARTIAL PAYMENTS.

379. Partial Payments are part payments made at different times of notes, acceptances, bonds, mortgages or other written and interest-bearing instruments which the debtor is obliged to pay.

380. Indorsements are the acknowledgments of the payments written on the back of the note, acceptance, etc., stating the amount and date of the payment.

Special receipts are sometimes given for partial payments made, instead of writing the acknowledgment on the back of the obligation.

3S1. The method of computing interest when partial payments have been made is based on the following principles:

1. Payments must be applied first to discharge accrued interest, and then the remainder, if any, towards the discharge of the principal.

2. Only unpaid principal can draw interest.

EXAMPLE 1.—A note the face of which was \$3,600, bearing interest at 6%, was given October 17th, 1884, and settled February 14th. 1889. Find the balance due, the following indorsements having been made: March 3rd, 1885, \$600; October 25th, 1836, \$1,000; December 6th, 1833, \$2,400.

SOLUTION.

| \$3,600.00 |
|------------|
| \$3,600.00 |
| 81.07 |
| \$3,681.07 |
| 600.00 |
| |
| \$3,081.07 |
| 304.39 |
| \$3,385,46 |
| 1,000 00 |
| |
| \$2,385.46 |
| 302.72 |
| \$2,688.18 |
| 2,400.00 |
| |
| \$288.18 |
| 3.31 |
| \$291.49 |
| |

EXAMPLE 2 .--

\$1,000.

E

Toronto, May 15th, 1881. Two years after date, for value received, I promise to pay to Edwin J. Mills, or order, one thousand dollars, with interest at 7%. James H. Ross.

On this note were indorsed the following payments:

| Sentember 2041, 1000 | s payme |
|------------------------------------|----------|
| September 20th, 1882 | \$150.60 |
| October 25th, 1884 | 200.90 |
| July 11th, 1886 | 75.20 |
| September 20th, 1887 | |
| December 5th 1000 | 112.10 |
| What remained 1 | 105.00 |
| What remained due May 20th, 1889 2 | |

SOLUTION.

| Face of note | |
|---|------------|
| Interest to Sept. 20th, 1882 (1 yr 199 de) | \$1,000.00 |
| Amount of principal and interest at the | 94.55 |
| Amount of principal and interest at time of first payment First payment (Sept. 20th, 1882) Remainder after deduction ford | \$1,094.55 |
| Remainder after deducting first payment | 150.60 |
| Interest from first payment to Oct of the | \$943.95 |
| Interest from first payment to Oct. 25th, 1834 (2 yrs. 35 da.) | 138.49 |
| Amount due at time of second payment | \$1,082.44 |
| | 200.90 |
| Remainder after deducting second payment | \$881.54 |
| Scould payment to Dog 5th 1000 // | 253.76 |
| | \$1,135.30 |
| Find payment, less than interest due | **,100.00 |
| - out in | |
| Sum of third and fourth payments, less than interest | |
| | |
| 1 num payment | |
| Sam of third, lourth, and tifth navmonth | |
| Remainder after deducting third fourth and guy | \$292.30 |
| | \$843.00 |
| Balance due at time of settlement (May 20th, 1889) | 26.84 |
| | \$869.84 |
| RULE. | |

382. 1. Compute the interest on the given principal from the date of the note to the time of the first payment. If this payment equals or exceeds the interest due, subtract the payment from the amount, and treat the remainder as a new principal.

nade at ages or ich the

of the ce, etc.,

ts made. ation.

partial llowing

accrued scharge

interest h. 1889. made: h, 1833.

8,600.00 81.07 3,681.07 600.00 3,081.07 304.39 3,385.46 1,000 00 2,385.46 302.72 2,688.18 2,400.00 \$288.18 8.31 \$291.49

2. If any payment is less than the accrued interest, compute the interest on the same principal, to a date when the sum of the payments equals or exceeds the interest then due, and subtract the sum of the payments from the amount, and regard the remainder as a new principal.

3. Proceed in the same manner with the remaining payments, until the date of settlement.

EXERCISE 87.

1. A note of \$4,560, dated Jan. 22nd, 1887, and drawing interest at 7%, had payments endorsed upon it as follows: Jan. 10th, 1888, \$2,000; Aug. 31st, 1888, \$500; Jan. 15th, 1889, \$1,200; Mar. 4th, 1889, \$860. Find the balance due June 15th, 1889.

2. On a claim for \$3,000, dated Aug. 12th, 1885, and bearing interest at 7%, payments were made as follows: Dec. 15th, 1885, \$30; April 1st, 1887, \$550; Jan. 20th, 1888, \$85; June 12th, 1888, \$1,651.50. How much was due May 30th, 1889?

8. I held a bond against Ira Fox, dated May 1st, 1885, for \$4,000, on interest at 6%. The following payments were endorsed on this bond: May 21st, 1886, \$800; June 10th, 1887, \$1,200; Aug. 10th, 1888, \$1,500. What was due May 1st, 1889?

4. On a mortgage for \$5,500, dated Aug. 13th, 1882, and bearing 6% interest, the following payments were made: Jan. 1st, 1883, \$100; Mar. 2nd, 1883, \$25; Aug. 13th, 1885, \$2,500; Dec. 19th, 1887, \$2,500; Mar. 1st, 1889, \$500. How much was required for full settlement, Mar. 11th, 1889?

t, compute the sum of due, and and regard

ing pay-

lrawing ollows : 1. 15th, Dalance

5, and llows : 20th, h was

1885, nents June was

and ade: 3th, 889, 4ar.

PARTIAL PAYMENTS.

5. Required, the balance due May 1st, 1889, on a note for \$4,119.82, at 6%, dated June 25th, 1888, on which a payment of \$450.25 was made Aug. 1st, 1888, and a payment of \$21.19 on the 15th of each subsequent month.

6. On a loan of \$2,000, made Mar. 19th, 1885, and bearing 6% interest, payments were made as follows: Nov. 1st, 1886, \$500; May 3rd, 1888, \$700; Feb. 1st, 1889, \$1,000. How much will be required for settlement in full, Mar. 2nd, 1889?

7. I gave a mortgage for \$10,000, May 9th, 1882, bearing 6% interest, and made thereon the following payments: Sept. 19th, 1882, \$500; Jan. 1st, 1883, \$500; April 25th, 1884, \$4,000; Oct. 15th, 1884, \$4,000; May 1st, 1889, \$3,525. How much was due at final settlement, June 2nd, 1889 ?

8. A bond was given Mar. 3rd, 1883, for \$8,650, with interest at 8%. The following payments were made on account: April 17th, 1884, \$1,000; May 10th, 1885, \$550; June 23rd, 1885, \$540; Dec. 22nd, 1886, \$803; Feb. 15th, 1887, \$25; Mar. 18th, 1887, \$25; April 19th, 1887, \$115; April 25th, 1888, \$146. How much remained due, May 7th, 1889?

9. A note of \$1,520, dated May 20th, 1888, and drawing interest at 6%, had payments endorsed upon it as follows: Oct. 2nd, 1888, \$300; Feb. 26th, 1889, \$25; April 2nd, 1889, \$570; Aug. 8th, 1889, \$600. Find the amount due Dec. 6th, 1889.

10. A note of \$2,000, dated Jan. 22nd, 1889, and drawing interest at 6%, had payments endorsed upon it as follows: May 20th, 1889, \$100; July 20th, 1889, \$325; Nov. 2nd, 1889, \$20; Dec. 23rd, 1889, \$125. Find the balance due Mar. 1st, 1890.

11. A note of \$1,662.50, dated Jan. 15th, 1888, and drawing interest at 61 %, had payments endorsed "pon it as follows : April 30th, 1888, \$25; June 24th, 1888, \$25; Sept. 2nd, 1888, \$625; Jan. 31st, 1889, \$700. Find the balance due May 12th, 1889.

12. Oct. 1st, 1885, a note for \$1,000 was given, payable in 4 years, with 6% interest. A payment of \$50 was made 1 year from date; a payment of \$250 was made 1 year 6 months from date; a payment of \$224 was made 2 years from date; a payment of \$20 was made 2 years 8 months from date; a payment of \$110 was made 2 years 10 months from date. How much remained due at the maturity of the note?

, 18. A mortgage for \$5,400 was dated Strathroy, Jan. 1st 1836, and endorsed as follows: May 22nd, 1887, \$1,200; Feb. 9th, 1888, \$150; Oct. 28th, 1888, \$1,500. What was due Mar. 1st, 1889, interest 5 %?

14. A note of \$302.25, dated Aug. 4th, 1887, and drawing interest at $6\frac{1}{2}$ %, had payments endorsed upon it as follows: Oct 14th, 1887, \$100; July 21st, 1888, \$100; Oct. 11th, 1888, \$50; Jan. 18th, 1889, \$50. Find the amount due July 22nd, 1889.

15. On the following note, payments were endorsed as follows; Nov. 3rd, 1887, \$50; Mar. 16th, 1888, \$50; Oct. 1st, 1888, \$50; Dec. 30th, 1888, \$1,000; April 1st, 1889, \$625. How much was due, if paid in full, May 8th, 1889, money being worth 6%?

\$1,600.00.

BRANTFORD, April 1st, 1887.

Three years after date, I promise to pay to the order of Silas Hopkins, one thousand six hundred dollars, value JAS, MURRAY.

16. On the following note one moments were made as follows : Aug. 1st, 1883, \$350; Nov. Srd, 1883 \$1,000;

Mar. 20th, 1885, \$600; Mar. 31st, 1885, \$2,500; Dec. 11th, 1888, \$2,000. What was the balance due Jan. 30th,

\$6,500.00.

BROCKVILLE, Mar. 19th, 1882.

On demand, I promise to pay to the order of T. Gilmour, six thousand five hundred dollars, with interest at 6 %.

W. HINDSON.

17. The following note was settled Oct. 13th, 1888; a payment of \$25 having been made Jan. 15th, 1887; one of \$800, July 12th, 1887; and one of \$200, April 1st, 1888. If money be worth 8 %, how much was due at final

\$585.50.

GALT, Aug. 1st. 1886.

Six months after date, I promise to pay to Alex. Buchanan, or order, five hundred eighty-five and $\frac{50}{100}$ dollars, value received. F. MoHARDY.

18. \$500.

ST. THOMAS, Feb. 1, 1888.

For value received, I promise to pay D. E. Broderick, or order, five hundred dollars three months after date, with interest at 7 %. JAMES MONROE.

Endorsed as follows, May 1, 1883. \$40.

| | | Nov. 14, 1888, \$8. |
|------|------------|----------------------|
| | " | April 1 1000, \$0. |
| | " | April 1, 1889, \$12. |
| unah | mog day (1 | May 1, 1889, \$30. |

How much was due Sept. 16. 1889?

19. \$5,000.

STRATFORD, May 1st, 1887.

Six months after date I promise to pay G. T. Smith, or order, five thousand dollars, with interest at 5 per cent., JOHN ADAMS.

Endorsed, Oct. 1st, 1887, \$700.

Feb. 7th, 1888, \$45.

Sept. 13th, 1888, \$480.

What was the balance due Jan. 1st, 1889?

66

1888, and i "pon it 388, \$25; Find the

payable 550 was as made as made 2 years 2 years at the

7, Jan. 1887. 51,500.

awing llows: 11th. t due

ed as Oct. 1889, 1889,

37. r of alue Y.

) as 00:

:03

20. \$2,460.

TRENTON, April 10th, 1887.

Four months after date I promise to pay W. H. Austin, or order, two thousand four hundred sixty dollars, with interest at 6 per cent., value received.

GEORGE G. WILLIAMS.

Endorsed, Aug. 20th, 1888, \$840. Dec. 26th, 1888, \$400. " " May 2d, 1889, \$1,000. How much was due Aug. 20th, 1889?

21. \$650.

Guelph, Jan. 1st, 1887.

For value received, I promise to pay Alexander Mc-Kenzie, or order, six hundred fifty dollars on demand, with interest at 6 per cent. GEORGE LAW.

Endorsed, Aug. 18th, 1887, \$100.

April 13th, 1888, \$120. What was due on the note, Jan. 20th, 1889?

204

1.1

0th, 1887. . H. Austin, lollars. with

WILLIAMS.

st. 1887. inder Mcaand, with E LAW.

EQUATION OF ACCOUNTS.

EQUATION OF ACCOUNTS.

383. Equation of Accounts, also called Equation of Payments, and Averaging Accounts, is the process of finding the time at which several debts due at different times may be paid in one sum without loss of interest to either party. It is also the process of finding the time when the balance of an account having both debits and credits, may be paid without loss of interest to either party.

384. The Equated Time is the date at which the several debts due at different times may be equitably paid

385. The Term of Credit is the time between the contraction of a debt and its maturity.

386. The Average Term of Credit is the time to elapse before several debts due at different times may all be paid at once without loss to debtor or creditor.

387. The Focal Date is any assumed date of settlement, with which the dates c the several accounts are compared for the purpose of finding the equated time.

Nores 1.-Any conceivable date may be taken as the focal date; the most common dates used being, the earliest due date, the latest due date, the first day of the month of the earliest due date, and the last day of the month preceding the month of the earliest due date.

2. In Equation Tables, Dec. 31st, or Jan. 1st, is taken for all examples. 8. Interest may be calculated at any rate per cent., and either on a 360 day basis, or a 365 day basis, without varying the result, providing only that a uniformity in rate and manner of computing interest be observed

4. The student is recommended to choose one method of equating accounts, that method being uniform regarding choice of focal date, rate,

388. Equation of accounts depends upon the following principles :

1. The rate and time remaining the same. Double the principal produces twice the interest. Half the principal produces half the interest, etc.

2. The rate and principal remaining the same. Double the time produces twice the interest. Half the time produces half the interest, etc.

3. Hence, the interest on any given principal for 1 year, 1 month, or 1 day, is the same as the interest of \$1 for as many years, months, or days, as there are dollars in the given principal.

4. Hence, the interest on any given principal for any number of years, months, or days, is the same as the interest for 1 year, 1 month, or 1 day, on as many dollars as is expressed by the product of the given principal multiplied by the given number of years, months, or days.

389. The several rules in equation of accounts are based upon the principle of bank discount, for they imply that the discount of a sum paid before it is due equals the interest of the same amount paid after it is due.

390. To find the average time when the items are all debits or all credits, having the same date and different terms of credit.

EXAMPLE.—A. bought a farm June 24th and was to pay \$500 down, \$300 in 2 months, \$400 in 6 months, and \$600 in 8 months. Find the average term of oredit and the equated time.

SOLUTION 1.

By the interest method.

| Interest on | \$500 | for | 0 | mo, | at 6 % | - | \$0.00. |
|-------------|-------|-----|---|-----|--------|---|---------|
| 44 | \$300 | for | 2 | 66 | 46 | = | 3.00. |
| 44 | \$400 | for | 6 | 66 | 66 | - | 12.00. |
| 66 | \$600 | for | 8 | 66 | 66 | = | 24.00. |
| | | • | | | | | |

Amount of payments = \$1,800 Interest = 39.00.

Interest on \$1,800 for 1 month at 6% = \$9. $\$39 \div \$9 = 4\frac{1}{3}$. 1 mo. $\times 4\frac{1}{3} = 4\frac{1}{3}$ mo. the average term of credit.

June 24th + $4\frac{1}{2}$ mo. = Nov. 3rd, the equated time.

Double the e principal

re. Double ne produces

for 1 year, f \$1 for as in the given

al for any the interest llars as is ultiplied by

counts are they imply equals the

items are date and

ay \$500 down, hs. Find the

 $9 = 4\frac{1}{4}$. erm of credit. me.

EQUATION OF ACCOUNTS.

EXPLANATION.

If we take June 24th as the time for payment of all the items, A. would lose the interest of \$300 for 2 months, \$400 for 6 months, and \$600 for 8 months, in all \$39 interest. He is therefore entitled to the use of \$1,800, the amount of the debt, for such a time as the interest on it would be equal to \$39, and which is shown above to be $\frac{11}{2}$ months, and 41 months, from June 24th, gives the equated time Nov. 3rd. A. could therefore pay the amount of the debt, \$1,800, on Nov. 3rd, without loss of interest either to himself or his creditor.

RULE FOR INTEREST METHOD.

Find the interest on each item for its term of credit, and divide the sum of these interests by the interest of the sum of the items for 1 day, 1 month or 1 year as the case may be.

The quotient will be the number of months or days from the focal date to the equated time of payment.

Add this number to the focal date and the result will be the equitable date of payment.

Nores 1.-In computing by the interest method the rate forms no element of the calculation, hence any rate may be used. The most convenient rates are 6 % and 12 %.

2. The result will be the same whether we reckon 365 days to the year or 360 days to the year.

SOLUTION 2.

By the product method.

| TTEMS | | TIME. | | PRODUCT. |
|-------|-----|---------|---|-----------|
| 500 | × | 0 mo. | = | 00 mo. |
| 300 | x | 2 mo. | = | 600 mo. |
| 400 | × | 6 mo. | | 2,400 mo. |
| 600 | × | 8 mo. | = | 4,800 mo. |
| 1,800 | | | | 7.800 mo |
| 7, | 800 | + 1,800 | = | 41 mo. |

This method is the same in principle as the interest method. The interest on \$300 for 2 months is the same as the interest on \$1 for 600 months; the interest on \$400 for 6 months equals the interest on

EXPLANATION.

\$1 for 2,400 months; and the interest on \$600 for 8 months equals the interest on \$1 for 4,800 months. A. would therefore lose the interest on \$1 for 7,800 months. He would therefore be entitled to the use of \$1,800 for such a time as the interest on it would equal the interest on \$1 for 7,800 months, or 44 months.

RULE FOR PRODUCT METHOD.

Multiply each item by its term of credit, and divide the sum of the products by the sum of the items; the quotient will be the average term of credit.

EXERCISE 88.

1. On a certain day A. bought a horse for \$175 on 30 days, 8 cows for \$120 on 45 days, 80 sheep for \$250 on 60 days, and 5 tons of hay for \$130 on 90 days. What is the average term of credit?

2. Bought a ship for \$30,000; the payments were \$5,000 cash, \$8,000 in 4 months, \$7,500 in 6 months, \$4,500 in 8 months, and the balance in a year. What is the average term of credit?

3. Sept. 1st, 1891, I bought goods, as follows: \$200 on 2 months' time, \$400 on 3 months, and \$450 on 4 months. What was the average term of credit, and the average date of maturity?

4. On the first day of December, 1890, a man gave 3 notes, the first for \$500, payable in 3 months; the second for \$750, payable in 6 months; and the third for \$1,200, payable in 9 months. What was the average term of credit, and the equated time of payment?

5. Bought merchandise Jan. 1st, 1893, as follows: \$350 cn 2 months, \$500 on 8 months, \$700 on 6 months. What is the equated time of payment?

6. Jan. 15th, I bought a bill of goods amounting to \$900, \$275 of which was on 30 days' credit, \$300 on 60 days, and \$325 on 90 days. What was the equated time of payment?

7. James Hudson, June 12th, owes \$317.75 due in 4 months, \$216.38 due in 5 months, and \$170 due in 6 months. Find the average time of payment and date of maturity.

8. Dec. 13t. 1894, bought goods to the amount of \$1,200, on terms as follows: 25% in cash, 30% in 3 months, 20% in 4 months, and the balance in 6 months. Find the equated time of payment.

5 on 80 days, on 60 days, What is the

were \$5,000 is, \$4,500 in s the average

vs: \$200 on n 4 months. average date

gave 3 notes, e second for \$1,200, paym of credit,

llows: \$350 aths. What

ting to \$900, on 60 days, time of pay-

75 due in 170 due in and date of

it of \$1,200, nonths, 20% Find the

9. May 1st, 1890, I purchased property for \$8,500, paid cash \$1,500, and gave notes, one for \$3,000, payable in 2 years, and another for \$4,000, payable in 4 years. Find the average term of credit on the notes.

10. Bought a bill of goods April 20th amounting to \$6,000, on the following terms: $\frac{1}{2}$ cash, $\frac{1}{4}$ in 4 months, and the balance in 6 months. At what date may the whole be justly paid?

11. A stock of groceries was purchased Jan. 1st, 1889, the purchase price payable as follows: $\frac{1}{4}$ in 1 month, $\frac{1}{4}$ in 8 months, $\frac{1}{6}$ in 4 months, $\frac{1}{3}$ in 5 months. When may the whole amount be equitably paid in one sum?

12. William Owens bought a farm of 320 acres at \$68 per acre, $\frac{1}{2}$ payable in cash, $\frac{1}{4}$ in 1 year, $\frac{1}{3}$ in 3 years, and the remainder in 5 years. What was the average term of

391. To find the average time when the items have different dates and different terms of credit, all the items being on the same side of the account.

EXAMPLE.-L. C. Hill bought goods of Wm. Grant as follows: June 1st, 1890, amounting to \$350, on 2 months' oredit; July 15th, 1890, \$400 on 3 months; Aug. 10th, 1890, \$4 50, on 4 months; Sept. 12th, 1890, \$600 on 6 months. What is the equated time?

SOLUTION 1.

Interest method.

| DUE. | ITEMS. | DAYS. | INTEREST AT 6%. |
|---------------|--------|-------|---|
| Aug. 1, | \$350 | 0 | \$00.00. |
| Oct. 15, | 400 | 75 | |
| Dec. 10, | | | 5.00. |
| | 450 | 131 | 9.821. |
| Mar. 12, | 600 | 223 | 22.30. |
| Amount = \$ | 1 000 | | the second se |
| 1 800 for 1 2 | 1,000 | | \$37.121 Interess. |

Interest on 1.800 for 1 day at 6% = \$.30. 37.121 + 30 = 1233 days.

Aug. 1 + 124 days = Dec. 8.

EXPLANATION.

If we take Aug. 1st as the time for payment of all the items, ... C. Hill would lose the interest on \$400 for 75 days, on \$450 for 131 days, and on \$600 for 223 days, in all \$37.123. In justice he should be allowed the use

of \$1,600 for such time as the interest will amount to \$37.121, or as shown above for 124 days.

Hence the equated time is 124 days, after Aug. 1st or Dec. 3rd.

RULE FOR INTEREST METHOD.

Take as the focal date the earliest due date. Find the interest on each item from the standard date to the date of its maturity and divide the sum of the interests by the interest of the sum of the items for 1 day.

The quotient will be the number of days from the standard date to the average date of payment. Add this number to the standard date and the result will be the equated time of payment.

Norrs 1.—If the earliest or latest due date is the focal date, its item has no interest, but such item must be included in the sum of the debts.

2. If the fraction in the quotient is $\frac{1}{2}$ day or more, 1 day is added; if less than $\frac{1}{2}$ day it is rejected.

3. Any date may be assumed as the focal date, the most preferable being the earliest or latest due date.

4. In business practice, odd cents and even odd dollars are rejected from the items in the interest calculations.

5. In the solution given above the gain of interest to the payee on the first two bills, which are to be paid after they are due, equals the loss of interest on the last two which are to be paid before they are due.

6. In regard to the foregoing problem, it may be urged that a debt can not be paid before it is contracted, but, it must be remembered, that the object of the solution is really to find at what date a note, given in settlement of the account, should be dated, in order that neither party would lose interest.

7. When terms of credit are given in months, calendar months are meant.

SOLUTION 2.

By the product method.

Assume August 1st as the focal date.

| DUE. | ITEMS. | | TIME. | | |
|-----------|----------|-----|------------|-----|-------------|
| Aug. 1, | \$350 | × | 0 da. | | PRODUCTS. |
| Oct. 15, | | | | = | 00. |
| | 400 | × | 75 " | = | 300.00. |
| Dec. 10, | 450 | × | 131 " | - | 589.50. |
| Mar. 12, | 600 | | | _ | |
| 4. 4. 424 | | × | 223 " | = | 1,338.00. |
| | \$1,800 | | | | \$2,227.50. |
| | 1800) 2 | 227 | 50 (1233. | | |
| | Aug. 1 + | 104 | 1 | - | |
| | nug, 1 + | 124 | 19.V9 - | DAG | |

37.121, or as

3rd.

Find the late of its e interest

standard umber to d time of

te, its item f the debts. added; if

prefera le

re rejected

yee on the the loss of ue. a debt can l, that the given in her party

onths are

EQUATION OF ACCOUNTS.

EXPLANATION.

This method of solution may be explained in a manner similar to that given to Solution 2, Art. 390.

RULE FOR PRODUCT METHOD.

1. Find the date at which each item matures, and find the number of days between the focal date and the date of maturity of each item.

2. Multiply each item by its number of days, and divide the sum of the products by the sum of the items. The quotient will be the average term of credit.

3. Add this quotient to the focal date, and the result will be the equitable date of payment.

SOLUTION 3.

Interest method.

Assume the latest date, March 12th, 1889, as the local date.

| DUE. Aug. 1, Oct. 15, Dec. 10, Mar. 12, | ITEMS. \$350 400 450 600 | DAYS. 223 148 92 0 | INTEREST AT 6 %. \$13.005. 9.863. 6.90. |
|---|--------------------------------------|--------------------------------|--|
| Amount = Interest on \$1 29 | \$1,800 ,800 for 1 .771 + 30 | | |

EXPLANATION.

Reckoning the days from the due dates Aug. 1st, Oct. 15th, Dec. 10th, Mar. 12th, to the focal date Mar. 12th, we find the number of days to be 223, 148, 92, and 0 days respectively. If the debt were not paid until Mar. 12th, 1891, William Grant would lose the interest, on \$350 for 223 days, on \$400 for 148 days, \$450 for 92 days, or a total interest of \$29.77 on Mar. 12th, 1891. The problem then becomes, "For what length of time should Wm. Grant be allowed interest on the debt \$1,800 so as to receive \$29.771 interest ?" and which is shown above to be 99 days. The time at which the debt should be paid so that neither party would lose interest, would therefore be 99 days before Mar. 12th, 1891, or Dec. 3rd,

SOLUTION 4.

By product method.

Assume March 12th as the focal date.

| DUE. | ITEMS. | | DATE | a. | PRODUCT |
|--------------|---------|-------------|------|-----|------------|
| Aug. 1. | \$350 | x | 223 | = | \$78,050. |
| Oct. 15. | 400 | × | 148 | - | 59,200. |
| Dec. 10. | 450 | x | 92 | = | 41,400. |
| Mar. 12. | 600 | x | 0 | = | 00. |
| Amount | \$1,800 | \$ 1 | ,800 |) (| 178,650. |
| | | | | | 001 da |
| Mar. 12, 189 | 1 99 | da | VS = | : T | 00. 8 1900 |

EXPLANATION.

The number of days is found as in Solution 3.

If the debt is settled on Mar. 12th, 1891, William Grant will lose the interest on \$850 for 228 days, or the interest on \$78,050 for 1 day; on \$400 for 148 days, or the interest on \$59,200 for 1 day; and on \$450 for 92 days, or the interest on \$41,400 for 1 day. The total loss of interest is therefore the interest on \$178,650 for 1 day. We have then to determine for how many days the interest on \$1,800 will equal the interest on \$178,650 for 1 day, which is found to be 991 days. Therefore the debt is due 99 days before Mar. 12th, 1891, or Dec. Srd, 1890.

EXERCISE 29.

1. A merchant bought goods as follows :

| Sept. | 5, | 1890, | a bill | of \$200 | on a | gradit | of C | | |
|-------|-----|-------|--------|----------|--------|------------|------|-------|--|
| Oct. | 10, | 56 | " | 500 | 011 11 | 66 CI CUID | | | |
| Nov. | 11, | ** | ** | 850 | | " | • | " | |
| Dec. | 5, | " | " | 425 | for a | | 60 | days. | |
| 71 | | | | 140 | 101 0 | WOLL. | | | |

What is the average date for the payment of the whole ?

2. John E. Lewis purchased goods of Isaac S. Smyth & Co. to the amount of \$5,000, \$1,250 to be paid June 2nd, 1889, \$1,000 to be paid July 5th, \$2,000 to be paid Aug. 15th; the balance, \$750, will become due Aug. 80th. At what date must a single note for the whole amount be drawn, payable in 3 months, that it may become due at the average date?

lose the lay; on 450 for interest o deter. interest ore the

08. 6 ys.

hole ? yth & e 2nd, Aug. . At nt be ue at

EQUATION OF ACCOUNTS.

٠

| 8. Bought goods as follows: Jan. 8, 1889, \$250 @ 3 mos. creater Feb. 13, " 360 " 4 " " " Mar. 6, " 1.25 " 60 days " What is the average date of payment? 4. When shall a note to settle the following made payable? | |
|---|--|
| Henry Field. To James L. Edw 1892. Mar. 3 To Mdse. @ 3 mos., as per bill rendered. Apr. 4 " 30 days. " " " 16 " 60 " " May 1 " 60 " " | \$250 00 100 00 300 00 420 00 |
| 5. Average the following staten.ent of account Mar. 6, To Mdse. @ 30 days \$315.0 "18, "60 " | \$1070 00 5: 00 |

| •• | 18. | 66 | ** | 60 " | \$010.0 0 |
|-----------|-----|----|----|---------|------------------|
| 66 | 25, | 6. | " | | 420.00 |
| Apr. | 4. | ** | | 3 mos. | 612.50 |
| | 12, | " | " | 60 days | 210.25 |
| 6. The fo | , | :4 | | 80 " | 400.00 |

following items were sold on a credit of 30 days each. What is the average time for the payment of the Arm

| | Apr. 1, 20 bbls. ex. fam. flour "11, 500 bush. Manitoba wheat "21. 80 bbls. October 11 | @\$8.50 t"1.25 | |
|----|--|---|--|
| 7. | " 26, 100 bush. oats Find the average of the full | " 6.75 " .45 | |
| | " 15, " " 60 days July 12, " " 3 mos. Aug. 18, " " 90 days Sept. 25, " " 9 mos. | ,275.00 500.00 450.50 820.87 145.62 | |
| | | | |

\$2,692.00

918

| 3. | May 5, Mdse. @ 60 days | \$600.00 |
|----|------------------------|---------------|
| | " 16, " " 30 " | 396.40 |
| | June 10, Cash | 250.00 |
| | July 7, Mdse. (net) | 420.00 |
| | Aug. 14, " @ 60 days | 538.28 |
| | | \$2,204.68 |

9. A young man, having money advanced to help him pay his way through college, received :

| | 1, 1888, | | Feb. | 15. | 1890 | \$86. | |
|------|-----------|------|------|-------------|-------|--------|--|
| Feb. | 15, 1889, | | | | | \$128. | |
| | 31, 1889, | A | | | | | |
| Q | ,, | 400. | nug. | <i>а</i> 0, | 1991. | \$175. | |

What was the equated time at which he should date a single interest bearing note for the whole sum ?

10. Five years from the date of the first loan, the above mentioned note was paid, with interest at 4%. What was the amount?

11. What is the average time at which the following bills become due? Feb. 10th, 1892, \$400 on 2 months' credit; May 10th, 1892, \$300 on 4 months' credit; June 16th, 1892, \$350; Aug. 6th, 1892, \$150.

12. Find the equitable date for a single note given on the following bills for merchandise: June 1st, 1895, \$20, Jaly 1st, \$30, Aug. 1st, \$30, Sept. 1st, \$20, each on 2 months' credit.

13. Bought goods of Messrs Holt & Co., as follows: Mar. 11th, \$35, on 30 days' credit; July 20th, \$95, on 2 months' credit; Sept. 8th, \$215, on 3 months' credit. What was the average term of credit?

392. To find the extension of credit to which the balance of a debt is entitled when partial payments have been made before they are due.

A. sold B. a bill of goods Mar. 12th on 6 months' credit amounting to \$1,740; July 10th, B. paid him \$500; Aug. 6th B. paid \$700. To what additional credit is B. entitled on the balance?

SOLUTION 1.

Interest method.

1

| \$300, \$700, \$1,200 . | July 10, Aug. 6, | + 6 months ; To Sept. 12, Sept. 12, | DAYS. 64 = 87 = | \$5.331. | |
|--------------------------------------|---------------------|---|-----------------------|----------|-----------|
| | 80 CF | 0 - \$1,200 = for 1 day, at = 1073 day, 8, the equita | 6% = \$ | 0.09. | interest. |

EXPLANATION.

If a partial payment is made before a debt is due, equity requires that the debtor should have an extension of credit on the balance, equivalent to the interest of the pre-payment.

B., by paying a portion of his debt before it is due, loses the interest on \$500 for 64 days, and the interest on \$700 for 37 days, in all \$9.65 interest. A. should therefore allow B. the use of the balance, \$540, until the interest on it amounts to \$9.65, and which is shown above to

Note.-Equity requires an extension of oredit, but the creditor is not always willing to allow this and is not required to do so by law.

SOLUTION 2.

By the product method.

ITEMS. DAYS. \$500 × 64 = 32000 \$700 × 37 = 25900 \$1,200 57900 \$1,740 - \$1,200 = \$540 540) 57900 (1073 days. Sept. 12 + 107 days = Dec. 28.

EXPLANATION.

A similar explanation to that, given in Solution 4, Art. 391, may be given.

elp hi**m**

36. 18.

5.

date a

above at was

g bills eredit; 16th,

en on , \$20, sh on

Mar. onths' t was

1 the ients 21.5

EXERCISE 90.

1. P. owed me \$1,300 due in 1 year. At the end of 4 months he paid me \$500, and at the end of 7 months \$300, on condition that I would let the balance stand an equitable time in consideration of these pre-payments. What was the balance, and when should it be paid?

2. A man bought a bill of goods on 90 days, amounting to \$2,840.75; if he pays \$1,000 down, what extension ought he to have on the balance?

8. A man owes \$1,569.75, payable in 90 days; 60 days before it is due he pays \$350.86, and 30 days later \$211.89 more; what extension ought he to have on the balance?

4. A person owes a debt of \$1,680 due in 8 months, of which he pays $\frac{1}{3}$ in 8 months, $\frac{1}{4}$ in 5 months, $\frac{1}{5}$ 6 months, and $\frac{1}{4}$ in 7 months. When is the remainder due?

5. Bought a bill of goods, amounting to \$1,500 on 6 months' credit. At the end of 2 months, I paid \$300 on account, and 2 months afterward, paid \$400 on account, giving my note for the balance. For what time was the note drawn?

6. The following sums are due from E. to F. :--\$500, at the present time; \$600, in 30 days; \$400, in 40 days; and \$900, in 60 days. If E. pays F. \$500 to-day, and \$1,000 in 10 days, how long from the present time should the rest stand, to balance the pre-payments?

7. A debt of \$2,000 is due in 1 year from Jan. 1st, 1890. In consideration of the payment of \$400 March 2nd, and \$800 April 1st, till what date should the balance be allowed to stand?

8. $\frac{1}{3}$ of a certain debt is paid 78 days before it is due; $\frac{1}{4}$, 60 days; $\frac{1}{4}$, 27 days. What extension should the debtor be allowed for the payment of the balance ?

9. A. sold B. a bill of goods March 12th, on 6 months, amounting to \$1,740; July 10th, B. paid him \$500; Aug. 6th he paid \$700 more; to what additional credit is B. entitled on the balance?

10. On a debt of \$2,500 due in 8 months from Feb. 1st, the following payments were made : May 1st, \$250; July 1st, \$300; and Sept. 1st, \$500. When is the balance due?

11. Find the average term of credit, and the equated time of payment from Dec. 15th, of \$225 due in 35 days, \$850 due in 60 days, and \$750 due in 90 days.

392. To find the equated time for the payment of the balance of an account having both debit and credit

EXAMPLE.-What is the equated time and date of paying the following account :

| Dr. | H. BRIERLEY | in | acct. | with | Muppun | • 0 |
|-----|-------------|----|-------|------|--------|-----|
| | | | | | | |

| 1890. | 1 | | actinial de Co. | Cr. |
|------------|---|-------|---------------------------------------|-------------------------|
| May 21 | | \$250 | By Cash "Sundries, 60 da. "Cash | \$300 \$400 \$100 |

SOLUTION 1.

Interest method.

| DUE. Aug. 21 '' 28 July 9 | \$250 \$160 \$910 \$800 \$110 Int. on | 112 da. 119 da. 69 da. | \$4.95§ \$1.84 \$16.13 \$10.13 \$7.09 \$7.09 \$1 day at | May 24 Aug. 7 July 21 | \$40 \$100 \$800 | тіме. 23 98 81 | INTEREST. \$1.15 \$6.53 \$1.35 \$9.03 } |
|------------------------------------|--|------------------------------|---|----------------------------------|------------------------|-------------------------|--|
| | weit | 00 + P. | $0.18\frac{1}{3} = 38$ | 6% = \$.0 87_{11}^{2} days. | 18 1 | | |

y 1, 1890 + 387 days = May 23, 1891.

Nores 1.-May 1st is chosen as the focal date. Any date may be chosen however.

end of 4 hs \$300, n equit-What

ounting tension

60 days \$211.89 nce?

ths, of onths.

on 6 800 on count, as the

00, at days; , and hould

1890. , and owed

due: ebtor

2. In this example the balance of interest on May 1st is in favor of **H**. Brierley, hence he is entitled to the interest on the balance of the account for 387 days after May 1st.

Had the balance of interest been on the credit side of the account, we should then have subtracted the equated time from the focal date.

RULE FOR INTEREST METHOD.

1. Find the interest on each item for the time from the focal date to the maturity of the respective items, and divide the balance of the interests by the interest of the balance of the items for 1 day or 1 month; the quotient will be the number of days or months, as the case may be, between the standard date and the time of settlement.

2. When the balance of an account and the balance of interest are both on the same side, add the quotient to the focal date; if on opposite sides, subtract it; the result will be the date of settlement.

Notes.--1. In finding the maturity of notes and drafts 8 days of grace should be added to the specified time of payment.

2. When no time of oredit is mentioned the transaction is understood to be for each, and the payment due at once.

SOLUTION 2.

By the product method.

| DUE. | ITEMS. | DAYS. | PRODUCTS. | 1 | | | Cr. |
|----------------------------|---|---|---|-------------------------------------|--|----------------|---|
| Aug. 21 '' 28 July 9 | \$500 \$250 \$160 \$910 800 | $\begin{array}{c}112\\119\\69\end{array}$ | 56000 29750 11040 96790 54200 | DUE. May 24 Aug. 7 July 21 | ITEMS. \$300 \$400 \$100 \$800 | 23 98 81 | PRODUCTS. 6900 39200 8100 54200 |
| | 110 May 1 | , 1890 |) 42590 (38 + 387 days | 717 days. | | | |

-, 1000 + 307 days = May 23, 1891.

RULE FOR THE PRODUCT METHOD.

1. Find the number of days from the focal date to the maturity of each item.

218

Dr.

in favor of ance of the

account, we date.

from the id divide alance of ll be the veen the

lance of the focal l be the

of grace

derstood

Cr. ODUCTS.

) the

EQUATION OF ACCOUNTS.

2. Multiply each item by its number of days, and divide the difference between the sums of products by the difference between the sums of items; the quotient will be the equated

3. If the greater sum of items and the greater sum of products are both on the same side of the account, add the equated time to the focal date; if on opposite sides subtract it; the result will be the date when the balance of the account

EXERCISE 91.

1. When did a note given in settlement of the following account begin to bear interest?

| | L. R. CLEM. | ~ |
|-------------------------|------------------------|-------|
| July 2 To mdse., 8 mos. | | Cr. |
| 5 1 10 mase., 8 mos. | \$580 Aug. 14 By cash, | \$450 |

2. When did interest begin on the following account, and what was due on settlement, Jan 1st, 1892, interest 5%?

| | O. | L. Hoos | ACR. | |
|---------|------------------|---------|-------|------|
| 1891. | 1 | | | Cr. |
| June 17 | To mdse., 2 mos. | 8070 | 1891. | |

| Sept. 20 " 3 mos. Oct. 1 " 1 mo. | \$650 | 1891. June 30 Oct. 1 Nov. 30 | By mdse. " oash, " mdse. | \$500 |
|--|-------|---------------------------------------|--------------------------------|-------|
| | 1 | | mdse. | \$150 |

3. When is the balance of the following account due by equation ?

| Dr. | | FRANK H. | BARNARI |). | Cr. |
|--------------------|----------|----------------|---------------------------------|-----------|-------|
| Jan. 15 Feb. 28 | To mdse. | \$600 \$300 | 1889. 1889. Mar. 31 | By cash, | \$300 |
| | | | Idal. 51 | | \$300 |

4. What is the balance of the following account, and when due by equation ?

| Dr. | BENJ. F. HAWEING | |
|-----|------------------|--|
| | | |

| 1889. 1 | | | | Ur. |
|--|----------------------------------|-----------------------------|----------|------------------|
| Jan. 14 " 28 Feb. 3 " 15 " | \$600 \$800 \$5 0 \$600 | 1889. Jan. 20 Feb. 10 | By cash, | \$1,000 \$700 |

5. Balance the following account by two methods:

Dr. J. H. Strong & Co. in acct. with Smith & CRANE. Cr.

| 1893. | 1 | | o o outility, | UT. |
|----------------|--------------------|-------|---|---------------------------|
| Mar. 2 Apr. | 5 To mdse., 60 da. | \$830 | By sundries, 80 da. " cash, " draft, 30 da. | \$450 \$ 500 \$ 260 |

Nors.—In this example the balance of items and excess of products being on opposite sides, the average time is subtracted from the standard date.

6. What is the balance of the following account and when due?

r. H. MORGAN in acct. with Lockwood & Co. Cr.

| 1890. | | | | 01. |
|--------------------------------|---------------|-------------------------|--|-------------------------|
| July 20 Aug. 10 Sept. 15 | - o Sundrios, | \$760 \$540 \$850 | By flour, "stocks, 30 da. "cash, | \$520 \$300 \$385 |

7. Find the average time of paying the following account:

Dr.

Dr.

GEORGE JENKINS.

Cr.

| Mar. 1 | To mdse., 80 da. | 18500 1891. | | |
|------------------|------------------|---|------------------|-------|
| Apr. 5 May 20 | | \$700 Apr. 12 \$700 May 10 \$850 June 4 | By draft, 20 da. | \$540 |
| | | | | \$600 |

ount, and

Cr. \$1,000 \$700

8:

NE. Cr.

da. \$450 \$ 500 £260

products standard

nt and

Cr.

\$520 \$300 \$385

owing

Or.

\$400 \$540 \$600

EQUATION OF ACCOUNTS.

8. Find the equated time for the payment of the balance due on the following account : ה..

| Mar. 1 To mdse., 60 da. \$200 1892. Mar. 6 By mdse. \$20 June 20 "90 da. \$900 May 16 "cash, \$150 July 30 "30 da. \$700 July 1 " \$360 Aug. 14 "60 da. \$100 July 2 " \$360 | Dr. 1892, | | W. T. DAWES | | Cr |
|--|--|----------------------|---|---------|---|
| Muse, \$240 | Mar. 1 May 10 June 20 July 30 | " 90 da. " 30 da. | \$200 Mar. 6 \$900 May 16 \$400 June 26 \$700 July 1 | " Cash, | \$200 \$150 \$360 \$990 \$240 |

9. Average the following account: **D**...

| Dr. 1892. | | MES GREEN | & Co. | Cr. |
|----------------------------|--|--------------|---|-------|
| Jan. 10 " 25 Apr. 20 | To mdse., 3 mos. " 30 da. " 3 mos. | mage louis 1 | By hal. of acct. " note, 3 mos. " draft, 30 da. | \$485 |

10. Balance the following account: n

| Dr. | 0 | . J. 1 | TAMILTON | N. | C |
|---------------------------------------|---|-------------------------|-------------------------------------|---|-------------------------|
| 1890. Jan. 20 Feb. 12 Mar. 1 | To sundries, 30 da. " 60 da. " 30 da. | \$500 \$340 \$300 | 1890. Jan. 20 Mar. 1 '' 20 | By real estate, 60da. " draft, 60 da. " cash, | \$400 \$200 \$400 |

11. Find the balance of the following account and when due:

| Dr. | |
|--|---|
| 1890. Aug. 11 Sept. 5 Oot. 20 | 1 |

| A. | B. in acct. with | C. D. | Cr. |
|---------------------------|--|---|------------------------|
| For mdse. For 1 horse, | \$160 Sept. 2 \$240 Oct. 10 \$175 Nov. 1 | By sundries, " note, 30 da. " oash, | \$75 \$100 \$110 |

12. Find the balance of the following account and when due: Dr

| 1890. | WM. GORMAN | in acc | t. with | JOHN HENDRIE. | Cr. |
|------------------------------|-------------------|----------------|------------------|---------------------|-----|
| Feb. 10 May 11 July 26 | For mdse., 4 mos. | \$450 \$500 | 1890. Mar. 20 | By sundries, 8 mos. | |

13. When is the balance of the following account due by equation?

| Dr. | Cr. | |
|---|---|---------------------------------|
| 1889. To mdse. Apr. 24 " May 1 " " 30 " Aug. 17 " | \$60 1889. Apr. 1 By cash, \$100 June 1 " \$150 Aug. 1 " \$90 Oct. 1 " | \$150 \$150 \$150 \$90 |

14. Find 1st, the balance of the following account, 2nd, when due by equation:

| Dr. | T | VALTER | L. PARI | KER. | | Cr. |
|--|----------|--|---------|---------|---|----------------------------------|
| 1889. May 11 July 1 Aug. 31 Oc%. 1 | 45 UUUU. | \$108.40 \$225.00 \$280.80 \$137.50 | Oct. 31 | Ву " | cash, 4 mos. note (no interest), cash, | \$124.27 \$167.91 \$305.05 |

15. Find when the following account is due by equation:

 $D_{r_{\bullet}}$

John Montgomery & Co.

| 1000 | | JOHN | MONT | GOMERY | & Co. | Cr. |
|--|---------------|------------------|-------------------------|---------------------------|--|----------------|
| 1889. Dec. 15 28 1888. Jan. 14 | To mdse. " | 2 mos. 30 da. | \$200 \$300 \$300 | 1890. Jan. 2 Mar. 1 | By cash, " 60 da. note (no interest), | \$300 \$150 |
| | | | | | and the second s | |

 $\mathbf{222}$

AVERAGING ACCOUNT SALES.

ount due by

| Cr. |
|---------------------------------|
| \$150 \$150 \$150 \$90 |

ount, 2nd,

Cr. \$124.27 te \$167.91 \$305.05

quation:

Cr.\$300 (no \$150

AVERAGING ACCOUNT SALES.

393. An account sales is an account rendered by a

commission agent, of goods sold on account of a consignor, and contains a statement of the sales, attendant charges, and the net proceeds due the owner.

Norzs .-- 1. The charges include freight, cartage, storage, advertising, insurance, commission, guaranty, etc.

2. The sales form the credit side of the account and the charges and advances the debit side.

394. Guaranty is a charge made in addition to the commission, for insuring the owner against the risk of nonpayment in case of goods sold on credit.

395. The charges for transportation, cartage, advertising, storage and insurance are considered due at the time of payment of the same.

396. The commission, guaranty, and other after charges of the commission merchant are considered due by some at the average date of sales; by others at the average due date of sales; while some merchants enter the commission at the date the account sales is rendered.

Norge.---1. When the commission is small compared with the gross sales, either of these methods produce a result, which is practically

2. In this work they will be considered due at the average due date of the sales.

3. Of course the due date of the commission must be a matter of agreement between the parties concerned.

397. The method of averaging an account sales is the same as that for averaging an account having both debits and credits, except in the matter of adjusting the date for the commission and other charges.

AVERAGING ACCOUNT SALES.

398. To average an account sales, and find when the net proceeds are due.

Example.-Average the following, and find the due date of the net proceeds :

Received on consignment 1,000 barrels of flour from Scott. Bros. Caledonia.

| | SALES. | |
|---------------------------------------|---|--|
| July 11 Aug. 5 '' 20 Sept. 2 | 200 bbls. of flour, sold on 30 da \$5.50 350 """""""""""""""""""""""""""""""""""" | \$1,100.00 2,170.00 1,500.00 1,150.00 \$5,920.00 |
| July 1 1 3 | CHARGES. Freight | 450 25 30,75 150 00 |
| 1 | Commercial balance | 148.00 \$779.00 \$5,141.00 |

SOLUTION.

1. Find average date of sales-Focal date, July 1st.

| Aug. 10. " 15. Sept. 19. Nov. 1. | ITEMS. \$1,100. 2,170. 1,500. 1,150. | DAYS. 40. 45. 80. 123. | INTEREST AT 69 \$7.331. 16.271. 20.00. |
|---|--|------------------------------------|---|
| Int. on \$5,92(Sales due Ju | \$5,920. for 1 day \$67.18 1 y 1st + 6 | at 6% = | 23.57 \$67.18 \$.98 68 days. 5 Sept. 7th. |

2. Find average date of charges, focal date J

| DUE. July 1. July 1. July 4. Sept. 7. | \$450.25. 30 75. 150.00. 148.00. | DAYS. 0. 0. 2. 68. | 10cal date July 1st. INTEREST AT 6%. \$.00. .00. .05. 1.6745. |
|---|---|---------------------------------------|---|
| Int. on \$779 fd \$1.7 Charges due July | 779.00. or 1 day at $2\frac{1}{5} \div 1.12$ 1 + 13 da | 6% = ² 3 8 = | \$1.7211. \$.1248. |

and find when

e due date of the

rom Scott. Bros.

1,100.00 ,170.00 ,500.00 ,150.00 \$5,920.00 450 25 30.75 150 00 148.00 \$779.00 \$5,141.00

: 6%.

ly 1st.

%

AVERAGING ACCOUNT SALES.

3. Averaging sales and expenses, they now stand as follows : Focal date July 1st.

| due. July 14 | ITEMS. \$779 | DAYS. 13 | PRODUCT. 10,127. | DUB. Sept. 7 | ітемя. \$5,920 779 | DAYS. 68 | ■RODUCT. 402,560. 10,127 | |
|-----------------|-----------------|-------------|---------------------|-----------------|------------------------------|---------------------|--------------------------------|--|
| • | Net proc | eeds \$5,1 | 41 due July | 1 + 76 8 | \$5,141 Avera lays = 8 | ge time ept. 15. | 200 100 | |

BULE.

1. Find the amount and the average dute of sales. The date of the sales will be the date of the commission and guaranty.

2. Find the amount and the average date of the charges.

3. Make the charges the debits and the sales the credits, and find the average date for paying the balance.

EXERCISE 92.

1. Put the following items into the form of an account sales, find the net proceeds and date of payment :

A. B. Harrison, of Montreal, sold a consignment of goods from Chase & Co., Toronto, as follows : Nov. 15th, 1889, 135 chests tea at \$45, on 30 days; Nov. 20th, 75 sacks coffee at \$28, on 2 months; Dec. 1st, 256 kegs lard at \$4.50, 30 days; same date 285 tubs butter at \$18.37 on 2 months. Paid freight Dec. 1st, \$23.75; cartage, \$5.40; storage, Dec. 10th, \$7.80; commission, $2\frac{1}{2}$ %.

2. Same parties sold Sept. 1st, on 3 months, 3,520 lb. sugar, at \$.121; Sept. 15th, 25 chests tea, each 85 lbs., at \$.98, on 2 months; October 2nd, 28 half-chests Oolong tea, 42 lbs. each, at \$1.05, on 2 months. The charges were paid October 15th, freight and cartage \$85, commission

220

-

AVERAGING ACCOUNT SALES.

.

3. Average the four following account sales :

| - | g and and sale | |
|---------|---|-------------|
| | 1888. | |
| g | | |
| 0 | ept. 23 95 harrels to Hudson & Son, @ \$5.60. | |
| 0 | at 1 and 1015 to 110 dean & a | 11 |
| | " 18 65 " Chas. H. Knapp, @ \$5.60, 0 | agh II |
| | " 18 65 " Chas. H. Knapp. @ 95.75 | asu, [] |
| N | ov. 3 110 " " " " " " " " " " " " " " " " " " | mo!! |
| | | 1 30 11 |
| | " 25 130 " " " Clark & Bro. @ \$5.00.00 | · ua., |
| | " Clinton Ma DL |) da!! |
| Q., | 25 130 " Clinton McPherson, @ \$5.80, 80 pt. 24 Freight CHARDES. CHARDES. | ab III |
| DG DG | pt. 24 Freight CHARGES. | isn. |
| 4 | pt. 24 Freight CHARGES. | 11 |
| 0 | - Uartingo | |
| Oct | t. 28 Cash advanced on co | •• 62.50 |
| No | The second advanced on or | |
| | | 30.00 |
| •• | 25 Commission, 4% | 2,000.00 |
| | -o Commission, 4 % | -1000.00 |
| | /0 •• | 5.00 |
| | | 137.78 |
| 189 | | 101.18 |
| | | |
| July | 7 15 500 barrels, 80 da. @ \$6.50 | |
| ••* | 20 Darrels, 30 da @ \$6 50 | 1 |
| | 30 300 " " 86.50 | 11 . |
| Aug. | . 10 600 " 7.00 | \$3,250.00 |
| -0- | | 10100.00 |
| | 6.75 | 2,100.00 |
| | 3 | 4,050.00 |
| | | 1.000.00 |
| | | \$9,400.00 |
| Aug. | 10 Storego L. OHARGES | 1 *0,100.00 |
| T. 16' | To Storage, labor and Charges. | 11 |
| July | 10 Storage, labor and cooperage, 1 Insurance on \$9,000 corperage, \$71 | 11 |
| • | Commission \$9,000 @ 1 % | 25 |
| | 1 Insurance on \$9,000 @ 1 % Commission on \$9,000 @ 1 % | |
| | Commission on \$9,000 @ \$ %, \$11.5 Net proceede day 21 %, \$25.6 | 5 |
| | Net proceeds due per average, 235.0 | |
| | 1 total due per average. | 317.50 |
| | | |
| 1892. | | \$9,082.50 |
| | | |
| April | 9 Sold Leonard Barker & Co., @ 6 mos. : 15 hhds. Cuba Burgar . 25 (10 h) | |
| | Sold Leonard Bosh | 11 |
| | 15 Li Darker & Co., @ 6 mar | |
| | 15 nnds. Cuba anges of mos. | 11 |
| | 32 half about sugar, 25,422 lbs. @ 18- | 11 |
| | 15 hhds. Cuba sugar, 25,422 lbs. @ 160. | \$4,067 52 |
| | 32 half-chests Oolong tea, 1,805 lbs., tare 480 = 1,325, @ 1.10, | W=,007 02 |
| | | 11 |
| | | 1,457.50 |
| | | |
| 44 | 5 Fire ing on BC one CHARGES. | \$5,525.02 |
| | Tire ins. on \$6 000 @ 11 dis. | 1 40,020.02 |
| | 5 Fire ins. on \$6,000 @ 11 %, 7 Cooperage weighing 11 %, | 1 |
| | 7 Cooperage, weighing, labor, etc., \$90.00 Com. and guar. on \$5,525.02 @ 5%, 276.25 Net proceeds due as \$276.25 | 1 |
| | Com. and guar. on \$5,525.02 @ 5 of 17.37 | 1 |
| | Net 04 \$0,025.02 @ 50 | - |
| | Net proceeds due por any %, 276.25 | 000.00 |
| | Net proceeds due per average, 276.25 | 883.62 |
| | -0-1 | 85141 16 |
| 1000 | | \$5,141.40 |
| 1892. | | |
| | | |
| May 10 | | |
| June 12 | | |
| | 2 bbls. currants, 30 days @ 70c., 1 case fig and the state of the stat | |
| 20 | 1 case for auto, 50 davs. | \$700.00 |
| July 17 | 1 case figs, 60 days, 100 bags figs, 60 days, | |
| | 100 bags peanuts, 30 days, | 85.05 |
| | Be poortube, SU (lava. | 69.60 |
| | | |
| | | 757.50 |
| May 10 | D CHADONE | Q1 010 11 |
| | Duties on \$950 @ 20% | \$1,612.15 |
| June 6 | Freight, storage and labor, \$190.00 | |
| | Commission for age and labor. | |
| | Commission on At anor | |
| 1 | 420.00 | |
| 1 | Net proceeds 1 40.30 | |
| | Net proceeds due,40.30 | 455.80 |
| | | 1 1 |
| | | 1,156.85 |
| | | |

AVERAGING ACCOUNT SALES.

4. Average the following account of sales:

Account sales of 500 barrels of pork received from Conover & Drowne, of Cincinnati, to be sold on their account and risk.

| $$, Commission on , at $2\frac{1}{2}$ %, | • • | • • | • • | . 12.50 |
|---|-----|-----|-----|---------|
| | | •• | •• | |
| Total charges | | | | |
| - Hos | •• | | | |

Net proceeds, due as per average,-

62.50 30.00 2,000.00 5.00 187.78 \$3,250.00 2,100.00 \$9,400.00

317.50 \$9,082.50

4,067 52

1,457.50

383.62

700.00 85.05 69.60 57.50 12.15

55.80 6.35

ACCOUNTS CURRENT.

ACCOUNTS CURRENT.

399. An Account Current is an itemized record of the mercantile transactions between two parties, showing the cash balance due at a certain date.

Nores .-- 1. An account current is a transcript of the ledger account, with the addition of certain details taken from the books of original entry, and is arranged in a differen's form.

2. Whether the items bear interest or not depends on custom or agree. ment between the parties.

3. It is customary for merchants, bankers, and brokers to render their

accounts at stated times, as monthly, quarterly, semi-annually, or

4. Among retail dealers, mechanics, farmers, etc., the items seldom bear interest; hence, in settling such accounts it is necessary to find only the merchandise balance.

5. In the illustrative example interest is calculated on the 360 days' basis, the necessary change to 365 days' basis being afterwards made.

6. In Ontario and Manitoba, interest may be recovered on open accounts from and after demand of payment and notice that interest

400. The Commercial or Merchandise Balance is the difference between the debit and credit items.

401. The Cash Balance is the sum required to settle an

account at a given dat-

402. To find the cash balance of an account at a given date.

EXAMPLE.-Find the cash balance of the following account, due on July 15th, 1890, at 3% interest :

Dr. J. M. DOYLE in sect with B

| 1890. | | | CC1. WILL | n R. HISCOX. | Cr. |
|-------|----------|------|--------------------------------------|---|-----|
| | at- 00 1 | 1000 | 1390. Apr. 20 May 13 June 1 | By bal. acct. " draft on 90 da. " bank stock, | 1 |

ACCOUNTS CURRENT.

POLUTION.

| Apr. 9 1 July 28 | DAYS. 97 105 -13 | \$650 1000 1260* | INTEREST. \$10.51 17.50 | DUE. Apr. 20 Aug. 14 June 1 | В АЧВ. 86 - 30 | \$500 940† | INTEREST. \$7.17 † | |
|------------------------|---------------------------|-------------------------|-------------------------------|--------------------------------------|-----------------------------|----------------|---------------------------|--|
| Bal. of | items | \$2910 2440 \$470 | 4.70† \$32.71 17.23 | | 44 | 1000 \$2440 | 7.33 2.73 * \$17.23 | |

Interest. 360 days to year. \$15.48 \$15.48 - 75 of \$15.48 = \$15.27. Actual interest. \$470 + \$15.27 = \$485.27. Cash balance.

EXPLANATION.

The third item on the Dr. side is not due until 18 days (indicated by - 13) after the date of settlement. and therefore J. M. Doyle is entitled to the discount on \$1,260 for 13 days. This amount may either be deducted from the interest on the Dr. side or added to the interest on the Cr. side as in the problem. Similar remarks apply to the second item on

Norgan-1. The reason for placing the interest of an item on ite own side, when it becomes due before the time of settlement, is because it is entitled to interest for the intervening time.

2. In like manner, if a credit extends beyond the settlement, equity requires that interest should be allowed on that item. Hence, its interest for that time must either be subtracted from its own side or be added to the opposite. The latter is the more convenient, and therefore adopted.

3. Interest tables are much used in making out accounts current.

4. If the account has been averaged, the amount due at a given date may be found by calculating the interest on the balance of the account from the time it is due to the date of settlement. If the date of settlement is earlier than the average date, subtract the interest from the

balance of the account; if later than the average date, add the interest. 5. The interest method of finding a Casa Balance is recommended because is gives the interest or discount on each item, it is readily understood, it is more satisfactory to those to whom accounts current are sent than the product method, and when interest tables are used it is shorter

RULE FOR INTEREST METHOD.

1. Find the due date of each item of the account. find the interest on each item from the date it becomes due to the day of settlement. The difference between the sums of the debit and the credit interests will be the balance of interest.

ord of the wing the

er account. of original

or agree.

nder their ually, or

s seldom find only

60 days' uade.

on open interest

is the

tlean

given

ae on

Cr. =

500 40

ACCOUNTS OURRENT.

2. To find the cash balance due, when the balance of interest and the balance of items are on the same side, take their sum ; when on opposite sides, take their difference.

EXERCISE 93.

1. Find the cash balance of the following account, Aug. 5th, 1892, at 6 %:

| Dr. | H. MEADO | Cr. | | | |
|---|--------------------|-----|--|----------|----------------------------|
| 1892. June 10 " 30 July 11 " 24 | To mdse, " " | 000 | 1892. June 15 " 30 July 6 " 30 | By cash, | \$100 150 200 800 |

2. Find the cash balance of the following account, Oct. 80th, 1892, at 6 % :

| 1892. | | | | MES FERGUSON. | Cr. |
|---|--|-------------------|--|---------------|-----------------------------------|
| Jan. 5 Feb. 12 Mar. 7 Apr. 15 May 9 | To mdse., 60 da. " 30 da. " " 60 da. " " 60 da. | 270 430 640 | 1892. Feb. 1 Mar. 80 Apr. 20 June 15 Aug. 1 | 44 44 * | \$300 250 200 800 400 |

Dr. J. S. CARSON in acct. with JAMES Fr

3. Find the cash balance of the same account at 8%.

4. Find the balance due Aug. 1st, 1892, at 8 %.

5. Find the balance of the same account due Jan. 1st, 1893, at 6%.

6. Find 1st, the balance of the following account; 2nd, when due by equation ; 3rd, cash balance due Jan. 1st, 1888, if money be worth 6% per annum. Prove the result.

| John | McMillan | & | Co. |
|------|----------|---|-----|
| | | | |

Dr.

Cm

| 1887. May 14 June 3 | To mdse. | , 1 mo. 60 da. | \$300 200 | 1887 May | | Ву | 2mo. note (no | |
|---------------------------|----------|-------------------|--------------|-------------|---|----|-------------------------------|-------|
| July 31 | " | 2 mos. | | July : | | | interest). 30 da. note (no | \$940 |
| | | | | 1888. | | | interest), | 150 |
| | | 4 | | Jan. | 1 | 66 | oash, | 100 |

ACCOUNTS CURRENT.

231

7. Find the cash balance due on the following account on the latest day of maturity, interest 6%:

| W. NICKLE. | Cr. |
|------------|------------|
| | W. NICKLE. |

| 1882. To md Mar. 30 To md Apr. 2 " July 16 " | se., 60 da. 90 da 60 da. | \$300 Mar 700 June 150 July | . 10 By mdse. | \$180 980 290 |
|--|--------------------------------|-----------------------------------|---------------|---------------------|
|--|--------------------------------|-----------------------------------|---------------|---------------------|

8. What sum in cash will settle the following account on Jan 1st, 1893, interest at 6%?

| Dr. | GEO. MILLS & CO. | Cr. |
|-----|------------------|-----|
| | | |

| 1892. Sept 14 Oct. 4 Nov. 11 Dec. 12 | " 60 da. | \$125.00 1892. \$125.00 Sept.30 416.50 Nov. 14 217.45 " 24 300.0.) " | | \$250 300 650 |
|--|----------|--|--|---------------------|
|--|----------|--|--|---------------------|

9. Find cash balance of the following account due July 21st, 1892, interest 8%:

| Dr. | | Tноs. | McKay. | , | Cr. |
|------------------------------------|-------|---------------------|-------------------------------------|------------------------------------|---------------------|
| 1892. May 22 " 29 June 10 | 61 16 | \$500 250 150 | 1892. May 25 June 9 July 2 | By cash, " sundries, " cash, | \$300 400 100 |

10. Find 1st, the balance of the following account; 2nd, when due by equation; 3rd, the cash balance due March 1st, 1889, if money be worth 5% per annum. Prove the result.

9 9 9

Dr

| <i>Di</i> . | | | D. 1 | 5. COOK. | | | Cr. |
|--|---------------------|---|-----------------------------------|---|---------|--|----------------------------|
| 1888. Aug. 31 Sept. 5 Oct. 31 Dec. 19 1889. Jan. 1 | By mdse., " " | 1 mo. 60 da. 4 mo. 30 da. 1 mo. | \$150 200 600 150 100 | 1888. Oct. 2 " 30 Dec. 1 1889. Jan. 25 | By " | 30 da. note (no interest), cash, 60 da. note (no interest), 1 mo acept. (no interest). | \$100 200 300 500 |

intertheir

Aug.

Cr.

)ct.

Cr.

250 200 300

st, id, 38,

r.

0

ACCOUNTS CURRENT.

11. Find cash balance due Jan. 1st, 1898, interest 6 % :

Dr.

J. BRADFIELD & Co.

| 1892. Oct. 10 | To mage do de : | | 1892. | | |
|------------------|----------------------------|---------------------|-----------------------------|-----------------|--------------|
| | " cash, " draft, 30 da. | \$150 350 250 | Aug. 25 Sep t. 20 | By mdse. 30 da. | \$500 350 |

12. Find the cash balance of the following account, due Nov. 3rd, 1893, interest 8%:

A. B. bought of C. D., July 16th, 1993, merchandise \$350; Aug. 11th, \$465; Sept. 9th, \$570; Sept. 14th, \$850; Oct. 18th, \$780. The former paid August 1st, \$860; Sept. 80th, in grain \$340; Oct. 5th, cash \$500; Oct. 21st, \$625.

18. Reduce the following memoranda to the form of an account, and find the cash balance due Jan. 1st, 1889:

Aug. 1st, 1888, A. bought goods of B. amounting to \$560; Aug. 26th, \$840; Sept. 21st, \$1,000; Oct. 12th, \$1,870; and Nov. 1st, \$600. A. sold B. Sept. 11th, 1888, wheat amounting to \$350; Oct. 1st, wool amounting to \$760; Oct. 81st, \$400 worth of butter; Nov. 16th, paid him \$1,000 cash.

14. What is the cash balance of the following account, Dec. 31st, 1889, at 7 %?

| 1889. | 11 | |
|---------------------------------------|----------|--------|
| Sept.10 Oct. 1 '' 23 Nov. 15 | 1,500.85 | 1 10 J |

Dr. S. MORGAN in acct with J. D. BISSONNETTE.

Cr.

Cr.

 $\mathbf{232}$

st 6 % :

Cr.

\$500 350

ıt, due

andise 14th, \$360; 21st,

of an):

5560; 870; vheat 760;

unt,

Cr.

ACCOUNTS CURRENT.

15. What is the cash balance on the following account, Jan. 10th, 1892?

| Dr. | W. R. | TELFORD | in | acct | with | A. | Т. | STEWART. | Cr. |
|-----|-------|---------|----|------|------|----|----|----------|-----|
| | | | | | | | | | |

| 1891. Aug. 4 " 20 Sept.10 " 24 | To sundries, 3 mos. """" """ | 1,050 | 1891. July 5 " 18 Aug. 11 " 18 | = , | \$685 840 960 800 |
|--|------------------------------------|-------|--|-----|----------------------------|
|--|------------------------------------|-------|--|-----|----------------------------|

16. Reduce the following transactions to the form of an account bearing interest at 6 %, and find the cash balance :

Feb. 11th, 1890, C. bought goods of D. amounting to \$1,250; March 14th, a bill of \$2,160; Apr. 10th, a bill of \$1,700; Apr. 30th, a bill of \$1,070; May 6th, a bill of \$2,000. March 1st, 1890, C. sold a bill to D. of \$1,640, March 20th, a bill of \$1,160; Apr. 15th, a bill of \$1,600; May 1st, a bill of \$1,340; May 21st, a bill of \$1,000. What was the cash balance June 10th, 1890?

17. What was the cash balance due July 20th, 1889, on the following account, at 7% interest?

Dr. C. W. HARRISON in acct with L. CONGDON.

Cr.

| 1889. Mar. 1 " 20 Apr. 10 May 21 | Z mos. | 750 | 1889. Apr. 5 " 20 May 1 " 22 | By mdse., 3 mcs. " 2 mcs. " 4 mcs. " cash, | \$350 900 620 200 |
|--|--------|-----|--|---|----------------------------|
|--|--------|-----|--|---|----------------------------|

STORAGE.

STORAGE.

403. Storage is a provision made for keeping goods in a warehouse for a time agreed upon, or for an indefinite time, subject to accepted conditions.

The term storage is used also to designate the charges for keeping the goods stored.

Rates of storage may be fixed by agreement of the parties to the contract, but are often regulated by Boards of Trade, Chambers of Commerce, or Warehouse Companies, and are estimated at a certain price per barrel, bale, bag, bushel, etc., per storage term.

404. A storage term is the number of days for which the storage is charged. The storage term is usually one week, 10 days, 20 days or 30 days. The rates of storage often vary for grains, or goods of different grades or values, and also on account of different modes of shipment.

405. Cash storage is a term applied to cases in which the payment of charges is made on each withdrawal or shipment, at the time of such withdrawal or shipment, notwithstanding the fact that the owner may still have goods of the same kind in store at the warehouse.

406. Credit storage is a term applied to cases in which sundry deposits or consignments are received, from which sundry withdrawals or shipments are made; and all charges adjusted at the time of final withdrawal.

407. A grain elevator is a building erected for the convenience of storing and shipping grain.

408. Storage receipts, especially of grains, are frequently bought and sold under the name of "warehouse receipts" or "elevator receipts," as representing so much value by current market reports.

Norg. -- When deposits or consignments, and withdrawals or shipments, are made at different times, debit is to be given for the amount of each

coods in definite

ping the

parties Trade. nd are bushel.

which ly one torage alues,

which al or ment. have

vhich hich all

the

fre-)use uch

ents. each

STORAGE.

deposit or consignment, from date to its final withdrawal or shipment, and credit given to the owner or consignor for each withdrawal or shipment, from date up to the time of settlement.

409. To find the average storage when goods have been received at different dates, but none delivered.

EXAMPLE. — There was received at a storage warehouse: Oct. 15th. 500 bbls. flour ; Oct. 24th, 120 bbls. apples ; Nov. 5th, 125 bbls. potatoes; Nov. 20th, 200 bbls. quinces; Nov. 24th, 340 bbls. apples. The merchandise was all delivered Dec. 12th. If the storage oharge was 4c. per bbl. for a period of 30 days average storage, what was the storage bill?

SOLUTION.

| These | | | | | | | | | | | | |
|------------------|------|-------|-------|-----|------|----|--------------------|-------|--------|--------|------|---|
| The storage of " | 500 | bbls, | for 5 | 8 (| davs | = | 29.000 | hhla | - | | | |
| ** | 120 | ** | 4 | 9 | | _ | | DDIS. | stored | for 1 | day. | |
| 66 | 125 | ** | - | | | _ | 5,880 | ** | ** | ** | | |
| " | | | | | " | = | 4.625 | "" | ** | ** | " | |
| | 200 | ** | 4 | 3 | " | = | 4,400 | " | " | " | | |
| 66 | 340 | 11 | 30 | R. | | | | | | | " | |
| | | | - | • | | - | 6,120 | | ** | " | 44 | |
| | | | | | | | 50,025 | hhla | stored | £ | | - |
| 50 | ,025 | bbls. | for 1 | đ | v = | 50 | $\frac{025}{10} =$ | 1 000 | | tor 1 | day. | |
| 1 (| 0.71 | | - | | ~ - | - | 30 = | 1,007 | bbls. | for 3(| dam | |

1,6671 bbls. @ 4c. a bbl. = \$66.70, storage bill. or 30 days

RULE.

Multiply the number of articles of each receipt by the number of days between the time of its deposit and withdrawal and divide the sum of these products by the number of days in the storage term. The quotient will be the average storage

EXERCISE 94.

1. There was received at a warehouse : May 15th, 2,500 bush. wheat; June 8th, 2,500 bush. oats; July 24th, 3,500 bush. barley; July 30th, 5,000 bush. corn. If all of this was shipped August 20th, what was the storage bill, the charge being 11c. per bushel per term of 30 days average

2. A farmer received for pasture: April 30th, 12 head of cattle; May 15th, 14 head of cattle; May 23rd, 27 head of cattle; June 9th, 5 head of cattle; June 30th, 8 head of cattle; July 16th, 40 head of cattle. All were delivered

STORAGE.

July 25th, and the charges wer 75c. per head for each week of 7 days' average pasturage. How much was his bill?

8. The following produce was received at a warehouse: Oct. 19th, 250 bbls. flour; Oct. 27th, 160 bbls. potatoes; Nov. 2nd, 240 bbls. apples; Nov. 24th, 60 bbls. onions; Dec. 6th, 180 bbls. flour. The merchandise was all delivered Dec. 8th. What was the clorage bill, the charge being $2\frac{1}{2}c$. per bbl. per term of 30 days?

410. To find the average storage when goods have been received and delivered at different times.

EXAMPLE.-- A warehouseman received and delivered the following:

| RECEIVED. | the rollowing: |
|---|--|
| Jan. 19, 300 bbls. Feb. 24, 200 " Mar. 8, 150 " | ⁶¹ DELIVERED. Feb. 9, 150 bbls. Mar. 18, 200 " Apr. 4, 150 " |
| Apr. 21, 400 " | May 7, 550 " |

What was paid for storage at 2c. a bbl., for a period of 30 days average storage, a settlement having been made May 7th ?

First Method.

SOLUTION.

From Jan. 19 to Feb. 9 = 21 da.; 300 bbl. stored for 21 da. = 6,800 for 1 da. Feb. 9 150 bbl. delivered. From Feb. 9 to Fcb. 24 = 15 da.; 150 bbl. rem'g for 15 da. = 2,250 Feb. 24.. 200 received. 68 From Feb. 24 to Mar. 8 = 12 da.; 350 bbl. stored for 12 da. = 4,200 Mar. 8.. 150 bbl. received. " From Mar. 8 to Mar. 18 = 10 da.; 500 bbl. stored for 10 da. = 5,000 Mar. 18 200 bbl. delivered. ** From Mar. 18 to Apr. 4 = 17 da; 300 bbl. stored for 17 da = 5,100 Apr. 4 150 bbl. delivered. 61 From Apr. 4 to Apr. 21 = 17 da.; 150 bbl. rom'g for 17 da = 2,550 Apr. 21 400 bbl. received. ** From Apr. 21 to May 7 = 16 da; 550 bbl. stored for 16 da = 8,800 May 7 550 bbl. delivered. Total 8,4200 bbl. for 1 day = 24200 = 1,140 bbl. for 80 da. / 84,200 " 1,140 bbl. @ 2c. a bbl. = \$22.80. Cost of storage.

for each was his

rehouse : potatoes; onions; was all e charge

ds have

following:

s average

for 1 da.

STORAGE.

RULE. 1. Multiply the number of barrels, bales, etc., by the number of days between the date of their receipt and the date of the next receipt or delivery ; add the number of articles of such next receipt, or subtract the number of such delivery, as the case may be, and so proceed to the time of the final delivery.

2. Divide the sum of the products thus found by the number of days in the storage term, and the quotient will be the Average Storage for that term.

Second method.

SOLUTION.

30 = 1,140.

1,140 bbl. @ 20. per bbl. = \$22.80. Cost of storage.

EXERCISE 95.

1. What will be the storage charge, at 4c. per bbl., for a term of thirty days average, on the following transaction? DELIVERED. 1889 .- June 12, 200 bbls., potatoes. 1889.-June 17, 75 bbls. potatoes. ** " 20, 155 " apples. 66 68 25, 125 66 44 July 18, 60 .. turnips. 18 46 80, 90 ** Aug. 2, 90 ** 44 apples. onions. 66 July 5, 60 " 6 **6** " 44 25, 40 turnips. 64 ** Aug. 9, 20 " ** ... " 15, 90 2. What will be the storage charge, at $4\frac{1}{2}c$. per bbl., for a term of thirty days average, in the following t

| BECEI | | | WING [| transaction? |
|-------|-----------|-------------------------------|---------------------------|--------------------------|
| 44 | " apples. | 1889Mar. " " 2 " Apr. 1 | 1, 100 8, 190 5, 60 | bbls. apples. "flour, |

288

STORAGE.

8. What is the storage on the following account to Dec. 81st, 1889, at $2\frac{1}{2}c$. per bbl., for 30 days ?

| | RECEIVE | | | DELIVERED. | | | | | |
|-------|---------------|-------|-------|--------------------------------|--|--|--|--|--|
| 1889. | -Aug. 17, 250 | bbls. | mdse. | 1889.—Aug. 23, 200 bbls. mdse. | | | | | |
| " | " 25, 90 | | ** | " Cant OF GIG | | | | | |
| 6. | Sept. 19, 200 | | 44 | 11 Oct 10 000 | | | | | |
| " | Oct. 12, 800 | ** | ** | H Man 00 the | | | | | |
| ** | Nov. 18, 200 | 66 | | | | | | | |
| ** | Dec. 17, 400 | ** | 66 | " Dec. 25, 550 " " | | | | | |

411. To find the Cash Storage on goods received and delivered at different dates, when charges vary.

EXAMPLE.—At a warehouse there was received and delivered merchandise as follows :

| RECEIVED. | |
|-------------------|--|
| Jan. 3, 150 bbl. | |
| Jan. 20, 200 bbl. | |
| Feb. 1, 300 bbl. | |

DELIVERED. Jan. 23, 250 bbl. Mar. 1, 400 bbl.

How much must be paid for storage on the above, at the rate of 5c. per bbl. for the first 10 days, or part thereof, and 3c. per bbl. for each subsequent 10 days, or part thereof?

SOLUTION.

 Dats.
 Receipts and Deliveries.

 Jan 8, received 150 bbl.

 " 20, " 200 "

 350 bbl. in store.

 Jan. 23, delivered 250 bbl. {150 bbl. stored 20 da. or 2 terms, 80. = \$12.00

 100 bbl. remaining.

 Feb. 1, received 300 bbl.

 400 bbl. in store.

Mar. 1, delivered 400 bbl. $\begin{cases} 100 \text{ bbl. stored 40 ds. or 4 terms, 14c. = $14.00 \\ 300 & 28 & 3 & 11c. = $39.00 \end{cases}$

Total cost of storage. \$64.00

at to Dec.

ls. mdse.

64

•

44

received vary.

delivered

bove, at thereof, or part

= \$12.00 = 5.00

\$14.60 39.00 \$64.00

STORAGE.

205

EXERCISE 96.

1. How much must be paid for storage on the following account at the rate of 5 cents per bbl. for the first 10 days, or part thereof, and 8 cents per bbl. for each subsequent, 10 days, or part thereof?

| RECEIVED. | |
|---------------------------------------|---|
| 1889May 7, 350 bbl. flour. | DELIVERED. |
| " " 26, 150 " " " June 15, 200 " " | 1869.—May 26. 250 bbl. flour. "June 1, 100 " " " 9, 100 " " |
| | ⁶⁶ ⁶⁶ 80, 250 ⁶⁶ 61 |

2. The receipts and deliveries at a certain warehouse on the following account were as follows :

| RECEIVED. | | |
|---------------------|--------|----------------------------|
| 1889June 20, 350 bb | . nork | DELIVERED. |
| Aug. 1, 250 " | | 1889July 10, 90 bbl. pork. |
| " " 25, 100 " | 66 | Aug. 15, 100 " " |
| " Sept. 12, 90 " | ** | " " 25, 250 " " |
| | | " Sept. 10, 50 " " |

What was the total storage paid, the rate being 5 cents per bbl. for the first 10 days, and 3 cents for each subsequent 10 days, or part thereof?

8. Find the cash storage on the following storage account :

| RECEIVED. | e ange weeden |
|------------------------|--------------------------------|
| 1889 Sept. 2, 100 bbl. | DELIVERED. |
| •• " 25, 200 •• | 1889.—Sept. 20, 100 bbl. |
| " Oct. 19, 350 " | 30, 100 " |
| " " 81, 150 " | " Oct. 10, 100 " |
| " Nov. 7, 200 " | " " 20, 100 " " " 30, 100 " |
| he contract | " Nov. 20, the remainder. |

The contract required the payment of 6c. per bbl. for the present term of 80 days or fraction thereof, and 8c. per bbl. for each subsequent term of 80 days or fraction thereof.

MISCELLANEOUS.

EXERCISE 97.

1. The interest on \$1,805, loaned on May 13th, at 51 % per annum is \$37.905; on what day was the money

2. A sum of money at simple interest has in four and one-half years amounted to \$735, the rate of interest being 5 per cent. per annum; what was the sum at first, and in how many years more will it amount to \$1,140?

8. I am offered a house that rents for \$27 per month, at such a price that, after paying \$67.20 taxes, and other yearly expenses amounting to \$24.85, my net income will be $8\frac{1}{2}$ % on my investment. What is the price asked for

4. In order to engage in business, I borrowed \$3,750 at 6%, and kept it until it amounted to \$4,571.25. How long did I keep the money?

5. October 12th, 1889, I purchased 2,700 bushels of wheat, at \$1.05 per bushel, and afterwards sold it at a profit of 6%. On what date was the wheat sold, if my gain was equivalent to 10 % interest on my investment?

6. December 11th, 1888, a lumber dealer borrowed money and bought shingles at \$4.50 per M.; September 17th, 1889, he sold the shingles and paid his debt, and 8 %interest, amounting to \$3,462.60. How many thousand shingles did he buy?

7. I loaned a bridge builder \$17,500 for seven years, at 10% per annum, compound interest payable quarterly, and took a bond and mortgage to secure the debt and its interest. Nothing having been paid until the end of the seven years, how much was required in full settlement?

8. Harry is ten, and Fred seven years old. If 7 % compound interest investments can be secured by their father, for what amounts must such investments be made in order that at the age of twenty-one the boys may each have

9. The day Charles was six years old, his father deposited for him in a savings bank such a sum of money that, at 4% interest, compounded quarterly, there will be \$7,500 to his credit on the day he attains his majority. What sum

10. Having purchased July 15th 1,150 barrels of pork, at \$16 per barrel, on four months' credit, the dealer, thirty days later, sold it at \$17.50 per barrel, receiving therefor a six months' note without interest. When the purchase money became due, he discounted the note on a basis of 7 %, and paid his debt. How much was gained ?

11. I loaned a friend a sum of money for nine months, at 6% per annum, and when the loan was due he paid \$851.50 in cash, which was 75% of the amount due me; the remainder was paid six months, fifteen days later, with interest at the rate of 10%. Find the amount paid at final settlement.

12. Having bought a mill for \$12,000, I paid cash \$4,000 on delivery, and gave a bond and mortgage for eight years without interest to secure the balance; to secure the interest, which was to be paid semi-annually, at the rate of 7% per annum, I gave sixteen non-interest bearing notes, without grace, for \$280 each, one maturing at the end of each six months for the eight years. If the four of the notes first maturing were paid when due, and no other payment was made until the mortgage became due, how much was required for full settlement?

13th, at 54 % the money

n four and of interest um at first, ;1,140?

r month, at and other ncome will asked for

\$3,750 at How long

ushels of d it at a my gain 2

porrowed ptember and 8% housand

ears, at ly, and nterest. years.

18. The discount on \$566.50 for nine months is \$16.50: find the rate of interest.

14. Bought 5,000 bushels of wheat at \$1.25 a bushel, payable in six months; I immediately realized for it at \$1.20 cash, and put the money out at interest at 10 %. At the appointed time I paid for the wheat; did I gain or lose . by the transaction, and how much ?

15. Jones loaned \$2,400 at 6% simple interest, until it

amounted to \$3,000. For what time was the loan made? 16. A man invested \$16,000 in business, and at the end

of three years, three months, withdrew \$22,880, which sum included investment and gains. What yearly per cent. of interest did his investment pay?

17. Sold an invoice of crockery on two months' credit; the bill was paid three months, eighteen days, after the date of purchase, with interest at 8 %, by a check for \$1,963.45. How much was the interest?

18. A bond, bearing interest at 8 %, and dated May 1st, 1881, was settled in full November 16th, 1889, by the payment of \$17,685. For what face amount was the bond

19. What sum will be due January 18th, 1892, on a debt of \$5,100, dated March 17th, 1885, bearing interest at 7 % per annum, payable semi-annually, if the first five payments were made when due and no subsequent payments

20. A merchant sold a stock of glassware on one month's credit; the bill was not paid until three months, twentyone days after it became due, at which time the seller received a draft for \$4,716.21 for the bill, and interest thereon at the rate of 5%. Find the selling price of the

is \$16.50 :

at \$1.20 At the or lose

t, until it n made ?

the end , which arly per

credit; the date 963.45.

y 1st, e paybond

a debt at 7 % paynents

nth's entyeller erest the

MISCELLANEOUS.

21. A tradesman who is ready to allow 5 % per annum, compound interest, for ready money, is asked to give credit for two years. If he charged \$110.25 in his bill, what ought the ready money price to have been?

22. A speculator borrowed \$6,250, at $7\frac{1}{2}$ % interest, and with the money bought a note, the face of which was \$7,500, maturing in nine months without interest, but which was not paid until two years from the date of its purchase. If the note drew 6 % interest after maturity, did its purchaser gain or lose, and how much?

23. A jobber bought 6,000 yards of Axminster carpet, at \$2.80 per yard, payable in six months, and immediately sold it at \$3.15 per yard, giving a credit of two months; at the expiration of the two months he anticipated the payment of his own paper, getting a discount off of 10 % per annum. How much did he gain by the transaction?

24. On the 20th of March, 1889, I borrowed \$13,500, at 5% interest; on April 5th, I loaned \$5,000 of the money until December 20th, 1889, at 8%; April 15th, I purchased with the remainder a claim for \$10,000, due August 1st, but which. not being paid at maturity, was extended until the \$5,000 became due, at the rate of 6%. How much did I gain, both claims having been paid on the day the loan of \$5,000 became due?

25. Find the present worth of \$842.70 for two years at 6%, compound interest.

26. If \$20 be allowed off a bill of \$420 due in six months, how much should be allowed off the same bill due in twelve months, reckoning true discount?

27. If \$15 be the interest on \$115 for a given time, what should be the true discount off \$115 for the same time?

28. If \$10 be allowed off a bill of \$110 due eight months hence, what should be the bill from which the same sum is allowed as four months' discount?

29. How much may be gained by hiring money at 5% to pay a debt of \$6,400, due in eight months, allowing the present worth of this debt to be reckoned by deducting 5% per annum discount?

30. The discount on a certain sum due nine months hence is \$20, and the interest on the same sum for the same time is \$20.75. Find the sum and the rate of interest.

31. Having bought goods to the amount of \$2,431.80 cash, I gave my 60 day note in settlement. If discount be at 7 %, what should have been the face of the note?

32. A note dated September 1st, 1889, payable in 90 days, with interest at $7\frac{1}{2}$ %, was discounted twenty-one days after date, at 10%. If the proceeds were \$690.52, what must have been the face?

33. If, on a note made for \$700, bearing interest at 6%, and dated January 1st, 1889, \$50 is paid on the first of every month, commencing February 1st, following the date, what is due January 1st, 1890?

34. F. J. Ramsay & Co. bought goods of John Hope & Co. as follows: July 1st, \$150, at three months; July 20th, \$200, at four months; August 16th, \$300, at two months; and October 4th, \$250 at four months. Find the equated time of payment, and what would be due on the account March 15th following, at 6% interest.

35. I owe \$480 payable in ninety days, and \$320 payable in sixty days. My creditor consents to an extension of time to one year, and offers to take my note for the

whole amount on interest at 6% from the equated time, or a note for the true present worth of both debts, on interest from date. How much will I gain if I choose the latter condition?

86. I sell goods to A. at different times, and for different terms of credit, as follows :

| Sept. 12, 1859, a b | oill on thirty days' | oredit, for | \$180 |
|---------------------|----------------------|-------------|-------|
| Oct. 7, " ' | | 41 | 300 |
| Nov. 16, " " | sixty | 46 | 150 |
| Dec. 20, " " | ninety | 46 | 850 |
| Jan. 25, 1860, " | thirty | 66 | 130 |
| Feb. 24, " | v | " | 140 |

If I take his note in settlement; at what time should interest commence?

87. A person owes \$850, due in three months, and \$750, due in six months; but at the end of two months he pays \$200, and three months afterwards, \$500. When is the remainder due?

38. A note for \$1,000, dated April 1st, 1889, payable on demand, with interest at 7%, bears the following endorsements: May 6th, \$200; July 5th, \$225.87; October 18th, \$322. What is due January 1st, 1889?

39. Bought goods to the amount of \$10,000, of which \$2,000 was to be paid in one month; \$2,000 in two months; \$4,000 in three months, and the balance in six months. If a note is given for the whole amount, how long should it run?

40. Four notes, made by J. Simpson, and payable as follows: \$560, due September 10th, 1888; \$800, due October 15th, 1888; \$1,100, due December 1st, 1888; \$900, due February 1st, 1889, were exchanged for a single note. When will it fall due?

nths n is

to the 5%

nce ime

sh,

iys, fter .ust

3 %, t of ate,

Co.)th, ns; ted unt

ayion th**e**

41. As a May has given three notes; one for \$300, due May 1st; one for \$350, due June 15th; and one for \$550, due August 1st. Desiring to exchange them for two notes of \$600 each, he makes one payable June 15th; when should the other fall due?

42. Bought a bill of goods amounting to \$1,200, on six months' credit. Paid cash on account \$100; at the end of three months paid \$300 more; and two months afterwards paid \$400, giving a note for the balance. For what time was the note drawn?

48. A note for \$835.25, dated July 1st, 1838, payable on demand, with interest at $6\frac{1}{2}$ %, bears the following endorsements: August 20th, \$157.50; September 21st, \$180.25; October 5th, \$200; December 1st, \$80. What is due January 1st, 1889?

44. On a bill of goods bought March 1st, amounting to \$1,500, on eight months' credit, the following payments were made: May 1st, \$350; August 1st, \$500; September 1st, \$150. What is the equated time for the payment of the balance?

45. A note for \$618.75, dated April 17th, 1888, payable on demand, bears the following endorsements : June 5th, \$126.50; August 20th, \$127.°5; November 17th, \$210. What is due January 1st, 1889, reckoning interest at 6 %?

46. Bought of A. T. Stewart & Co., the following bills of goods on five months' credit: February 10th, 1888, \$900; March 15th, 1888, \$2,000; May 10th, 1888, \$750; June 12th, 1888, \$2,000. Find the present worth of a note drawn July 1st, in payment of the whole, discounted at 6 %.

47. Bought goods at different dates, as follows :

11

| Aug. 15, | amounting | to | \$475, | on | 6 | months' | credit. |
|-----------|-----------|----|--------|----|---|---------|---------|
| Sept. 10, | 46 | | 600, | | | " | |
| Oct. 5, | 66 | | 750, | " | 4 | ** | |
| Nov. 1, | " | | 450, | 66 | 8 | " | |

What sum will equitably discharge the whole debt November 10th, allowing true discount at 7%?

48. Purchased merchandise of W. Duncan & Co., as follows:

Jan. 1, a bill amounting to \$375.50, on 4 months' credit.

| Jan. 20, | •• | 168.75. | 5 | 65 |
|----------|----|---------|---|------------|
| Feb. 4, | ** | 386.25, | 4 | 6.6 |
| Mar. 11, | " | 144.60, | 5 | ÷ 1 |
| Apr. 7. | " | 386.90, | 3 | 6 ± |

What is the present worth of a note made May 1st, in payment of the whole, discounted at 6%?

, due \$550, lotes when

a six end ftervhat

e on rse-25 ; due

to ts oer of

le h, 0. ,? ls

З, ; а

d

PERCENTAGE.

PERCENTAGE.

STOCKS.

412. Stocks represent the capital or property of incorporated companies.

413. An **Incorporated Company** is an association authorized by law to transact business, and having the same *rights* and *obligations* as a single individual.

414. A Share is one of the equal parts into which the capital stock of a corporation is divided.

Norg.—The par value of a share varies in different companies. It is usually \$100, and will be so regarded in this work unless otherwise stated. Shares of \$50 and \$25 are called half-stock and quarter-stock respectively.

415. A Certificate of Stock is a paper issued by a corporation specifying the number of shares to which the holder is entitled, and the par value of each share.

416. The par value of a stock is the sum named in the certificate.

417. The Market Value of stock is the sum for which it can be sold.

Nors.-When shares sell for their nominal value, they are at par; when they sell for more, they are above par, at a premium, or at an advance; when they sell for less, they are below par, or at a discount.

When stocks sell at part hey are quoted at 100; when at 5% above par they are quoted at 105; when at 10% discount they are quoted at 90.

418. A Dividend is a sum divided among the stockholders from the net profits of the company, and is a certain percentage computed on the par value of the stock.

Note.-Companies sometimes declare a Sorip Dividend, entitling the holder to the sum named payable in stock at par value.

incor-

iation g the

h the

It is stated. tively.

the

n the

hich

par; t an ount. par

ocksa

ck.

STOCKS.

419. A **Preferred Stock** is one which is entitled annually to a stated per cent. dividend out of the net profits before the *common* stock dividend is declared.

420. A Stock Broker is one who buys and sells stocks for others, on a commission called brokerage which is always a certain percentage computed on the par value of the stock purchased or sold.

421. A Stock Jobber is one who buys and sells stocks on his own account.

422. An Instalment is a payment of part of the capital.

423. An Assessment is a sum required of stockholders to meet the losses or the business expenses of the company.

424. The Gross Earnings of a company are its entire receipts from its ordinary business.

425. The Net Earnings is the remainder after all expenses are deducted.

426. A Bond or Debenture is a written agreement to pay a sum of money, with a fixed rate of interest, at or before a specified time. The term is applied to the Dominion, Provincial, County, Township, City, Town, Village, Railroad Bonds, etc.

Note.--Bonds or Debentures are named from the corporations who issue them, the rate of interest they bear, the date at which they are payable or from a combination of any of these.

Bonds are also known, First Mortgage, Second Mortgage, etc., Income Bonds, Consols, Sinking Fund, etc.

427. Coupon Bonds are those having small certificatee attached representing the different instalments of interest payable at the times specified, and which are to be cut off when paid, as a receipt.

Nore.—1. Bonds are also issued without coupons, in what is known as • the registered form. In t. s case the bond is only payable to the registered owner, or his assignce, and the interest is paid by cheque or in cash to the owner or to his attorney.

STOCKS.

2. Bonds are sometimes issued with coupons attached payable to bearer, but the principal of which may or may not be registered at the choice of the owner.

423. The principal United States government bonds are the $4\frac{1}{2}$'s of 91, redeemable at the option of the government after Sept. 1st, 1891; 4's of 1907, redeemable at the option of the Government after July 1st, 1907; Refunding Certificates of the denomination of \$10, bearing interest at 4%, and convertible at any time with accrued interest, into 4% bonds; Currency 6's, issued to aid in the construction of Pacific railroads, payable in thirty years after date, and maturing at different dates from 1895 to 1899.

Consols are the leading funded securities of the English Government, bearing 3 % interest, payable half-yearly, and redeemable only at the pleasure of the Government.

The funded debt of France bears the title of Rentes, bearing usually, interest at the rate of 5%

The German Empire has a funded debt bearing 4% interest, known as 4%, Imperial bonds.

The funded debt of Austria is known as the Austrian Consols, the largest part of which bears 5% interest.

Russia has a debt which bears a nominal interest of 5%, or $5\frac{1}{2}$ %. The bonds are known as Oriental Loans, and are below par.

The bonds in Italy are cailed Rentes, and bear interest of 3%, or 5%.

yable to d at the

bonds overnat the inding interest terest, in the years 95 to

ıglish y, and

ntes,

g 4%

trian

5 %, and

erest

STOCK EXCHANGE.

429. Stock Exchanges are associations organized for buying and selling stocks, sonds, and other similar securities.

430. Quotations are usually made at so much per cent. on the basis of a par value of \$100 per share.

431. Stocks are usually bought or sold either "cash," "regular way," "seller three," "buyer three,"

Note.—1. A stock sold "cash" is deliverable the day sold, a stock sold "regular way" is deliverable next day, or if bought "regular way" is to be paid for the next day. "Seller three" means deliverable on either of three days at the option of the seller. "Buyer three" means the buyer can demand delivery within three days, but must take and pay for it the third day.

2. Quotations are termed "flat" when the accrued interest is included in the price named.

3. Transactions on any of the above terms carry no interest.

4. If the option is over three days, interest on the selling value of the stock is paid by the buyer to the seller.

5. One day's notice is required of intention to terminate an option of a longer period than three days.

6. Should the stock pay a dividend during the pendency of a contract, the dividend belongs to the purchaser of the stock, unless otherwise previously agreed.

432. Margin is each or other security deposited with a broker on account of either the purchase or sale of securities, and to protect the oroker against loss, in case the market price of the securities, bought or sold, varies so as to be against the interests of the customer. It is usually 10% of the par value of the stock.

2. The margin deposited with the broker is simply to protect the broker against losing any money should the stock move in the wrong direction. In case of the stock so doing, the margin must be made good by the deposit of an additional amount, otherwise the broker will sell the stock to protect himself from losing any of the money he has advanced It is usually 10% of the par value of the stock.

433. 1. A Bear is an operator who is "short" of stock. He wishes to buy at a lower rate, and tries to depress the price of the stock of which he is "short."

2. A Bull is an operator who is holding stock for an advance. He is said to be "long" of stock. Bulls try to advance the price of the stock of which they are "long."

3. Collaterals. Stocks, bonds, notes, or other value given in pledge as security, when money is borrowed.

4. Hyphothecating Stocks and bonds, is depositing them as collaterals.

5. B. C. "between calls." The sale not taking place on the call of the stock but after the first call and before the second call.

6. Short. When one has sold stock which he does not own hoping to realize a profit by buying it at lower prices, he is said to be "short."

7. A "Put" is a contract which secures to the holder the privilege of delivering to the person named therein a number of shares of stock at a specified price per share, within a limited time (usually thirty days), without the obligation to deliver it. The holder of a "put" is not required to pay interest.

8. A "Call" is a contract which secures to the holder the privilege of buying a number of shares of stock at a specified price, within a limited time without the obligation to purchase it. The holder of the "call" must pay interest on the purchase price of the stocks to the day of delivery.

o protect the in the wrong made good by will sell the as advanced

" of stock. press the

ck for an ills try to long."

er value wed.

epositing

place on ofore the

loes not prices,

bolder erein a share, out the equired

holder k at a gation interay of

STOCK EXCHANGE.

9. A "Spread" is a contract which secures to the holder the privilege of either buying or selling within a limited time, a number of shares of stock, at a specified price. without the obligations of taking or delivering it.

10. A "Straddle" is a contract which secures to the holder the privilege of either buying or selling, within a limited time a number of shares of stock, not only at the price mentioned in the contract, but, also at the market price of the stocks at the date the privilege was purchased.

11. Puts, Calls, Spreads and Straddles, are privileges not recognized by the Stock Exchange.

12. Cover, to "cover one's shorts." Where stock has been sold short and the seller buys it in to realize his profit or to protect himself from loss, or to make his delivery, he is said to be "covering short sales."

13. Ex.-Div. or Ex.-Dividend. When the price of stock does not include, and the stock does not carry to the buyer a recently declared dividend.

14. Difference. When the price at which a stock is bargained and the price of the stock on the day of delivery are not the same, the broker against whom the variation exists, frequently pays the "difference" in money, instead of furnishing or receiving the stock.

15. Watering Stock is increasing the number of shares of an incorporated company without a corresponding increase of their value. This is usually done in the re-organization of a railroad or in the consolidation of two or more railroads.

16. A "Corner" is produced when one or more operators owning or controlling all the stock of a company are able to purchase still more for either immediate or future delivery, from one who is "short." When they demand the stock, the sellers are unable to find it in the market.

ł

17. Brokerage. The usual brokerage for buying and selling stocks is $\frac{1}{2}$ %, and is calculated on the par value of

434. Given number of shares, the par value of a share. To find the stock, or vice versa.

EXAMPLE 1.-What amount of stock is represented by 40 shares of Bank of Montreal stock, par value \$200 per share?

SOLUTION.

40 shares at \$200 each = $$200 \times 40 = $8,000$ stock.

EXAMPLE 2.—How many shares, par value \$200 each, are represented by \$8,000 Bank of Montreal stock?

SOLUTION. \$200 = value of 1 share.

.: \$8,000 = " " 8000 = 40 shares.

EXAMPLE 3. - What is the par value of a share, when 40 shares of Bank of Montreal stock represent \$8,000 stock?

SOLUTION.

40 shares represent \$8,000 stock

: 1 share represents agon = \$200 stock.

EXERCISE 98.

What amount of stock is represented by-

| 1. | 120 | shares | Western | Agginnon | | 5 | |
|----|-----|--------|----------|-------------------------|-----------|----------|--------|
| 2. | 60 | 66 | Bank of | Assurance, Montreal, | par value | \$40 per | share? |
| 3. | 200 | 44 | | - Cler | " | \$200 | 44 |
| 4. | 150 | 66 | 44 | Toronto, | " | \$200 | ** |
| 5. | 175 | ** | " | Commerce, | 66 | \$50 | 66 |
| 6. | 240 | 46 | | Hamilton, | " | \$100 | 46 |
| 7. | 98 | " | Imperial | Bank, | 66 5 | \$100 | 66 |
| | 75 | | Dominio | n Bank, | 66 | \$50 | 44 |
| | | • | Standard | Bank, | . " | \$50 | |

Find the par value of a share when-

| 9. | 40 | share. | Imperial Bonk | | | |
|------|-----|--------|--|---------|----------|---------|
| 10. | 75 | - 14 | s Imperial Bank rej Merchants' Bank | present | \$4,000 | stock ? |
| 11. | 90 | +6 | Ontario Bank | 66 | \$7,500 | 44 |
| 12. | 120 | ** | | ** | \$9,000 | |
| | 800 | ** | Standard Bank | 66 | \$6,000 | 44 |
| 14. | 70 | " | Western Assurance | Co. | \$12,000 | 44 |
| 15. | 80 | | Imp. S. & Invest. | ** | \$7,000 | 44 |
| 16. | | | B. & L. Association | ** | \$2,000 | 4 |
| -LU. | 110 | ., | Dominion Telegraph | 1 " | \$5,500 | 4 |
| | | | - | | | |

ying and value of

ł

ue of a

shares of

ck.

presented

shares of

STOCK EXCHANGE.

How many shares are represented by--

| 17. | \$8,500 | stock | Merchants' Bank, par | · . | |
|-----|---------|-------|------------------------|-----|--------|
| 18. | \$9,600 | ** | Bank of Montreal, | | |
| | \$7,525 | | Lon & Can T a | 61 | \$200 |
| | \$2,640 | ** | Lon. & Can. L. & A., | 61 | pu0. |
| | \$3,150 | " | Western Assurance Co., | | \$40. |
| | \$3,175 | | Bank of Toronto, | 61 | \$200. |
| 23. | | | B. & L Association, | 44 | \$25. |
| | ~ 10 | | North-West Land Co., | 61 | £5. |
| 44. | \$6,400 | " | Imperial Bank, | | \$100. |

435. To find the cost price or selling price of any number of shares, the market value of the shares being given, and vice versa.

EXAMPLE 1.- What is the cost of 60 shares of Bank of Co. merce Stock at 121 %, brokerage 1 % ?

EXAMPLE 2.-What will be received as proceeds of a same of 60 shares of Bank of Commerce Stock at 121%, brokerage 1 %?

SOLUTION.

Selling price 1 share = $\$121 - \$_{1}^{2} = \$120_{1}^{2}$ " 60 shares = $\$120_{1}^{2} \times 60 = \$7,245$.

EXAMPLE 3.—If 60 shares of Bank of Commerce Stock cost \$7,275, find the market value, brokerage 1 %.

SOLUTION. 60 shares cost \$7,275

: 1 share costs $\frac{7,275}{60} = $121\frac{1}{2}$

\$1211 - \$1 brokerage = \$121 = market value.

EXAMPLE 4.- If 60 shares Bauk of Commerce Stock sold for \$7,245, find the market value of the stock, brokerage 1%.

SOLUTION.

60 shares sold for \$7,245

: 1 share sold for $\frac{\$7,245}{60} = \1203

\$1203 + \$1 brokerage = \$121 = market value.

EXAMP. 5.—How many shares Bank of Commerce Stock at 121 can be bought for \$7,275, brokerage $\frac{1}{2}$ %

SOLUTION.

Cost of 1 share = $$121 + $1 = $121_{\frac{1}{2}}$ \$7,274 ÷ \$121_{\frac{1}{2}} = 60 shares. Ans.

EXAMPLE 6 .- How many shares Bank of Commoroe Stock at 121 must I sell to realize \$7,245, brokerage 1 %?

SOLUTION.

Receipts from sale 1 share = $\$121 - \$\frac{1}{4} = \$120\frac{3}{4}$ \$7,245 ÷ 1203 = 60 shares. Ans.

EXERCISE 99.

Find the amount of cash required to purchase-

| 1. 2. 3. 4. 5. 6. 7. 8. | 70 60 120 300 45 90 110 36 | MAR. VAL. 110 75 35 140 220 206 105 80 | BROK. 1 %. 1 %. | 9. 13 10. 4 11. 134 12. 200 13. 76 14. 170 15. 800 16. 360 | $\begin{array}{c} & 117_{\frac{1}{2}} \\ 6 & 87_{\frac{1}{2}} \\ 0 & 93_{\frac{1}{2}} \\ 0 & 75_{\frac{1}{2}} \\ 5 & 86_{\frac{3}{2}} \\ 0 & 122_{\frac{3}{2}} \\ 0 & 264_{\frac{1}{2}} \end{array}$ | BROK. 1 %. 1 %. |
|--|---|--|---|---|--|---|
|--|---|--|---|---|--|---|

Find the cash received from the sale of-

| | SHARES. | MAB. VAL. | | | | | |
|--|---------|--|--|--|---|--|---|
| 17. 18. 19. 20. 21. 22. 23. 24. | | 96 47 135 120 110 80 84 120 | BROK. + %. + %. + %. + %. * * %. * * * * * * * * * * * * * * * * * * * | 25. 26. 27. 28. 29. 30. 81. 32. | SHARES, 200 48 120 36 45 160 240 60 | MAR. VAL. 1103 2234 2608 1504 754 878 1454 753 | BROK. 1 %. 1 %. |
| | | | | | | | |

Find the market value of the slock when-

| | SHARI | ES. | | BROE. | | | - which | | |
|--------------------------|----------------------|------|------------------------------------|-------------------|----------------------------------|-------------------------|----------------|------------------------------|-------------------|
| 88. 84. 85. 36. | 30 40 50 60 | cost | \$3,615 2,405 3,795 7,215 | +%. ±%. ₹%. | 41. 42. 4 3. | 8HAR 70 84 100 | sold for "' | \$5,600 6,720 7,525 | 1% |
| 37. 38. 39. | 80 120 360 | | 6,410 14,520 25,245 | ま %. ま %. | 44. 45. 46. | 60 48 56 | 56 66 64 | 4,890 3,858 3,962 | 1%. 1%. 1%. |
| 40. | 90 | ** | 6,750 | ₩%. ₩%. | 47. 48. | 75 80 | 44 44 | 4,500 ^{-/} 7,270 | ₹%. 1%. |

.

256

Stuck at 121

STOCK EXCHANGE.

How many shares may be bought for-

| 49. | COST. \$13,155 | MAR. VAL. | | | COST. | MAR. VAL. | BROK. |
|-------------------|--------------------------------|--------------------------------------|-------------------|--------------------------|---|-----------------------|-------|
| 50. 51. 52. | \$9,760 \$5,610 \$13,620 | 225 121 3 140 85 | ₹%. ₹%. ₹%. | 53. 54. 55. 56. | \$1,923 \$3,850 \$12,025 \$4,134 | 80 96 240 86 | *%. |
| | | 60 | \$ %. | 56. | \$4,134 | 86 | 1%. |

How many shares must be sold to realize-

| | S. P. | MAR. VAL. | BROK. | | | | | |
|------------------------|---|--|--------------------------|-------------------|---|-------------|----------------------------|--|
| 57. 7 59. 60. | \$8,505 \$10,245 \$4,314 \$4,350 | 121 <u>4</u> 85 <u>1</u> 90 87 1 | 1%. 1%. 1%. 1%. | 62. 63. | s. p. \$19,755 \$2,400 \$8,336 \$10,548 | 96‡ 130‡ | BROK. 1%. 1%. 1%. | |
| | | | | | | 110 | 1%. | |

436. Given the number of shares or amount of stock held and rate per cent of dividend, to find income, or

EXAMPLE 1.- What income will be derived from 60 shares G. T. R. Stook paying 6 % dividends?

SOLUTION.

Income from 1 share is \$6 60 a res is \$6 × 60 = \$360. 6.6

EXAMPLE 2.-What would a stockholder, who owns \$4,000 Bank of Commerce Stock, receive from a 5 % dividend?

SOLUTION.

\$4,000 stock = 40 shares 40 shares at \$5 income per share = \$200.

EXAMPLE 3 .--- What number of shares does a person hold who receives \$300 income, from a 6 % dividend ?

SOLUTION.

\$6 income is derived from 1 share .: \$300 66 ...

 $300 \div 6 = 50$ shares.

EXAMPLE 4 .-- What amount of stock must be held to obtain \$200 income from a 4% dividend ?

SOLUTION.

\$4 income is derived from 1 share

: \$200 +6 64 200 ÷ 4 = 50 shares. $50 \text{ shares} = 50 \times 100 = $5,000 \text{ stock}.$

257

BROE. 1%. 1%.

2

1% 1%.

%.

ROE.

10,00

K.

EXAMPLE 5.-What is the rate per cent. dividend when 40 shares

SOLUTION.

40 shares yield an income of \$240

: 1 share yields an income of \$6

: rate per cent, dividend is 6 %.

EXAMPLE 6.-\$300 income is derived from \$3,750 stock; find the rate per cent. of dividend.

SOLUTION.

\$3,750 stock = 87¹/₂ shares 87¹/₂ shares yield an income of \$300

 \therefore 1 share yields an income of $\frac{300}{87\frac{1}{2}} =$

.

. rate per cent. dividend = 8%.

EXERCISE 100.

What income will be derived from-

| | SHARES. | DIV. | 1 | SHARES. | DIV. | | SHARES. | - |
|----------------------|------------------------|----------------------------|----------------------|-------------------------|--------------------------------|-------------------------|---------|--|
| 1. 2. 3. 4. | 70 120 150 65 | 6%. 54%. 41%. 8%. | 5. 6. 7. 8. | 120 110 75 126 | 3 %. 81 %. 9 %. 81 %. | 9. 10. 11. 12. | | DIV. 51 %. 6 %. 7 %. 81 %. |

What income will be derived from-

| 18. 14. 15. 16. | втоск. \$5,000 \$8,750 \$4,400 \$3,620 | DIV. 7 %. 3 %. 4 %. 5 %. | 17. 18. 19. 20. | втоск. \$3,600 \$4,500 \$9,150 \$4,375 | DIV. 6 %. 91 %. 51 %. 8 %. | 21. 22. 23. 24. | STOCK. \$4,100 \$2,225 \$4,520 \$3,200 | DIV. 54 %. 8 %. 84 %. 6 % |
|--------------------------|--|--------------------------------------|--------------------------|--|--|--------------------------|---|---------------------------------------|
| | | | | *-,010 | 0 %. | 24. | \$3,200 | 6%. |

What number of shares and what stock must be held to obtain-

40 shares

find the

Ŵ

STOCK EXCHANGE.

What is the rate per cent. of dividend when

| 81 | ARES. | | INCOME. | and the second second | 1011- | · |
|----------|-------|----|---------|-----------------------|-------|---------|
| 37. | 50 | | \$275. | SHARES. | | INCOME. |
| 38. | 60 | 60 | \$800. | 42. 36 | | \$196. |
| 39. | 90 | | \$390. | 48. 42 | 44 | \$189. |
| 40. | 75 | 44 | \$450. | 44. 80 | ** | \$500. |
| 41. | 84 | - | \$170. | 45. 54 | ** | \$351. |
| 171. 4 . | | | | 46. 120 | 66 | \$900 |

What is the rate per cent. of dividend when

| | STOCE. | Theorem | A HOLE WIGH |
|--------------------------|---------|---|--|
| 47. 48. 19. 50. | | INCOME. yields \$245. "\$182. "\$225. "\$380. | STOOK, INCOME. 52. \$4,500 yields \$185. 58. \$7,550 "\$453. 54. \$8,600 "\$301. |
| 51. | \$2,800 | " \$115. | 55. \$3,275 ** \$131. 56. \$4,125 ** \$330 |

487. Given cash invested, market value of stock and rate per cent. dividend to find income, or vice versa.

EXAMPLE 1.-What income will be derived from investing \$6,315 in the 6 per cents at 105, brokerage 1 % ?

| 6315 | SOLUTION. | |
|------|-----------|--|
| 0010 | | |

Number of shares bought. Art. 485. 1051

6315

× 6 = \$360. Income. Art. 436. 1051

EXAMPLE 2.-What sum must be invested to secure an income of \$360 from the 6 per cents at 105, brokerage ‡ % ?

| 860 | | SOLUTION. | |
|-----|-------------|---------------|--|
| | 60 . | Number of the | |

umber of shares held. Art. 436.

1051 × 60 = \$6,815, Cash invested. Art. 485.

EXERCISE 101.

1. What income is derived from investing-

| CASH. | BATH. | 3/18 | - | | | oung- | - | |
|---|--|---|----|---------------------------------------|------------------|----------------------|---|---------|
| 1. \$4,210 3. \$5,715 3. \$1,683 4. \$3,524 5. \$15,025 6. \$7,938 7. \$24,050 8. \$10,189 | 5% 41% 8% 6% 7% 8% 9% 71% | MAB. VA 105 95 70 110 150 220 240 140 | 1% | 9. 10. 11. 12. 13. 14. | CASH. \$8,510 | BATR. 4 % 51 % | MA'3. VAL 1061 1102 96 851 140 130 225 76 | まままながない |
| | | | | | | ~ /0 | ••• | 1% |

DIV. 51%. 6%. 7%. 81 %.

DIV. 51%. 8%. Bł %. 6%.

d to

DIV. %. %. %. %.

2. What amount of cash must be invested in order to derive an-

| 1. 2. 3. | \$200 \$270 | 5% 4 1 % | MAB. VAL. 105 95 | BROR. 1%. 1%. | 0. 10. | інсомів. \$320 \$264 | BATE. 4 % 51 % | MAR. VAL. 1061 | ₿ %. |
|----------------------|--|-----------------------------|--------------------------------|---------------------|-----------------------------------|---|------------------------|---------------------------------|--------------------------|
| 4. 5. 6. 7. | \$72 \$192 \$700 \$288 \$900 | 81% 6% 7% 8% 9% | 70 110 150 220 240 | ま%. ま%. ま%. | 11. (12. 13. 14. 15. | \$1,500 \$112 \$288 \$700 \$700 | 61% 31% 8% 7% | 1104 96 854 140 130 | 1%. 1%. 1%. 1%. |
| 8. | \$540 | 71 % | 140 | 1 %. | 16. | \$360 | 10 % 44 % | 225 76 | 1%. |

438. To find the per cent. of income from a given investment without regard to its maturity.

EXAMPLE .- What per cent. of my investment shall I secure by purchasing Ontario Bank stock at 105, paying 7% dividends?

SOLUTION.

| UI. | 1 \$109 IU | vestme | 1 t. 87 in/ | nome in | derived. | |
|------|------------|---------|--------------------|---------|---------------|-----------|
| - 66 | \$1 | ** | | | uerived. | |
| | | | 105 | " | 44 | |
| | \$100 | ** | 100 ¥ | _7 | \$63 income i | |
| | rate per | 0004 | 00.00 | 102 - | ncome i | 5 derived |
| | - Por | 00110 = | 03%. | | | |

439. To find how stock must be bought, which pays a given per cent. dividend, to realize a specified per cent. on the investment.

EXAMPLE.—At what price must I buy stock which pays 6% dividend to realize 8% on my investment?

SOLUTION.

Since the income derived from 1 share is \$6, \$6 must therefore be 8% of my investment for 1 share.

66

8% of gurchase price of 1 share = \$6 : 100 % 66 **

.....

= 190 × 6 = \$75. Ans.

EXERCISE 102.

What per cent. of my investment will be derived from investing in the-

| 1. 4 per 2. 5 3. 6 | cents | 80. | 5.8 per 6.9 7.10 | ** | 175. | 10. 41 | r cents | at 70. 76. |
|--------------------------|-------|-----|------------------------|----|------|-----------------------------|----------|---------------|
| 4. 31 | 48 | | | 65 | | 11. 5 1 12. 6 | 66 66 | 110. 90. |

rder to

BROK. 5 %.

given

tre by

ł.

per

dend

8%

18.

m

70. 76. 10.

90.

STOCK EXCHANGE.

At what price must I buy stock which pays-

3 1

| 13. | 6 % | dividenda | to men 1 | A | | | |
|-----|------------------|-----------|------------|------|-------|-------------|--|
| 14. | 4% | " | in realize | 9%0 | on my | investment? | |
| | 5% | " | | 0% | " | ** | |
| | 8% | " | 64 | 6% | 44 | " | |
| | | | 66 | 41 % | " | ** | |
| 17. | 3 1 % | 44 | 44 | 5% | ** | " | |
| | 41% | ** | " | 31 % | | " | |
| | 7% | ** | ** | | " | | |
| 20. | 9% | 66 | " | | " | f 4 | |
| | | | | 10 % | | 6. | |

440. To find the per cent. income derived from investing in bonds or debentures payable in a given time.

EXAMPLE.—What per cent. income will be received if I buy Dominion 6's at 120, payable at par in 16 years ?

SOLUTION 1.

| | Cost prices | ce of \$100 o | " = | \$100 = n | ar value |
|-----|----------------------------|---------------|-----------|------------------------|---------------|
| | | Loss in 1 | 6 years = | \$20 | |
| | Income each | h vear from | lyear = | \$17 | |
| | Gain each : On \$120 in | vested, the i | ncome cle | = \$6 - \$:ared = \$43 | 1 = \$42 |
| | On \$100 | *6 | " | $= \frac{43}{120}$ | × 100 = \$323 |
| ••• | \$322 is dori | ved from th | e investm | ent. | |

SOLUTION 2.

| | | | bonds = '' = | = \$100 par value at end of 16 years 96, \$6 per year for 16 years |
|-------|----------|--------|-----------------|---|
| Total | receipts | ** | | \$196 at end of 16 years |
| | Cost | " | " = | 120 |
| •• | | 100 ** | - | \$76 for 16 years \$322 for 1 year from the investment. |

441. To find how bonds must be bought, which have several years to run, and which pay a given per cent. dividend, to realize a specified per cent. on the investment.

EXAMPLE.-At what price must 6% bonds, payable in 10 years, be bought so as to realize 5% on the investment?

SOLUTION 1.

By simple interest.

Amount of \$100 of bonds in 10 yrs. at 6 % = \$160.

In order to realize 5% on the investment we can afford to pay the present worth of \$160 due in 10 years, reckoning interest at 5 %. Present worth of \$160 for 10 yrs. at 5 % = $\frac{188}{188} \times 160 = 1063 . We can therefore afford to pay \$1063 for \$100 of bonds.

SOLUTION 2.

By compound interest.

If \$6 income be invested at compound interest as soon as received each year at 5%, the income at the end of 10 years will amount to \$75.467 (see Table of Annuities).

: Amount of \$100 of bonds at end of 10 years = \$175.467, and the present worth of this amount for 10 years at 5 %, compound interest = \$175.467 ÷ \$1.6289 + = \$107.72 + Ans.

EXERCISE 103.

1. What per cent. of the investment is received as income by purchasing C. P. R. 5's at 105, payable at par in twenty years?

2. What per cent. income will be received if I buy Dominion 4's at 112, payable at par in sixteen years?

3. Bought Intercolonial Railway bonds at 90, bearing 4% interest, having twenty-five years to run. What per cent. will be realized if they are paid at par at maturity?

4. What per cent. income will be gained from 8 % bonds, bought at 80, and payable at par in twenty years?

5. In 1882, Intercolonial 6's, due at par in 1930, were bought for 108. What interest will this pay?

263

6. If I pay 108 for Dominion 4's, having fifteen years to run, what per cent. will I receive if I keep them till they mature, and they are paid at par?

7. At what price must 6% debentures, payable at par in eight years, be brought to realize 4% on the investment?

8. Bought railroad bonds payable in five years, and expect to realize 7 % on the investment. What did I pay ?

9. What must I pay for 5% debentures, which mature in fifteen years, that my investment may yield 4%? (Both simple and compound interest).

10. What shall I pay for a bond of \$500 having twelve years to run, with interest at 6%, in order to make it an 8% investment? (Both methods).

11. What must be paid for a \$600 debenture, due in five years, with interest annually at 4%, so as to realize 5% on the investment?

EXERCISE 104

1. What income will \$19,650 invested in Dominion $8\frac{1}{2}$'s at $97\frac{3}{4}$ yield, brokerage $\frac{1}{2}$ %?

2. If \$48,000 is invested, $\frac{1}{2}$ in 5% stock, at 95 $\frac{1}{2}$, and $\frac{1}{2}$ in 6% stock at 112, brokerage $\frac{1}{2}$ % in each case, what annual income is secured?

3. A farm which rents for \$411.45 per annum, is sold for \$8,229, and the proceeds invested in 5% bonds at 105, brokerage $\frac{1}{2}$ %. Is the yearly income increased or diminished, and how much?

4. How much must a gentleman invest for his daughter in 7% bonds, selling at 95, to secure to her a semi-annual income of \$815 ?

ears, be

. .

pay the

d each 75.467

d the st =

as par ouy

ng per ?

ls,

re

5. Bought 300 shares of Michigan Central at 101; held them twenty days, paying interest at 7% on the purchasemoney, and sold them at $102\frac{7}{5}$. Deducting interest, and brokerage $\frac{1}{5}$ %, for purchase and sale, what was the net profit?

6. A man bought 100 shares Canadian Pacific at 79¹/₄, and sold the same at 82⁵/₅. What was the gain, less $\frac{1}{3}$ % brokerage?

7. Governments yielding \$240 income a year at 4% interest, were sold at 108, and the proceeds invested in land at \$75 an acre. How many acres were bought?

8. Which is the better investment, R. R. stock at 25% discount, and paying a semi-annual dividend of 4%, or money loaned at 10%, interest payable annually? What per cent. better?

9. What per cent. of his money will a man obtain by investing in 6% stock at 108, at a discount of 16%?

10. If stock paying 10% dividends is at a premium of $12\frac{1}{2}$ %, what per cent. of income will be realized on an investment in it?

11. Which will yield the better income, 8% bonds at 110, or 5's at 75; 5's at 70, or 6's at 80?

12. Which is the more profitable, and how much, to buy B. & L. H. 7's at 105, or 6% bonds, at 84?

13. If a man buys stock at 17% above par, what per cent does he receive on his investment, if the stock pays **a** dividend of $8\frac{1}{2}$ % on its par value (\$100)?

14. A man bought 8 shares of stock at $108\frac{3}{4}$, and after keeping it eleven months received a dividend of \$7 a share, and sold the stock then at $109\frac{1}{5}$. What per cent. did he receive on his investment?

1; held urchaseest, and the net

at 791, less 1 %

at 4% in land

t 25 % %, or What

in by

nn of nan

s at

1, to

per 75 **a**

fter re, he

STOCK EXCHANGE.

15. How many shares of Dominion Telegraph stock at $84\frac{1}{5}$, can be bought for \$12,000, brokerage $\frac{1}{5}$ %?

16. Bought Oct. 12th, 400 G. W. R. at 42¹, and 200 Michigan Central at $92\frac{1}{2}$; Nov. 10th, sold the former at $42\frac{7}{5}$, and the latter at $93\frac{3}{4}$. What was my gain, money being worth 5 %?

17. Which would be the better investment, \$12,120 in Michigan Central at 84, paying 3% annual dividends, or the same invested in Canada Bank stock at 2,020, paying 15% every two months?

18. On 84 shares of stock two semi-annual dividends were declared, one at 5 %, the other at 4 %, the investment paid 10%. What did the stock cost?

19. A man's income from \$2,000 worth of stock is \$75 semi-annually. What is the per cent. per annum ?

20. At what per cent. discount must 6% stock be bought, that the investment may pay 9%?

21. If a stock yields 15% per annum, what is its value when money is worth 8%?

22. Which is the more profitable investment, a stock at 120, paying 8% annually, or a 20-year bond at 90, paying 6% annually?

23. At what price must 6% bonds, payable in eight years, be bought to realize 4% on the investment.

24. How many shares of a half stock, standing at 5% above par, should be given in exchange for 700 shares of the stock of an express company, at 25% below par?

25. A man subscribed for 300 shares of stock in a manufacturing company, the par value of which was placed at \$50 per share; but, after paying three instalments, amounting to 75% of the par value, a dividend of 3% was declared. How much will be receive, and at what rate per cent. on the actual cost 2

26. The gross earnings of a stock company with ... capital of \$3,500,000 are \$420,000; their expenses are 60% of their gross earnings. What per cent. dividend can they declare, after putting aside \$28,000 as a surplus?

27. The receipts of a mining company in one year are \$170,000, clear of all expenses. The company has a capital of \$500,000, divided into shares of \$10 each, reserving \$50,000 as a contingent fund. What rate of dividend can it declare for the year? what per month? and how much can be paid on each share of stock?

28. March 4th, deposited with my broker \$500 margin, for purchasing 50 shares Canada Pacific R. R. stock at $92\frac{1}{4}$. The stock was sold March 28th at $96\frac{3}{4}$. Allowing 6% interest on the deposit, and charging 6% interest on the purchase, and $\frac{1}{8}$ % brokerage, what was the net profit on the transaction?

29. Sold "short" through my broker 200 shares Michigan Central at 90, and "covered" my "short" at 86§. Allowing $\frac{1}{6}$ % commission for buying and selling, what was my net profit?

30. May 6th, I bought through my broker 300 shares of a certain stock at $93\frac{1}{4}$, depositing with him \$3,000 as "margin," for his security against loss by a fall of price. On the first of the following month, he sold them for my account at 95. How much does he owe me besides the \$3,000, if he charges $\frac{1}{3}$ % brokerage for each transaction, interest at 6% (for the exact number of days) on the money used in excess of my deposit?

31. Three companies, A, B, and C, are to be consolidated on the basis of the relative market values of their stock.

| Thus, | A's | capital | \$1,000,000, | Market value | 100%: |
|-------|-----|---------|--------------|--------------|-------|
| | B's | " | \$1,500,000, | | 50 %: |
| | C's | " | \$625,000, | 66 | 40 %. |

267

The capital of the consolidated company is to be \$2,000,000, in 20,000 shares of \$100 each. What proportion and what amount of the capital should be allotted to each of the old companies; and how much stock in the new company should the holder of 1 share of the stock of each of the old companies be entitled to ?

32. A customer deposited \$500 margin with a broker November 23rd, who purchased for him 50 shares Michigan Central at 80. He sold the same stock November 30th, at 98. What was the gain, brokerage $\frac{1}{5}$ %?

38. Aug. 30th, a broker purchased for the account of a **customer** 300 shares of Railroad Stock at 78. He deposited **as a margin** \$3,000. On Sept. 22nd ,the stock was sold at $74\frac{3}{4}$. What was the loss? Interest 6%, and commission $\frac{1}{3}$ %.

84. May 10th, a speculator deposited with his broker \$5,000 as a margin, and directed him to purchase for his account 500 shares 1 ominion Saving & Loan, preferred at 90§. May 20th, the stock was sold at 94§. What was the gain? Interest 6%, brokerage $\frac{1}{5}$ %.

85. Sept. 10th, I deposited with my broker \$5,000 as margin, and he purchased for me 200 shares, C. P. R. at $90\frac{1}{2}$, 200 shares, Lon. & Can. L. & A. (half stock) at 122 $\frac{1}{4}$, and 200 shares Intercolonial Railway Stock at 49 $\frac{3}{4}$. The stocks on Sept. 30th were quoted as follows: C. P. R. $80\frac{3}{4}$, Lon. & Can. L. & A., 120 $\frac{1}{5}$, Intercolonial Railway 41 $\frac{6}{5}$. How much should I have deposited with my broker to make my margin of 10% good, and to cover commission of $\frac{1}{5}$ % for buying and selling, and interest at 6%? If I had been unable to have made an additional deposit, and the broker had "sold me out," what would have been my loss?

with .. les are nd can s?

ar are capital erving id can much

argin, t 921. g 6% on the ofit on

fichi-: 86§. : was

res of O as orice. r my s the ction, oney

ated ck.

EXCHANGE.

EXCHANGE.

442. Exchange is the system by which merchants in distant places discharge their debts to each other without the transmission of money.

Suppose for example that A. of Toronto owes B. of Halifax \$2,000 for grain, and C. of Halifax owes D. of Toronto \$2,000 for dry goods. The two debts may be discharged by means of one draft or bill of exchange without the transmission of money. Thus B. of Halifax draws on A. of Toronto for \$2,000 and sells the draft to C. of Halifax, who remits it to D. of Toronto, D. of Toronto presents the draft to A. of Toronto for acceptance or payment, and thus both debts are cancelled. There is in effect a setting off or exchange of one debt for the other.

443. A Bill of Exchange is a written order, drawn by one party on another, to pay a specified sum of money to a party named therein, or to his order, or to bearer.

444. Bills of Exchange are of two kinds, viz. : Inland or Domestic, and Foreign.

415. An Inland Bill of Exchange is one which is drawn and made payable in the same country.

446. A Foreign Bill of Exchange is one which is drawn in one country and made payable in another country.

147. Inland Bills of Exchange are usually called Drafts, and are distinguished as Time Drafts and Sight Drafts.

448. A Sight Draft is one which is made payable upon presentation or on demand.

449. A Time Draft is one which is made payable at a certain specified time after date or after time of presentation for acceptance.

EXCHANGE.

450. A Bill of Exchange is negotiable when it may be transferred from one person to another by endorsement or assignment.

451. The **Rate of Exchange** is the rate per cent. which is computed on the Bill of Exchange.

452. The **Course of Exchange** is the current price paid in one place for bills of exchange on another place. This price varies, according to the relative conditions of trade and commercial credit at the two places, between which exchange is made.

The course of exchange between two countries, depends on their relative amount of indebtedness to each other; and these, in turn, are largely dependent on "the balance of trade," or comparative amount of exports and imports. Thus, if the United States owes Great Britain more than Great Britain owes the United States, which is likely to be the case if it has imported from Great Britain more than it has exported thither, exchange on that country will be in demand, and will consequently command a premium. If, on the other hand, the balance of trade is in favor of the United States—that is, if the exports exceed the imports,— Great Britain will be indebted to the United States, the supply of bills on Great Britain will more than meet the demand, and exchange will fall below par.

The premium for exchange on any country can not long exceed the cost of shipping specie thither; for merchants will transmit coin to pay their indebtedness abroad, if it is cheaper so to do than to buy exchange.

453. The **Par of Exchange** is the estimated value of the coins of one country as compared with those of another, and is either intrinsic or commercial.

454. The Intrinsic Par of Exchange is the comparative value of the coins of different countries, as determined by their weight and purity.

Thus, according to the mint regulations of Great Britain and France, £1 sterling is equal to 25 fr. 20 cent., which is said to be the par between London and Paris. Exchange between the two countries is said to be at par when bills are negotiated at this rate; that is, when a bill for £100 drawn in London is worth 2,520 frances in Paris, and conversely. When

ints in vithout

,000 for s. The xchange on A. of its it to nto for ere is in

drawn noney er.

nland

ch is

ch is other

afts, fts.

upon

at a nta-

EXCHANGE.

£1 in London buys a bill on Paris for more than 25 fr. 20 cent., the exchange is said to be in favor of London and against Paris; when £1 in London will not buy a bill on Paris for 25 fr. 20 cent., exchange is against London and in favor of Paris.

Exchange is made to diverge from par by any discrepancy between the actual weight or fineness of the coins and the mint standard, and by the variations in the demand and supply of bills of exchange.

455. The Commercial Par of Exchange is the comparative value of the come of different countries, as determined by their nominal or market price.

Norg.—The intrinsic par is always the same while the coins remain unchanged; but the commercial par, being determined by commercial usage, fluctuates.

456. When exchange sells for more than the face of the draft, it is above par, or at a premium, and below par, or at a discount, when sold for less than its face.

INLAND OR DOMESTIC EXCHANGE.

457. To find the cost of a draft at sight.

EXAMPLE 1.—How much must be paid for a sight draft-of \$1,000, on the Bank of Montreal, at a premium of $1\frac{1}{2}$ %?

SOLUTION.

\$1 + \$.015 = \$1.015, course of exchange : \$1 costs \$1.015 : \$1 000 cost \$1.015

: \$1,000 cost \$1.015 × 1,000 = \$1,015. Ans.

EXAMPLE 2.-How much must be paid for a sight draft of \$600, on the Bank of Ottawa, at a discount of 1 %?

SOLUTION.

\$1 - \$.01 = \$.99, course of exchange ∴ \$1 costs \$.99 ∴ \$600 cost \$.99 × 600 = \$594. Ans.

458. To find the cost of a time draft,

EXAMPLE 1.-What will be the cost of the following draft, exchange on Hamilton being in Toronto at 21 % premium?

\$600.

TORONTO, July 18th, 1889.

Seventy days after sight, pay to J. S. Carson, or order, six hundred dollars, value received, and charge the same to my account.

To Bank of Montreal, Hamilton.

JAMES FERGUSON.

SOLUTION.

 \$1 + \$.0225 = \$1.0225, course of exchange .012, bank discount of \$1 for 73 da. at 6% (legal rate) \$1.0105, cost of exchange of \$1
 \$1 cost \$1.0105
 \$1005 × 600 = \$606.30.

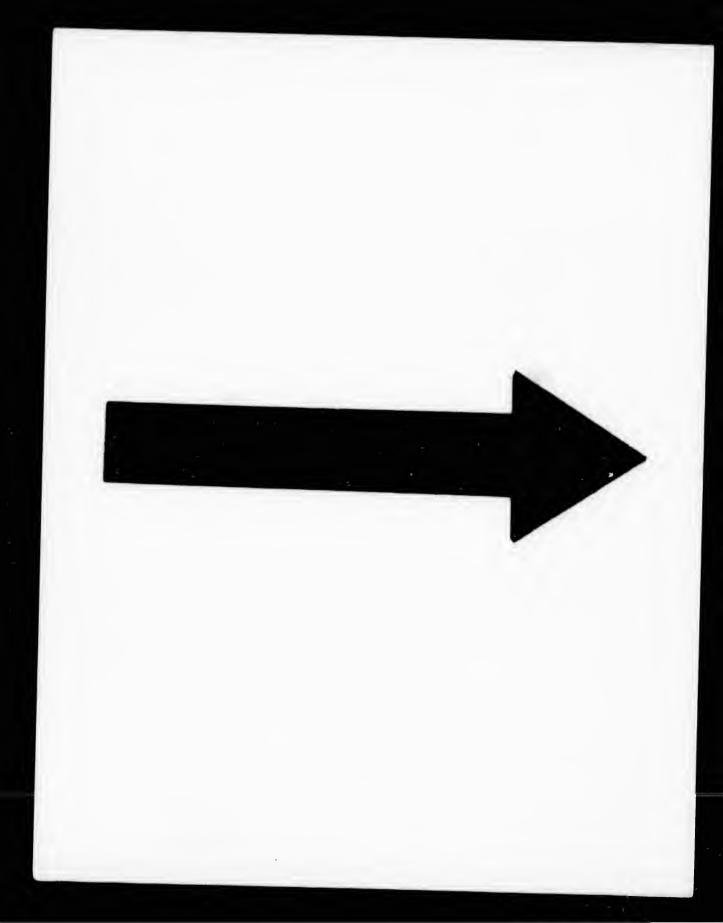
0 cent., the when £1 in e is against

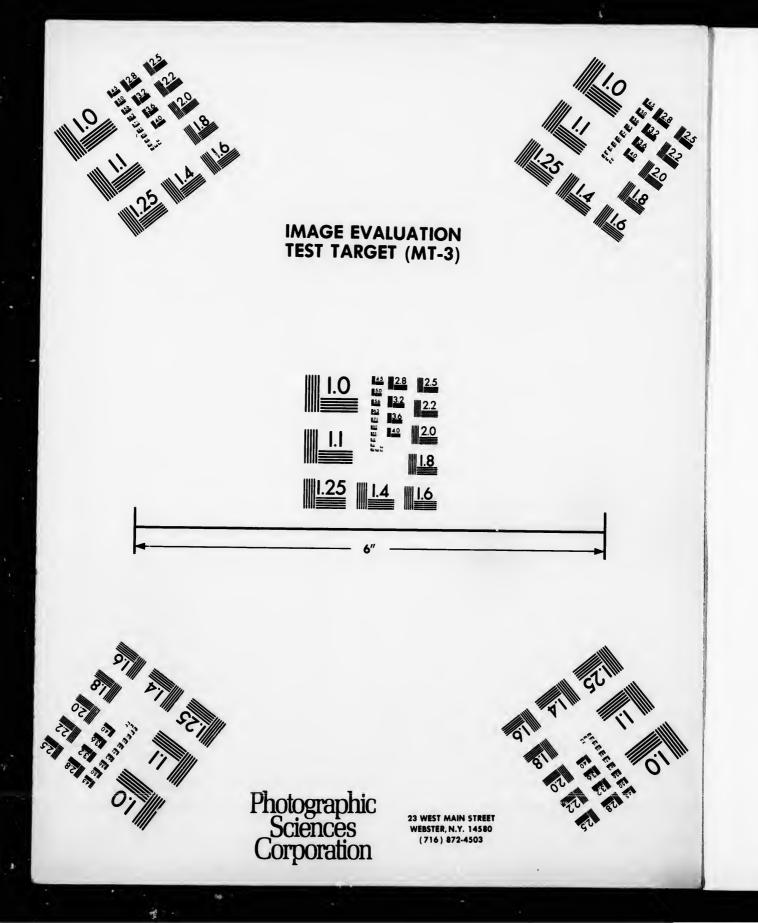
y between rd, and by

he comus deter-

ns remain mmercial

e of the w par,







EXAMPLE 2.—Find the cost of a 60 days' draft on the Bank of Quebec, Toronto, for \$900, at a discount of $2\frac{1}{2}$ %.

SOLUTION.

\$1 - \$.025 = \$.975, course of exchange
 .0104 +, bank discount of \$1 (63 da.), at 6 % (legal rate)
 \$.9646, cost of exchange of \$1

\$1 cost \$.9646

∴ \$900 " \$.9646 × 900 = \$868.14.

EXERCISE 105.

1. Find the cost of a draft on Montreal for \$1,100, at $\frac{1}{4}$ of 1% premium.

2. Find the cost of a draft on Winnipeg for \$1,850, at $\frac{1}{4}$ of 1% discount.

8. What is the cost of a draft on Chatham for \$1,800, at $1\frac{3}{4}$ % premium ?

4. Exchanged \$600 in bank notes for gold at 5 % premium. How much did I receive ?

5. Sold \$375 uncurrent money at 21 % discount. How much did I receive? How much did I lose?

6. What was the cost of a bill for \$240 on Belleville, purchased at $1\frac{1}{2}$ % premium ?

7. Required the amount to pay for a draft to be remitted to Hart & Denton, Kingston, for \$1.250, exchange at $\frac{3}{4}$ % discount.

8. Shipped goods to Winnipeg, and received a draft for \$2,500, which gave me a profit of 20%; sold the draft at $4\frac{1}{2}$ % premium. How much did I gain by both transactions?

9. Bought goods for \$1,250, and sold them at a profit of 25%; purchased a draft on Fredricton with the proceeds, at a discount of $\frac{3}{4}$ %. What was the amount of the draft?

273

on the Bank of

3 % (legal rate)

100, at 🛓 of

1,350, at ‡

\$1,800, at

premium.

int. How

ville, pur-

remitted ge at $\frac{2}{3}$ %

draft for draft at transac-

profit of proceeds, ie draft? 10. A commission merchant sold goods, the net proceeds of which were \$2,750. How large a draft can be buy to remit to his consignor, if he pays $2\frac{1}{2}$ % premium for the draft? How large a draft if he purchases at $2\frac{1}{2}$ % discount?

11. Find the cost of a draft for \$1,600, payable 30 days after sight, when exchange is $\frac{1}{2}$ of 1 % premium, and interest 6%.

12. Find the cost of a draft for \$950, payable in 80 days, when exchange is at par and interest $4\frac{1}{2}$ %.

18. Find the cost of a draft for \$500, payable 60 days after sight, when exchange is $\frac{1}{2}$ of 1% discount, and interest 7%.

14. Find the cost of a draft for \$1,200, payable in 90 days after sight, when exchange is $\frac{1}{2}$ of 1% premium, and interest 7%.

15. Find the cost of a draft for \$810, payable in 90 days, when exchange is at $\frac{1}{4}$ of 1 % premium, and interest $5\frac{1}{2}$ %.

16. Find the cost of a draft for \$725, payable in 60 days, when exchange is at $\frac{1}{4}$ of 1 % discount, and interest 5 %.

17. What must be paid in Toronto for a draft on Victoria at 90 days, for \$4,800, the course of exchange being $101\frac{2}{3}$ %?

18. A firm in Toronto bought a 60 days' draft on Montreal for \$2,500, at § % premium, 6 % interest. What did the draft cost?

19. A broker in Montreal bought a 90 days' draft on Halifax for \$1,299 at $\frac{1}{2}$ % discount. He paid $\frac{1}{6}$ % additional for brokerage. How much did he pay for the draft?

20. A commission merchant in Winnipeg sold for a firm in Hamilton a consignment of cotton. The sales amounted to \$12.240, and his commission was 5% on the sales. He bought and remitted a 30 days' draft at $\frac{5}{6}$ % discount for the proceeds due the firm. How much did the draft cost? 274

INLAND OR DOMESTIC EXCHANGE.

459. To find the face of a draft at sight.

EXAMPLE 1.—I paid \$652.86 for a sight draft on the Bank of Commerce, Winnipeg, at a premium of $\frac{3}{4}$ %. What was the amount of its face ?

SOLUTION. \$1 + \$.0075 = \$1.0075, course of exchange \$1.0075 is paid for \$1 face \$1 1 44 " ** .0075 652.86 \$652.86 ** ** ** 1 0075 : Face of draft = \$648.

EXAMPLE 2.—A commission merchant in Belleville wishes to remit to his employer at Halifax a sight draft purchased with \$7,202.70. What is the face of the draft, exchange at §% discount?

> SOLUTION. \$1 - \$.00625 = \$.99375, course of exchange \$.99375 is paid for \$1 face \$1 " " $$\frac{1}{.99375}$ " \$7,202.70 " " $$\frac{7,202.70}{.99375}$ " \therefore Face of draft = \$7.248.

460. To find the face of a time draft.

EXAMPLE 1.—The cost in London of a 70 days' draft on Ottawa, exchange 3 % premium, was \$797.40. What was the face of the draft?

SOLUTION.

.99675

\$1 + \$.00875 = \$1.00875, course of exchange

.012, bank discount of \$1 for 73 da. at 6%

.: Face of draft = \$800.

Bank of Comamount of its

e

shes to remit 02.70. What

on Ottawa, ne draft?

ŧ

at 6%

INLAND OR DOMESTIC EXCHANGE.

EXAMPLE 2.—A commission merchant in Stratford wishes to remit to his employer in Montreal \$987.10 by a draft at 30 days. What is the face of the draft which he can purchase with this sum, exchange being at a discount of $\frac{2}{3}$ %?

SOLUTION.

| \$1 | \$.0075 = \$.9925, course of exchange .0054 +, bank discount for 33 ds. at 6% \$.9871 = cost of \$1 |
|-----|---|
| | \$.9871 is paid for \$1 face |
| | \$1 " " 1 " |
| | \$937.10 · · · \$987.10 · · |
| | : Face of draft = $$1,000$. |

461. To find the rate of exchange on a sight draft.

EXAMPLE 1.—The cost of a sight draft on Winnipeg for \$1,200 was \$1,213.50. Find the rate of exchange.

| | | | | SOLUTION. | | |
|---------|--------|--------------|----|------------|--|---|
| | | Cost | = | \$1,213.50 | ٠ | |
| • | | Face | = | \$1,200.00 | | |
| | | Premium | = | \$13.50 | | |
| \$1,200 | vas pu | rchased at a | pr | emium of | \$13.50 | |
| \$1 | ** | " | | 66 | \$13.50 | |
| | | | | | *1,200 | |
| \$100 | 66 | 66 | | " | $\frac{13.50 \times 100}{1.000} = 11 | |
| | | | | | 1,200 | 1 |
| | | : Rate of | ex | change = | 11% premium. | |

EXAMPLE 2.—The cost of a sight draft on Victoria for \$600 was \$594.75. What was the rate of exchange?

| | | | | 8 | OLUTION. | - 0 | | | |
|-------|-----|-----|--------------|----|----------------------|---------|----|-----|----|
| | | | Face Cost | | \$600.00 \$594.75 | | | | |
| | | | Discount | = | \$5.25 | | | | • |
| \$600 | Was | pur | chased at a | di | scount of | \$5.25 | | | |
| \$1. | | 66 | 68 | | " | \$ 5.25 | | | |
| \$100 | | 66 | 44 | | ** | \$5.25 | × | 100 | ** |
| , | | Ra | te of exchan | ge | = 1% d | iscoun | t. | · | |

462. To find the rate of exchange on a time draft.

EXAMPLE 1.—The cost in Collingwood of a 70 days' draft for \$1,000 is \$1,020. Interest being 6%, what was the rate of exchange ?

| | | | | | vonange r |
|---------|--|------------------|---------|----------------------|-----------|
| | | So | LUTION. | | |
| | Cost | | \$1,0 | 20 | |
| | Face | | | | • |
| | Promi | | \$,10 | 00 | |
| | Tutur | n, less interest | \$ | 20 | |
| | Interest | for 73 da. at 6 | % 8 | 12 | |
| | Full prei | ninm | | | |
| \$1 000 | The state of the s | | \$ | 32 | |
| *-,000 | was purch | ased at a pre | mium o | f \$30 | |
| \$1 | ** | " | | | |
| | | | 44 | \$ 32 | |
| \$100 | | | | 1,000 | |
| 4100 | " | ** | 66 | s ³² × 10 | 0 |
| | _ | | | N. | - = \$81 |
| | .: Rate | of exchange = | 810 | 1,000 | |
| | | | | reminm. | |

EXAMPLE 2.—The cost in Quebec of a 70 days' draft for \$6,000 is \$5,910. Interest being 6 %, what is the rate of exchange ?

| | | · Solt | TION. | | |
|----------------|-------------------------|---------------------------|--------------------|---|-----|
| | Cost Face | •• •• •• | \$6,000 \$5.910 | | |
| | Discount, Interest f | plus interest or 73 da | \$90 \$72 | | |
| 8 6.000 | Full disco | unt. | 810 | | |
| \$0,000 | was purcha | sed at a disco | ount of | f \$18 | |
| \$1 | 64 | " | " | 8 18 | |
| \$100 | 66 | " | 66 | ^{6,000} ⁸ ¹⁸ × 10 | 0 |
| | : Rate of | exchange = | å% d | | 018 |

EXERCISE 106.

1. A sight draft was purchased for \$550.62, exchange being at a promium of $3\frac{1}{2}\%$; what was the face ?

2. What is the face of a sight draft bought for \$7,500 at a premium of \$2.50? (\$2.50 on \$1,000 = $\frac{1}{2}$ %.)

277

ò

ime draft.

draft for \$1,000 nge?

\$81

for \$6,000 is

tchange

\$7,500

8. Find the largest draft payable 30 days after date that can be bought for \$4,985.00, exchange being at a premium of $\frac{1}{4}$ %.

4. What per cent. of its face is the cost of a 90 days' draft, if exchange is 1% premium, and interest is allowed at 4%?

5. Find the face of a 60 days' draft, bought for \$620.75, if exchange is \$2.50 discount, and interest 6 %.

6. Find the face of a draft, payable 60 days after date, that can be bought for \$1,125, when exchange is at $\frac{1}{2}$ of 1% discount, and interest $5\frac{1}{2}$ %.

7. Find the face of a draft, payable 30 days after date, that can be bought for \$520, when exchange is at $\frac{1}{2}$ of 1% premium, and interest 4%.

8. Find the face of a draft, payable 60 days after sight, that can be bought for \$1,250, when exchange is at $\frac{1}{4}$ of 1% premium, and interest 7%.

9. Find the face of a draft, payable 80 days after sight, that can be bought for \$274, when exchange is at par, and interest 6 %.

10. Find the face of a draft, payable 90 days after date, that can be bought for \$10,000, when exchange is at par, and interest $4\frac{1}{2}$ %.

11. A commission merchant in Detroit wishes to remit to his employer in St. Louis, \$512.36 by draft at 60 days; what is the face of the draft which he can purchase with this sum, exchange being at $2\frac{1}{2}$ % discount?

12. An agent in Halifax having \$1,324.74 due his employer, is instructed to purchase with the same a draft drawn at 30 days; what will be the face of the draft, exchange being at $1\frac{2}{3}$ % premium?

13. My agent in Winnipeg sells a house and lot for \$7,500, on commission of $1\frac{1}{2}$ %, and remits to me the proceeds in a draft purchased at $\frac{1}{2}$ % premium; what sum do I receive from the sale of my property?

14. The Merchants' Bank of New York having declared a dividend of $6\frac{1}{4}$ %, a stockholder in Toronto drew on the bank for the sum due him, and sold the draft at a premium of $1\frac{3}{4}$ %, thus realizing \$508.75 from his dividend; how many shares did he own?

15. A man in Owen Sound has \$4.800 due him in Quebec; how much more will be realize by making a draft for this sum on Quebec and selling it at $\frac{1}{2}$ % discount, than by having a draft on Owen Sound remitted to nim, purchased in Quebec for this sum at $\frac{3}{4}$ % premium?

16. A man in Brantford purchased a draft on Montreal for \$5,320, drawn at 60 days, paying \$5,141.78; what was the course of exchange?

17. An agent, owing his principal \$5,059.20, was directed to buy a draft with this amount, and remit it. The prinsipal received \$4,960; what was the rate of exchange?

18. Sight exchange on Toronto for \$5,000 cost \$5,075; what was the course of exchange?

and lot for to me the ; what sum

ng declared lrew on the t at a predividend;

The him in making a st $\frac{1}{2}$ % disemitted to emium ?

Montreal what was

s directed The prinange ?

\$5,075 ;

FOREIGN EXCHANGE.

463. Foreign Exchange is the exchange which is carried on between different countries, and is distinguished as direct and circuitous.

Exchange with Europe is effected mainly through the great financial centres, London, Paris, Antwerp, Berlin, Hamburg, Frankfort, and Amsterdam.

464. Direct Exchange is confined to the two places between which the money is to be remitted.

465. There are always two methods of transmitting money between two places. Thus, if A. is to receive money from B.,

1st. A. may draw on B. and sell the draft;

2nd. B. may remit a draft made in favor of A.

Note.—One person is said to draw on another person when he is the maker of a draft addressed to that person.

466. A set of exchange is a bill usually drawn in triplicate, each bearing the same date, payable to the same party, and so expressed that when one of the bills is paid the others become void.

The object of drawing Bills of Exchange in sets of three is to provide against loss in transmitting from one country to another. The bills are sometimes sent by different routes or by the same route at different dates. Some merchants send only the first and second and preserve the third.

SET OF EXCHANGE.

£1,000.

(1.)

TORONTO, July 23, 1889. Sixty days after sight of this First of Exchange (Second and Third of the same tenor and date unpaid), pay to the order of H. E. Clarke, One Thousand Pounds Sterling, value received, and charge the same to account of

JOHN McDONALD & Co.

To Brown, Shipley & Co., London, England. No. 179.

£1,000.

(2.)

TORONTO, July 23, 1889.

Sixty days after sight of this Second of Exchange (First and Third of the same tenor and date unpaid), pay to the order of H. E. Clarke, One Thousand Pounds Sterling, value received, and charge the same to account of

JOHN MCDONALD & Co.

To Brown, Shipley & Co., London, England. No. 179.

£1,000.

(8.)

TORONTO, July 28, 1889.

Sixty days after sight of this Third of Exchange (First and Second of the same tenor and date unpaid), pay to the order of H. E. Clarke, One Thousand Pounds Sterling, value received, and charge the same to account of

JOHN McDONALD & Co. To Brown, Shipley & Co., London, England. No. 179.

467. Foreign Bills of Exchange are usually drawn in the currency of the country in which they are payable. Thus drafts on England are usually drawn in pounds, shillings, and pence; on France, Belgium, and Switzerland, in francs; on Germany in marks, etc.

468. Foreign Bills of Exchange are usually drawn at sight (3 days), or at sixty (63 days) days' sight.

469. Quotations for 3 days refer to sight exchange, on the theory that 3 days' grace are allowed on sight drafts, though custom varies in this respect.

470. Sight drafts are frequently called "short" exchange, and 60 day drafts, "long" exchange.

471. "Long" exchange is sold at a rate below that for "short" exchange, sufficient to equalize the difference in interest between the dates of maturity of the two classes of bills, the banker having the use of the money from the time the draft is drawn till it is paid.

472. A Letter of Credit is a draft made by a banker in one country, addressed to *foreign* bankers, by which the holder may draw funds at different places to any amount not exceeding the limits of the letter of credit.

478. Exchange on England (sterling exchange) is quoted by giving the value of £1 in dollars and cents.

Thus, when exchange is 4 84, a draft of £1 will cost \$4.84; of £100, \$484.

474. By Act of Parliament the value of the pound sterling was fixed at \$4\$ (9£=\$40). This is much below its intrinsic value, which is now fixed at \$4.86 $\frac{2}{3}$. The rates of exchange usually quoted in commercial papers are

nly 23, 1889. nge (Second , pay to the ds Sterling, ; of ALD & Co.

y 28, 1889. ange (First pay to the s Sterling, of D & Co.

28, 1889. age (First ay to the Sterling,

& Co.

calculated at a certain per cent. on the old par of exchange.

Exchange is at par between Great Britain and Canada when the old par of exchange is at a premium of $9\frac{1}{2}$ per cent., for \$4 $\frac{4}{5}$ increased by $9\frac{1}{2}$ per cent., equals \$4.86 $\frac{4}{5}$.

475. Sterling quotations usually range between 4.80 and 4.91 (*i e.* \$4.80 to \$4.91 to the £ sterling). Two quotations are mentioned for each kind of exchange, and indicate the highest and lowest price paid on the same day. Thus 60 days' sterling 4.86 @ 4.87, means that the lowest quotation to the £ was \$4.86, and the highest \$4.87.

Quotations are frequently given with reference to the old par of exchange. Thus 60 days' sterling $9\frac{1}{4}$ to $9\frac{1}{2}$ means that the old par of exchange (£1 = \$4 $\frac{4}{5}$) ranges from $9\frac{1}{4}$ % to $9\frac{1}{2}$ % premium, *i. e.* the lowest course of exchange is \$4 $\frac{4}{5} \times 1.09\frac{1}{4}$; the highest, \$4 $\frac{4}{5} \times 1.09\frac{1}{5}$.

476. Exchange on France, Belgium, and Switzerland, is quoted by giving the value of \$1 in francs and centimes. Thus, when exchange is $5.27\frac{1}{2}$, \$1 will buy 5 francs and $27\frac{1}{2}$ centimes.

477. Exchange on Amsterdam, (Netherlands), is quoted by giving the value of one guilder or florin in Canadian currency.

The intrinsic par value of one guilder is $40\frac{2}{10}$ cents.

478. Exchange on Germany is quoted by giving the value of 4 marks (reichsmarks) in cents.

The intvinsic par value of 1 mark is 23to cents.

old par of

1

nd Canada of 91 per \$4.863.

ween 4.80 ing). Two lange, and d on the 87, means , and the

to the old 9½ means iges from exchange

itzerland, centimes. ancs and

r is quoted Canadian

ents.

ving the

| 5 |) |
|---|---|
| REI | |
| TIR | |
| VALUES OF FOREIGN MONEY IN CANADIAN CURRENC | í |
| DIA | |
| ANA | 1 |
| C/ | |
| H | |
| NES | l |
| MO) | |
| N | |
| 3EI | |
| FOI | |
| HO | l |
| 22 | |
| 5 | |
| V.A | |
| | |

| | | | | | | | | | | | F | 2, | R. | E. | I | 71 | V | E | X | C. | H | d | N | G | E. | | | | | | | | | | | | - | 28 |
|-------------------------------|--------------------|------------------|----------------------|-----------------|--------|----------------------|-----------------|---------|-----------------|-----------------------------|-----------------|----------------------------|------------------|---------------|-----------------------------|---------------------|-----------------------|-----------------------------|--------------------|--|----------------------------|-------------------------------|--|-------------------------------------|--------------------|--------|------|---------------------|-----------------|-----------------|--------------------------------|-------------------|----------------------|------|-----------------------------------|--------------|-----------|-----------------|
| STANDARD COIN. | | | (See Great Britain.) | | | o, IU and 20 france. | DOLLVIANDO. | | | Condor, doubloon and escudo | | 1-16, 2, 4, and 1 doubloon | 10 and 20 crowns | Peso. | 5. 10 35 50 and 100 minute. | 5. 10 and 30 frames | Superview and commit- | 5 10 90 50 and 100 American | 5. 10 and 20 mores | | 5, 10, 20, 60 and 100 line | 25.10and 90 von gold and cil- | the state of the s | Pesonriollar 510 05 and 50 conteres | 10 an 1 20 crowns. | | Sol. | , 5 and 10 milrees. | and one rouble. | | 5. 10, 20, 50 and 100 pesetas. | 10 and 20 crowns. | 5, 10 and 20 francs. | | 25, 50, 100, 250 and 500 niastare | tornamed and | Peso. , | |
| Value in Cana- dian Money. | | \$ 96.5 | | 1.04 | | 0.00 | | 100 | | | | | | | | 19.3 | | | | | | | 1.00.0 | | | | | | 10.00 | | | | | | | 100.0 | | 6.76 |
| STANDARD. | Gold and Cilmon | JAAITO DITO DITO | Silver | Gold and Silver | Silver | Gold | Silver | Silver | Gold and Silvar | Silver | Gold and Silver | Told | | Javine Javine | non non | Gold and Silver | Dion | Gold and Silver | Diolo | The second secon | Tayling and Sulver | JANTO | DIOD | JAATTO | Cold and Silver | Silvar | Gold | Silver | Gold | Gold and Silver | Gold | Gold and S. vor | Toor | Gold | Cold and Ciline | Silver | Silver | old and Cilicon |
| | Peso-fuerte | | | | | Door I,000 reis | | DOLLAR. | reso | | Peso | | | Piaster | Franc | Pound Sterling | Drachma | Mark | | Lira | | Dollar | | | | Sol | | | | | | | | | | | Patacon S | |
| COUNTRY. | Anstralia Kepublic | Austria | Belgium | ١. | Brazil | Bogota | Central America | Chili | China | Cuba | Danmark | Foredon | Tourselor | ESAPE | F FALICO | Great Britain | Greece | Gernan Empire. | India | I tearly | Japan | 1/106718 | | | | | | Sandwich Telande | - | Sweden | | | | | | | : | Tenzana / |

480. To find the cost of a foreign bill of exchange.

EXAMPLE 1.—How much must be paid in Toronto for a bill of exchange on Liverpool for $\pounds 1,200$, exchange being quoted at $\pounds 4.863$ to the \pounds sterling?

SOLUTION.

Cost of $\pounds 1 = \$4.86\frac{3}{2}$ \therefore " $\pounds 1,200 = \$4.86\frac{3}{2} \times 1,200 = \$5,841$. Ans. EXAMPLE 2.—How much must be paid in Hamilton for a draft on Paris for 2,072 frances, exchange being quoted at 5.18?

SOLUTION

| | 0 | onorion. | • | |
|--------|-------|----------------------|--|------|
| francs | = | \$1 | | |
| franc | = | $\frac{1}{5.18}$ | | |
| francs | = | $\frac{2,072}{5.18}$ | = \$400. | Ans. |
| | franc | francs = franc = | francs = \$1 $franc = \$\frac{1}{5.18}$ | |

EXAMPLE 3.—What will be the cost in Montreal of the following bill of exchange on Liverpool, at $9\frac{1}{2}$ % premium?

MONTREAL, July 22nd, 1889.

At sight of this first of exchange (second and third of same tenor and date unpaid), pay to the order of W. R. Telford, Montreal, four hundred and thirty-two pounds, value received, and charge the same to the account of,

J. P. HUME & Co.

To Alex. Grant & Son., Liverpool, England.

| | Solution. | | r |
|------|---|------|--|
| £9 | $=$ \$40 \times 1.095 | | EXPLANATION. |
| £1 | $= \$\frac{40 \times 1.095}{9}$ | | Since exchange on Liverpool is at 91% |
| £432 | $= \$\frac{40 \times 1.095 \times 432}{9} = \$2,102.40$ | Ans. | premium, £9 will cost \$40 × 1.095. Art. 475. |

EXERCISE 107.

1. Sold to a broker 480 English sovereigns at 4.86. I was paid in currency when gold was quoted at $1.05\frac{1}{4}$. How much did I receive?

 $\mathbf{284}$

exchange.

to for a bill of at \$4.86³ to the

341. Ans. for a draft on

the following

22nd, 1889. nd third of er of W. R. wo pounds, unt of, we & Co.

LANATION. exchange on is at 91% £9 will cost

5. Art. 475.

4.86. I 5]. How 2. An importer purchased a bill of exchange on London, at 3 days' sight, for £488 16s. 6d., at $4.85\frac{1}{2}$. What was the cost?

3. Find the cost of a bill of exchange on Manchester, for £485 12s. 6d. at the par value.

4. An exporter sold a draft for £540 8s. on Liverpool, payable in London, at 4.84, brokerage $\frac{1}{5}$ %. What were the proceeds?

5. What is the cost in K^* is ston of a bill on London, Eng.; for £425 6s. 8d., at $9\frac{3}{4}$ % premium ?

6. How much will a draft on Berlin for 2,400 marks cost, exchange being quoted at $94\frac{1}{2}$?

7. Bought a bill of exchange on Paris for 3,760.20 francs, when exchange was $5.22\frac{1}{4}$. What did the bill cost?

8. What is the cost in Toronto of a bill of exchange on St. Petersburg for 3000 roubles at $1\frac{1}{4}$ % premium, the par of exchange being \$.754 for 1 rouble?

9. What is the cost of a bill of exchange on New York for \$7,200, at $\frac{6}{3}$ % premium ?

10. Bought at par, 260 rupees of India, 560 Austrian florins, and 480 crowns of Denmark. How much did I pay for all?

11. Sold a bill of exchange on Amsterdam for 1,440 guilders. Exchange $39\frac{3}{5}$. What was the sum obtained?

12. Sold exchange on Geneva, through a broker, for 8,000 francs at 60 days' sight. What were the proceeds of the draft, exchange being $5.20\frac{5}{5}$, brokerage $\frac{1}{5}$?

13. What will it cost to remit 8,750 france to Antwerp at par value?

14. What were the proceeds of a draft, sold through a broker, for 8,748 marks (Reichsmarks), at $94\frac{3}{8}$, brokerage $\frac{1}{8}$?

15. What are the proceeds of a draft on Paris for 12,420 francs, at $5.19\frac{3}{4}$, brokerage on exchange $\frac{1}{6}$?

481. To find the course of exchange.

EXAMPLE 1.—The cost of a bill of exchange on Liverpool for £500, including a brokerage of $\frac{1}{5}$ %, was \$2,443.05. What was the quotation ?

| Se | DLUTION. |
|------------------------------------|--|
| $100\% + \frac{1}{2}\% = 1$ | 001 %. |
| $100\frac{1}{8}\%$ of cost of bill | = \$2,443.05 |
| .: Cost of bill | $= 2,443.05 \times 100 = 22.440$ |
| : £500 are worth | \$2,440 |
| £1 is worth | $\frac{2,440}{500} = $4.88, \text{ course of exchange}.$ |

EXAMPLE 2.—The cost of a bill of exchange on Hamburg for 4,400 marks, including brokerage of $\frac{1}{2}$ %, was \$1,057.32. What was the course of exchange on Hamburg?

| | Solut | ION. | | |
|----|--|--|-----|---------------|
| .: | $\frac{100\% + \frac{1}{8}\% = 100\frac{1}{8}\%.}{100\frac{1}{8}\% \text{ of cost of bill}} = \frac{100\frac{1}{8}\%}{100\frac{1}{8}\%}$ | \$1,057.82 \$1,057.32 × | 100 | 61 070 |
| | ∴ 4,400 marks are work 1 mark is worth 24c. × 4 = 960 | 100 1 orth \$1,056 24c. | | \$1,056. |

EXERCISE 108.

Find the course of exchange of a bill.

| - | - | | 0 | | | |
|-----|----|--------------------|------|--------------|-----------|-----|
| | | £5,000, | Cost | \$24,230.50, | Brokerage | 10/ |
| 2. | ** | £2,000, | 66 | \$9,732.15, | 41 | |
| 8. | 44 | 3,200 marks, | " | | | 1% |
| 4. | ** | 800 " | | \$765.66, | 46 | 1% |
| | | | 66 | \$184.23, | 66 | 1%. |
| 5. | ** | 1,600 guilders, | 66 | \$645.61, | 66 | |
| 6. | ** | 3,600 " | " | \$1,680.75 | " | 1%. |
| 7. | ** | 1,854 francs, | 66 | \$360.45, | 66 | 1%. |
| 8. | 44 | 866,20 " | ** | \$72.09. | | 1%. |
| 9. | 44 | 2,200 reichsmarks. | ** | | ** | 1% |
| 0. | ** | | | \$528.66, | 44 | 1%. |
| .0. | | .5,500 " | " | \$1,821.65, | " | 1% |

11. A draft on Dublin for £860 cost \$1,786. What was the course of exchange?

ris for 12,420

verpool for £500, the quotation?

\$2,440.

rse of exchange.

nburg for 4,400 was the course

\$1.056.

nge. Art. 478.

ge 1 %. 1% ŧ%. 1% 1% 1% 1% 1% 1% 1% 6. What

FOREIGN EXCHANGE

12. The cost in currency, when gold was at $104\frac{1}{4}$, for a bill of exchange for 12,800 guilders on Amsterdam was \$6,245.80, including 1% brokerage. What was the course of exchange?

13. I paid \$5,817 for a bill of exchange for £1,200 on Liverpool. What was the course of exchange, exclusive of brokerage?

14. The cost, including $\frac{1}{6}$ % brokerage, for a draft on Antwerp for 833 francs was \$161. What was the course of exchange?

15. A merchant paid \$755 for a bill of exchange for 3,200 marks on Frankfort. What was the course of exchange, no charges for brokerage being made?

482. To find the Face of a Foreign Bill of Exchange.

EXAMPLE 1.-- A bill of exchange on Manchester, England, cost \$1194.94 when exchange was 4.88. What was the face of the bill?

SOLUTION. \$4.88 = cost of £1 \$1 £ 1 • • 4.88 \$1194.94 = e1194.99 .. £244.875. 4.88

= £244 17s. 6d. Face of bill.

EXAMPLE 2 .- The cost of a bill of exchange on Bremen was \$570, when exchange was 95. What was the face of the bill?

SOLUTION. 8.95 = cost of 4 marks. (Art. 478). .95 4 × 570 \$570 = .. .95 =

2,400 marks, Face of bill.

Example 8 .- The cost of a bill of exchange on Paris was \$500, when exchange was at 5.18. What was the face of the bill?

SOLUTION. = cost of 5.18 francs. \$500 = 5.18×500 66 = 2,590 francs, Face of bill.

EXERCISE 109.

1. A bill of exchange on Montreal, cost £125 in Birmingham, England, exchange being at 8% premium for sterling; required the face of the bill?

2. Bought a bill of exchange on London, when exchange was 4.90 and gold $102\frac{1}{2}$. I paid \$87,668.75 in currency. What was the face of the bill?

8. An agent remitted to his principal a draft on Toronto from Amsterdam at $\frac{1}{3}$ % brokerage, exchange being at 40. The cost of the draft in Amsterdam, including brokerage, was 960 guilders. What was the face of the draft?

4. A broker invested \$1,158 in Paris francs at par. How many francs did he purchase?

5. What will be the face of a bill on Hamburg, exchange being quoted at $94\frac{1}{2}$ and the cost of the draft \$756?

6. An agent in Boston, having \$7,536.30 due his employer in England, is directed to remit by a bill on Liverpool. What is the face of the bill which he can purchase for this money, exchange being at 11 % premium ?

7. A merchant in Chatham has 9.087 guilders, 10 stivers, due him in Amsterdam, and requests the remittance by draft. What sum will he receive, exchange on Canada being in Amsterdam at $2\frac{1}{2}$ guilders for \$1? (1 guilder = 20 stivers.)

8. What is the face of a 3 days' draft on Bremen, that was purchased in Hamilton for \$3,261.60, exchange $94\frac{3}{8}$?

9. A trader in London, Eng., wishes to invest £2,500 in merchandise in Lisbon. If he remits to his correspondent at Lisbon a bill purchased for this sum at the rate of 64¹/₂d. sterling, per milree. What sum in the currency of Portugal will the agent receive?

10. G. B. Smith & Co., Toronto, instructed their agent at Berlin to draw on them for a bill of goods of 4,500 marks, exchange at $97\frac{1}{8}$, brokerage $\frac{1}{4}$ %. What did they pay in Canadian money for the goods?

£125 in Birpremium for

hen exchange in currency.

ft on Toronto being at 40. g brokerage, draft?

at par. How

rg, exchange \$756?

.80 due his y a bill on he can purremium ?

, 10 stivers. ace by draft. la being in 20 stivers.) emen, that inge 948? t £2,500 in respondent the rate of urrency of

heir agent s of 4,500 did they

FOREIGN CIRCUITOUS EXCHANGE.

483. Arbitration of Exchange is the process of finding the cost of exchange between two places, if remittance be made through one or more intermediate places.

Norg.-1. When there is only one intermediate exchange, the process is called Simple Arbitration ; when there are two or more intermediate exchanges, the process is called Compound Arbitration.

2. The object of arbitration is to ascertain the most advantageous ronte for making drafts or remittances.

484. There are always three methods of receiving money from a place, or of transmitting money to a place, by means of indirect exchange through one intervening place. Thus,

If A. is to receive money from C. through B., 1st. A. may draw on B., and B. draw on C.; 2nd. A. may draw on B., and C. remit to B.; Srd. B. may draw on C., and remit

If A. is to transmit to C. through B., 1st. A. may remit to B., and B. remit to C.; 2nd. A. may remit to B., and C. draw on B.; 3rd. B. may draw on A., and remit to C.

EXAMPLE 1.- A man in Toronto paid a demand bill in Paris of 5,400 francs, by remitting to Amsterdam at the rate of 21 cents for 10 stivers, and thence to Paris at the rate of 28 stivers for 3 francs. How much Canadian money was required ?

SOLU ! ION.

28 stivers = 3 francs : 28 stivers = 1 franc. 21 cents = 10 stivers : it cents = 1 stiver. 5,400 × 28 5,400 francs stivers 5,400 × 28 stivers 5,400 × 28 × 21 oents 8 × 10 = \$1,058.40. Ans.

EXPLANATION.

To reduce france to stivers, multiply by 👫, because there are 👫 times as many stivers as there are francs.

To reduce stivers to cents, multiply by 23, because there are 23 times as many cents as there are stivers.

EXAMPLE 2.- A Montreal merchant remits 55,880 floring to Amsterdam by way of London and Paris, at a time when the exchange of Montreal on London is \$4.885 for £1, of London on Paris is 25.4 france for £1, and of Paris on Amsterdam is 212 france for 100 florins; per cent. brokerage being paid in London and in Paris. How many dollars will purchase the bill of exchange?

SOLUTION.

100 florins = 212 francs

25.4 francs = £1

55,880 florins x

: $\left(\frac{212}{100} \times \frac{100\frac{1}{8}}{100}\right)$ france = 1 florin. $\therefore \pounds \left(\frac{1}{25.4} \times \frac{100 \sharp}{100}\right) = 1 \text{ frame.}$ = £1 $=\frac{55,880 \times 212 \times 801}{100 \times 800}$ francs. $= \pounds \frac{55,880 \times 212 \times 801 \times 801}{100 \times 800 \times 25.4 \times 800}$

 $\frac{55,880 \times 212 \times 801}{100 \times 800}$ frances $\pounds \frac{55, (\ ^{\circ}9 \ \times \ ^{\circ}212 \ \times \ ^{\circ}801 \ \times \ ^{\circ}801}{100 \ \times \ ^{\circ}800 \ \times \ ^{\circ}25.4 \ \times \ ^{\circ}800}$ $= 3^{55,880 \times 212 \times 801 \times 801 \times 4855}$ 100 × 800 × 25.4 × 800 = \$22.840.634 + Ans.

EXPLANATION.

To reduce floring to frames, multiply by $\frac{212}{100} \times \frac{100_5}{100}$, because there are $\left(\frac{212}{100} \times \frac{100\frac{1}{3}}{100}\right)$ times as many irance as there are floring.

To reduce france to \mathcal{L} , multiply by $\left(\frac{1}{25.4} \times \frac{100^{\frac{1}{5}}}{100}\right)$, because there are $\left(\frac{1}{254} \times \frac{100k}{100}\right)$ times as many £ as there are france.

To reduce £ to \$, multiply by 4.885, because there are 4.885 times as many \$ as there are £.

EXAMPLE 8 .--- A banker in New York remits \$3,000 to Liverpool, by arbitration, as follows : First to Paris at 5 francs 40 centimes per \$1; thence to Hamburg at 185 francs per 100 marcs; thence to Amsterdam 2t 85 stivers per 2 marcs; thence to | iverpool at 220 stivers per 21 sterling. How much sterling money will he have in lank at Liverpool, and what will be his gain over direct exchange at 10 % premium ?

e are 📲 times

e are 21 times

80 florins to the exchange Paris is 25.4 r 100 florins; How many

florin.

3.

CS.

 $\frac{\times 801 \times 801}{25.4 \times 800}$ $\frac{801 \times 4885}{4 \times 800}$

se there are

ause there

5 times as

verpool, by ses per \$1; msterdam rs per £1 Liverpool, m?

FOREIGN EXCHANGE.

٠**.**

| | SOLUTION. |
|--|---|
| | $\begin{array}{rcl} \therefore \ \pounds_{147} &= 1 \ \text{stiver.} \\ \text{stivers} & \therefore \ \frac{4}{16} \ \text{stivers} &= 1 \ \text{maro.} \\ 0 \ \text{maros} & \therefore \ \frac{4}{16} \ \text{stivers} &= 1 \ \text{maro.} \\ \therefore \ \frac{4}{16} \ \text{stivers} &= 1 \ \text{frano.} \\ \therefore \ \frac{4}{16} \ \text{francs} &= \$1. \\ \text{stivers} & \frac{3,000 \times 540}{100} \ \text{francs.} \\ \text{stivers} & \frac{3,000 \times 540 \times 100}{100 \times 185} \ \text{maros.} \\ & \frac{8,000 \times 540 \times 100 \times 35}{100 \times 185 \times 2} \ \text{stivers.} \\ &= \ \pounds \ \frac{3,000 \times 540 \times 100 \times 35}{100 \times 540 \times 100 \times 35} \end{array}$ |
| $\begin{array}{l} \$ \left(\frac{49}{2} \times \frac{1}{100} \right) = \pounds 1 \\ \bullet \cdot \ \$ 3,000 = \pounds \frac{22000}{10} \times \frac{2}{40} \times \frac{198}{100} \end{array}$ | 100 × 185 × 2 × 220 = £696 11s. 2d. Circuitous exchange. = £613 12s. 9d. Direct exchange. £82 18s. 5d. Gain. Ans. |

EXERCISE 110.

1. When exchange at New York on Paris is 5 frances 16 centimes per \$1, and at Paris on Hamburg 2½ frances per marc banco, what will be the arbitrated price in New York of 7,680 marc bancos of Hamburg?

2. The exchange at Paris upon London is at the rate of 25 frances 70 centimes for £1 sterling, and the exchange at Vienna upon Paris is at the rate of $40\frac{1}{2}$ Austrian floring for 20 frances: find how many Austrian floring should be paid at Vienna for a £50 note.

8. An agent in Boston, having \$7,536.30 due his employer in England, is directed to remit by a bill on Liverpool. What is the face of the bill which he can purchase for this money, exchange being at 11% premium?

291

ŧ

4. Bills on Amsterdam, bought in London at 12 florins 15 cents per £1 sterling, are sold in Paris at $57\frac{1}{2}$ floring for 120 francs. What is the course of exchange between London and Paris?

5. If at Philadelphia, exchange on Liverpool is at 9§ % premium, and at Liverpool on Paris 26 frances 86 centimes per £1; what is the arbitrated course of exchange between Philadelphia and Paris, through Liverpool?

6. A resident at Naples having a bequest of \$8,720 made him in Boston, orders the remittance to be made to his agent in London, who remits the proceeds to Naples, reserving his commission of $\frac{1}{2}$ % on the draft sent. If exchange on London is 9% in Boston, and the rate between London and Naples is £1 for 5 scudi, how much does the man realize from his bequest?

7. A merchant of Toronto wishes to transmit 2,400 mares banco to Hamburg. He finds exchange between Toronto and Hamburg to be 35 cents for 1 marc. The exchange between Toronto and London is \$4.83 for £1; that between London and Paris is 26 frances for £1; and that of Paris on Hamburg is 47 frances for 25 marcs. By what way should the Toronto merchant remit?

8. A person in London owes another in St. Petersburg 920 roubles, which must be remitted through Paris. He pays the requisite sum to his broker, at a time when the exchange between London and Paris is 25.15 francs for ± 1 , and between Paris and St. Petersburg 1.2 francs for 1 rouble. The remittance is delayed until the rates are 25.95francs for ± 1 and 1.15 francs for 1 rouble. What does the broker gain or lose by the delay?

9. A merchant in New York wishes to pay £3,000 in London. Exchange on London is at par; on Paris, 5

12 florins florins for n London

s at 94 % centimes between

\$8,720 made to Naples, ent. If between loes the

2,400 etween The or £1 ; l; and s. By

rsburg . He n the or £1, for 1 25.35 s the

0 in is, 5

FOREIGN EXCHANGE.

francs 25 centimes per \$1; and on Amsterdam, 40 cents to a guilder. The exchange between France and England at the same time 25 france to £1, that of Amsterdam on England is 12; guilders to £1. Which is the most advantageous, the direct exchange, or through Paris, or

10. When the course of exchange between London and Paris is 9¹/₂d. per franc, and 3.63 francs are equivalent to 1 Prussian thaler, and 24.5 thalers to 34 Austrian florins, and 25 Austrian florins to 12.6 Venetian ducats,---if a London merchant owe to one in Venice 1,000 ducats, will it be more advantageous to remit by way of Paris, Berlin, and Vienna, or direct to Venice, supposing a ducat to be equivalent to 4s. 2d. ?

RATIO.

485. Ratio is the relation between two members of the same denomination, expressed by the quotient of the first divided by the second.

Thus the ratio of 9 to 6 is (9 + 6); the ratio of 6 to 9 is $(6 \div 9)$.

486. The Sign of ratio is the colon (:).

The ratio of 9 to 6 is expressed 9:6, or 9 + 6, or as a fraction $\frac{2}{3}$.

487. The Terms of a ratio are the numbers compared.

488. The Antecedent is the first term, or the dividend, or, if expressed as a fraction, the numerator.

489. The Consequent is the second term, or the divisor, or, if expressed as a fraction, the denominator.

490. The two terms together form a Couplet.

491. A Direct Ratio is the quotient of the antecedent divided by the consequent.

492. An Inverse Ratio or Reciprocal Ratio is the quotient of the consequent divided by the antecedent.

493. Ratios are compared by comparing the fractions by which they are represented.

494. Ratios are compounded by multiplying together the fractions by which they are represented, and expressing the resulting fraction as a ratio.

Thus the ratio compounded of 3:5 and 7:9, is $\frac{3}{5} \times \frac{7}{5} = 21:45$.

PROPORTION.

295

rs of the the first

6 to 9 is

or 8.8 8

apared.

vidend.

or the or.

edent '

is the

stions

ether esing

7 =

PROPORTION.

495. Proportion consists in the equality of two ratios.

For example, the ratio of 27 yds. to 9 yds. is $\frac{97}{12} = 3$; the ratio of 87 $\frac{1}{2}$ cts. to 12 $\frac{1}{2}$ ots. is $\frac{87\frac{1}{4}}{12\frac{1}{2}} = 3$ and, therefore, the ratio of 27 yds. to 9 yds. is equal to the ratio of 37 $\frac{1}{4}$ ots. to 12 $\frac{1}{4}$ ots., since each ratio is equal much

This is expressed thus: -27 yds. : 9 yds. = $37\frac{1}{2}$ cts. : 12 $\frac{1}{2}$ ots., or 27 yds. : 9 yds. :: $37\frac{1}{2}$ ots., ite double colon (::) being used instead of the sign of equality (=), or it may be expressed $\frac{27 \text{ yds.}}{9 \text{ yds.}} = \frac{37\frac{1}{2} \text{ cts.}}{12\frac{1}{2} \text{ cts.}}$

496. The arithmetic test of proportion is, therefore, that the two fractions representing the ratios must be equal.

Since $\frac{6}{12} = \frac{4}{2}$ therefore 6 : 12 :: 4 : 8.

497. The two terms 6 and 8 are called the extremes. The two terms 12 and 4 are called the means.

6 is called the *first* proportional. 12 is called the *second* proportional, 4 is called the *third* proportional. and 8 is called the *fourth* proportional.

498. Where the two means are the same number, that number is said to be a mean proportional between the two extremes.

Thus, in the proportion 4:6:6:9, 6 is the mean proportional between 4 and 9.

499. When two quantities are connected in such a way, that, when the first is increased any number of times, the second is increased the same number of times, they are said to be in direct proportion.

PROPORTION.

For example, if 1 lb. of sugar cost 3 cta

| 2 | lbs. | will co | st 2 | time | 38 8 | ota. |
|---|------|---------|------|------|------|------|
| 0 | | | 8 | ** | | 46 |
| 4 | 44 | ** | 4 | 66 | 8 | 66 |
| | eto | . etc. | | | | |

That is, if we increase the weight any number of times we increase the cost the same number of times, i.e., the cost of the sugar is directly proportional to its weight and vice versa. Hence, 1 lb. : 7 lbs. :: 8 cts. : 7 times 8 cts.

500. When two quantities are connected in such a way, that, when the first is increased any number of times, the second is decreased the same number of times, they are said to be in inverse proportion.

| For or | | 1. 14 | | ц. |
|---------|-----|-----------------|--------|---|
| I OI CA | amp | ie, if one man | can do | A Diego of much to to a |
| | 2 | men will do the | a work | a piece of work in 12 days, in 12 days ÷ 2 |
| | 3 | ** | 44 | 11 12 days + 2 |
| | 4 | 44 | | 12 days ÷ 3 |
| | | sto., etc. | | 12 days ÷ 4 |
| 4 2 10 | | | | |

That is, if we increase the number of men any number of times, we decrease the time the same number of times, i.e., the number of men required to do the work is inversely proportional to the number of days,

Hence, 1 man : 4 men :: 12 days : 12 days.

501. The student will obtain from the foregoing illustrations the following principles.

1. The product of extremes is equal to the product of the means.

2. Hence, the product of the extremes, divided by either mean, will give the other mean.

3. The product of the means, divided by either extreme will give the other extreme.

SIMPLE PROPORTION.

297

SIMPLE PROPORTION.

502. A Simple Proportion is an expression of equality between two simple ratios.

EXAMPLE 1 .- Find the term omitted in the following proportion 3:16:: no. required : 48.

SOLUTION.

 $8 \times 48 + 16 = 9$, no. required. Principle 2.

EXAMPLE 2.-If 5 lbs. of sugar cost 60 cts, find the cost of 11 lbs.

SOLUTION.

Here more requires more, (i.e., more weight requires more cost) hence the cost is *directly* proportional to the weight.

: 5 lbs. : 11 lbs. :: 60 cts. : required cost.

: required cost = $\frac{11 \times 60}{5}$ = \$1.32 Ans. Principle 8.

EXAMPLE 3.-If 3 men can do a piece of work in 25 days, how long will it take 5 men to do the same work?

SOLUTION.

Here more requires less (i.e., more men require less time to do the same work) hence, the time is inversely proportional to the number of men.

: 3 men : 5 men :: time required for 5 men : 25 days (time required for 3 men).

: time required for 5 men = $\frac{3 \times 25}{\delta} = 15$ days Ans. Principle 2.

5 men : 8 men :: 25 days (time required for 8 men) : no. of days required.

 \therefore no. days required = $\frac{3 \times 25}{5} = 15$ days. Principle 3.

Example 4.-If 6 men can do a piece of work in 12 days, in what time will 4 men do the same work?

SOLUTION.

Here less requires more (i.e., less men require more time to do the same quantity of work), hence the time is inversely proportional to the number

:. 6 men: 4 men :: time required for 4 men : 12 (ti required for 6 men),

: time required for 4 men = $\frac{6 \times 12}{4}$ = 18 days, Ans. Frinciple 3.

es we increase ugar is directly

such a way. f times, the es, they are

2 dave.

of times, we iber of men ber of days,

oing illus-

uct of the

by either

extreme

SIMPLE PROPORTION.

Norzs 1.—If the terms of any couplet are of different denominations, they must be reduced to the same denomination.

If the odd term is a compound number reduce it to its lowest unit.
 If the divisor and dividend contain factors common to both, cancel them.

EXERCISE 111.

Find the term omitted, and represented by x, in each of the following proportions:

1. 8:52 = 20: x. 2. 12: x = 1: 144. 3. x: 20: :120: 50. 4. \$80: \$4 = x: 8. 5. 2.5: 62.5: :5: x.

6. \$175.35 : \$x :: $\frac{1}{2}$: $\frac{1}{2}$. 7. $\frac{41}{2}$ yd. : x yd. :: \$93 : \$27 $\frac{1}{2}$. 8. x : 9.01 = 16.05 : 5.35. 9. $\frac{x}{9.01} = \frac{16.05}{5.35}$. 10. $\frac{1}{2}$ yd. : x yd. :: \$ $\frac{1}{2}$: \$5.

11. If 12 gallons of wine cost \$30, what will 63 gallons cost ?

12. If 9 bush. of wheat make 2 bbl. of flour, how many barrels of flour will 100 bush. make ?

13. If 6½ bush. of oats cost \$3, what will 9½ bush. cost?

14. What will 87.5 yd. of cloth cost, if 13 yd. cost \$.42?

15. If by selling \$1,500 worth of dry goods I gain \$275.40, what amount must I sell to gain \$1,000?

16. What will 111 lb. of tea cost, if 8 lb. 12 oz. cost \$3.50 ?

17. If a speculator in grain gain \$26.32 by investing \$325, how much would he gain by investing \$2,275?

18. In canning 5 lb. of raspberries 3 lb. sugar are needed, how many pounds sugar for 38 lb. of berries ?

19. If with the money I have, I can buy 84 lb. of coffee at 25c a lb., how many pounds can I buy for the same money at 80c a lb?

SIMPLE PROPORTION.

20. If wall paper be 20 inches wide, I shall need 7 rolls to paper a room. How many rolls will suffice if the paper be 24 inches wide? If 30 inches wide?

21. If \$750 will yield \$120 interest in a certain time, what interest will \$600 yield in the same time?

22. A man, whose step measures $\frac{4}{5}$ yard. counts 1,200 steps from his house to his office. How many steps will his son have to take, whose step measures $\frac{1}{2}$ yd?

23. If each man on board ship consumes daily $1\frac{1}{4}$ lb. bread, their bread will last $5\frac{1}{5}$ months. How much will each man get per day if it is to last $6\frac{1}{2}$ months?

24. The rate of two pedestrians is as 5:4. How many miles will the first travel in the same time in which the second travels $84\frac{1}{2}$ miles ?

25. At the rate of \$180 for $\frac{3}{10}$ acre, what will 5 acres cost?

26. The heat produced by a cubic yard of beech-wood is to that produce 1 by a cu. yd. of pine as 9:7. How many cu. yd. of peech-wood are needed to produce the heat of 50 cu. yd. of pine?

27. If 12 yards of velvet cost \$52, what will 9 yd. cost?

28. A farmer sowed 8 bush. of buckwheat on $2\frac{2}{3}$ acres. How much would he need for a field containing $4\frac{1}{2}$ acres?

29. # of a sum of money is \$800, how much is \$ of it ?

enominations.

s lowest unit. both, cancel

in each of

: \$27**1.** 5.

5.

8 gallons

ow many

h. cost ?

st **\$.**42 ? I gain

.

oz. cost

vesting

needed,

coffee same

COMPOUND PROPORTION.

503. A Compound Proportion is an expression of equality between two ratios, one or both of which are compound.

Thus 3:4 6:9 :: 14:28 is a proportion composed of a compound and a simple ratio, and may be expressed, $3 \times 6: 4 \times 9:: 14: 28$, equivalent to a simple proportion, 18:36::14:28.

504. The terms of a proportion have not only the relations of magnitude, but also the relations of cause and

505. Causes, in proportion, are considered as things that produce a certain result : as, men at work, money lent, horses, time, etc.

506. Effects are the result of causes : as, work done, interest drawn, cost, distance travelled.

507. Every problem in proportion may be considered as a comparison of two causes and two effects; these causes and effects being themselves either simple or compound.

Thus if 4 tons of hay as a cause, will bring, when sold, \$24 as an effect, 12 tons, when sold, as a cause, will bring \$72 as an effect. Or, if 6 horses as a cause, draw 10 tons as an effect, 9 horses as a cause, will draw 15 tons

508. Since like causes produce like effects, the ratio of two like causes must equal the ratio of two like effects produced by

COMPOUND PROPORTION.

Hence every question in proportion must give one of the following statements :

1st cause : 2nd cause :: 1st effect : 2nd effect. or 1st effect : 2nd effect :: 1st cause : 2nd cause.

EXAMPLE 1.-If 4 horses consume 24 bushels of oats in 12 days, how many bushels will 20 horses eat in 16 days?

SOLUTION.

| | • | 1st cause | : 2nd cause | :: | 1st effect : 2nd effect. | |
|----|-----|---------------------|------------------------------|----------------------------------|---|--|
| | | 4 norses 12 days | : 20 horses : 16 days | } :: { | 24 bush : No bush maning | |
| •• | No. | bush. requir | $ed = \frac{20 \times 1}{4}$ | $\frac{16 \times 12}{\times 12}$ | $\times \frac{24}{2} = 160$ bush. Ans. Prin. 3. | |

EXAMPLE 2.—If 2 workmen dig a ditch 24 yards long and 3 feet wide, and 2 feet deep, in 5 days, how long will it take 3 workmen to dig a ditch 30 yards long, 4 feet wide, and 3 feet deep?

SOLUTION.

| ISC CAUSE | : 2nd cause | : 1st effect | : | 2nd effect. |
|-------------------------|-------------------------------|----------------------------------|---|----------------------|
| 2 workmen : 5 days : | 3 workmen No days required | :: {24 yards 3 feet 2 feet | : | 30 yards. 4 feet. |

Here one part of the means is missing, and it may be found by dividing the product of the extremes by the product of the given parts of the means.

Hence, required time = $\frac{2 \times 5 \times 30 \times 4 \times 3}{3 \times 24 \times 3 \times 2} = 8\frac{1}{3}$ days. Ans. Prin. 2.

EXERCISE 112.

Find the term omitted and represented by x in the following proportions.

| 1. $3:4$ = 40 : x. | $8. \begin{array}{c} 6: \ x \\ 14: 12 \end{array} \} = \begin{cases} 86: 48, \\ 56: 54. \end{cases}$ |
|--|---|
| 2. $\frac{480: x}{30: 15}$:: 84 : 21. | 4. $\begin{array}{c} 7 : 28 \\ 12 : x \end{array}$:: $\begin{array}{c} 60 : 80, \\ 8 : 3, \\ 6 : 8. \end{array}$ |

5. Five clerks use 25 quires of paper in 8 days. At the same rate, how much paper will 6 clerks use in 10 days?

•

xpression of ich are com-

mpound and a : 28, equivalent

ot only the f cause and

d as things ork, money

work done,

considered nese causes npound.

4 as an effect, r, if 6 horses draw 15 tons

atio of two roduced by

COMPOUND PROPORTION.

6. Six lamps consume 2 gallons of petroleum in 8 days. How many lamps will consume 3 gallons in 12 days ?

7. Two workmen dig a ditch of 24 yds. in length and 8 ft. in width in 5 days. How long will it take 8 workmen to dig a ditch 30 yds. long and 4 ft. wide ?

8. Eight persons spend \$296 on a journey of 7 days. How long will \$300 last 7 persons at that rate?

9. If a block of marble 5 ft. long, 3 ft. wide, 2 ft. thick, weighs 4,850 lb., what will a block weigh measuring 7 ft. in length, 4 ft. in width, and 8 ft. in thickness?

10. Ten cwt. of merchandise cost \$2½ freight for 245 miles. What will 5 cwt. cost for 210 miles?

11. If \$700 at interest amounts to \$770 in 15 months, what sum must be put at the same rate to amount to \$845 in the same time?

12. From the milk of 20 cows, each giving 18 qts. daily, $16\frac{1}{2}$ cheeses of 50 lb. each are made in 42 days. How many cows, giving but 16 qts. daily, will be needed to make 88 cheeses of 60 lb. each in 28 days?

13. Being asked to find the number of bricks in a wall 10 ft. high, 922 ft. long, and 16 in. thick, I found that a part of the wall, 4 ft. high, 4 ft. long, and 16 in. thick, contained 448 bricks. How many in the whole wall?

14. If \$750 gain \$202.50 in 4 years 6 months, what sum will gain \$155.52 in 1 year 6 months?

15. If it require 1,200 yds. of cloth $\frac{4}{5}$ wide to clothe 500 men, how many yards which is $\frac{2}{5}$ wide will clothe 960 men?

16. If by travelling 6 hours a day at the rate of $4\frac{1}{2}$ miles an hour, a man perform a journey of 540 miles in 20 days, in how many days, travelling 9 hours a day at the rate of $4\frac{2}{3}$ miles an hour, will he travel 600 miles ?

COMPOUND PROPORTION.

303

m in 8 days. days ?

length and 3 workmen

7 of 7 days.

2 ft. thick, ring 7 ft. in

t for 245

15 months, int to \$845

qts. daily, ays. How ed to make

s in a wall ound that in. thick, wall?

what sum

clothe 500 960 men ?

f 4½ miles 1 20 days, he rate of 17. What sum of money will produce \$300 in 8 months, if \$800 produce \$70 in 15 months?

18. How many days will 21 men require to dig a ditch 80 ft. long, 3 ft. wide, and 8 ft. deep, if 7 men can dig a ditch 60 ft. long, 8 ft. wide, and 6 ft. deep, in 12 days?

19. How many men will be required to dig a cellar 45 ft. long, 34.6 ft. wide, and 12.3 ft. deep, in 12 days of 8.2 hours each, if 6 men can dig a similar one 22.5 ft. long, 17.8 wide, and 10.25 ft. deep, in 3 days of 10.25 hours each?

20. If a bin 8 ft. long, $4\frac{1}{2}$ ft. wide, and $2\frac{1}{2}$ ft. deep hold $67\frac{1}{2}$ bush., how deep must another bin be made, that is 18 ft. long and $8\frac{4}{5}$ ft. wide, to hold 450 bush. ?

21. How long should A. lend B. \$1,175, to balance loans from B. to A. of \$100 for 3 months, \$400 for 2 months, and \$600 for 6 months? How much should A. lend B. for 10 months, to balance these loans?

DISTRIBUTIVE PROPORTION.

509. Distributive or Partitive Proportion is the method of dividing a number, or quantity, into parts which are proportional to given numbers.

510. The principle of this rule can be applied to the solution of numerous questions of a practical nature, such as determining the profits and losses of partners in trade, apportioning shares of participators of prize money, finding the relative proportion of ingredients requisite to form a given quantity of a compound, apportioning taxes, school rates, averaging, etc.

EXAMPLE 1.—Divide \$600 among A. B. C. and D., so that their shares may be in the proportion of 3, 4, 5 and 6.

SOLUTION 1.

 $\begin{array}{rl} 8 + 4 + 5 + 6 = 18 \\ 18:3 :: \$600 : A.'s share & \therefore A.'s share = \$100 \\ 18:4 :: \$600 : B.'s share & \therefore B.'s share = \$133 \\ 18:5 :: \$600 : C.'s share & \therefore C.'s share = \$166 \\ 18:6 :: \$600 : D.'s share & \therefore D.'s share = \$200. \end{array}$

EXPLANATION.

Altogether there are 18 shares, of which A. gets 3, B. 4, C. 5, D. 6, and the problem then becomes: If 18 shares represent \$600, what is represented by 3 shares? by 4 shares? by 5 shares? by 6 shares? These give rise to the preceding proportions.

SOLUTION 2.

| 18 shares = \$600 1 share = $\frac{600}{18}$ A. gets 3 shares = $\frac{600}{18} \times 8 = 100 B. gets 4 shares = $\frac{600}{18} \times 4 = 133 etc |
|--|
| |

DISTRIBUTIVE PROPORTION.

SOLUTION 3. A. 3 shares A. gets $\frac{3}{18}$ of the whole and $\therefore \frac{3}{18}$ of \$600 = \$100 B. 4 61 B. gets 1 of the whole and : 1 of \$600 = \$1331, C. 5 24 D. 6 **

Total 18 shares.

The student is recommended to use either the second or third method of solution.

EXAMPLE 2 .- Divide \$2,000 among A., B., C., so that B. may have \$300 more than A., and C. \$200 more than B.

SOLUTION.

A.'s share = A.'s share B.'s share = A.'s share + \$300 C.'s share = A.'s share + \$300 + \$200 Total = 3 times A.'s share + \$800 : 8 times A.'s share + \$800 = \$2,000 . 8 ** = \$1,200 . A.'s share = \$400 B.'s share = \$400 + \$300 = \$700 C.'s share = \$700 + \$ 00 = \$900.

EXERCISE 113.

1. Divide \$60 into two parts proportional to 11 and 9.

2. Divide \$2,500 into parts proportional to 2, 3, 7, 8.

8. Divide \$8,470 into parts proportional to $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{4}$. 4. Gunpowder is made of saltpetre, sulphur and charcoal in parts proportional to 75, 10 and 15; how many pounds of each are contained in 12 cwt. of gunpowder?

5. The sides of a triangle are as 3, 4, 5, and the sum of the lengths of the sides is 480 yards : find the sides.

6. Divide \$640 among A., B. and C., so that A. may have three times as much as B., and C. as much as A. and B.

7. Divide the number 582 into 4 such parts that the second may be twice the first, the third 21 more than the second, and the fourth 54 more than the first.

on is the arts which

ied to the ture, such s in trade. y, finding to form a es, school

o that their

5, D. 6, and epresented give rise to

\$100 \$1831.

DISTRIBUTIVE PROPORTION.

8. If C. has twice as much money as B., and if \$12 be taken from A.'s money, it will be equal to $\frac{1}{3}$ of B.'s; how much has each, the sum of their moneys being \$645?

9. A man left his property to be divided among his 3 sons in proportion to their ages, which are 21, 18, and 12 years. The share of the youngest is \$1,440. What was the value of the property?

10. A., B., C., and D. commenced business with a capital of \$18,500; A. invested \$800 less than B., and C. invested \$1,000 more than A., and D. \$900 less than C.; how much did each invest?

11. Divide 560 into parts, so that the second may be 4 times the first.

12. A force of police 1,921 strong is to be distributed among 4 towns in proportion to the number of inhabitants in each; the population being 4,150, 12,450, 24,900, and 29,050 respectively. Determine the number of men sent to each.

13. Divide 450 shares of stock among 3 persons, in proportion to the number of shares owned by each; A. holds 400, B. 200, and C. 300; how many shares will each receive?

14. A piece of land of 200 acres is to be divided among 4 persons, in proportion to their rentals from surrounding property. Supposing these rents to be £500, £350, £800, and \pm 90, how many acres must be allotted to each?

15. If $\frac{2}{3}$ of A.'s money, and $\frac{3}{4}$ of B.'s equal \$900, and $\frac{3}{4}$ of B.'s is twice $\frac{2}{3}$ of A.'s, what sum has each?

16. A father divided \$18,500 among 3 children, so that the portion of the second was greater by one-half than that of the first, and $\frac{1}{2}$ the first was equal to $\frac{1}{6}$ of the third; what was the share of each?

if \$12 be 3.'s; how 345?

ng his 3 3, and 12 Vhat was

a capital . invested .ow much

nay be 4

stributea nabitants ,900, and nen sent

s, in pro-A. holds vill each

d among rounding 50, £800, 1?

0, and $\frac{3}{4}$

, so that han that e third ;

PARTNERSHIP.

PARTNERSHIP.

511. A Partnership is an association of two or more persons, who combine their capital, skill or labor, or all of them, for the purpose of carrying on some lawful business, and for participating in the profits or losses arising therefrom, according to the terms of their agreement.

512. The busin is association is called a *Firm*, *House*, or *Company*: and each individual of the association is called a *Partner*.

513. Partners may be classified as-

1. Active partners.

2. Silent or dormant partners.

8. Nominal partners.

4. Special partners.

514. An Active Partner is one who has an interest in the business, and is known to the public as a partner.

515. A Silent or Dormant Partner is one who has an interest in the business, but is unknown to the public as a partner.

516. A Nominal Partner is one who allows his name to be used for the benefit of the firm, without having any pecuniary interest in its business.

517. A Special Partner is one who is held liable for only a specified amount.

518. In an ordinary partnership, each member is tiable to the full extent of his means for the liabilities of the firm; but in a joint stock company, each shareholder is liable only for the amount of his unpaid capital. This explains the meaning of the torm "Limited," which is added to the names of companies, as for example, "The Canada Publishing Co." (Limited).

519. Capital is the money or property invested in the business.

520. The Resources or Assets of a firm consist of the property it owns and the debts due the firm.

521. The Liabilities of a firm embrace all the debts or obligations due by the firm to its creditors.

522. The Investment is the aggregate of the money or property jointly contributed by the partners.

523. The Net Capital is the excess of the Assets or Resources over all Liabilities.

524. The Net Insolvency is the amount which the liabilities exceed the resources.

525. The Net Investment of a firm is the difference between the total sum invested and the total withdrawals.

526. The Net Gain is the excess of the gains over the losses, during a certain time.

527. The Net Loss is the excess of the losses over the gains, during a certain time.

528. A Partnership Settlement is an adjustment of the partners' accounts setting forth the net investment, liabilities assumed, withdrawals, gains, losses, and showing his net capital or net insolvency at closing or settling the partnership's interests.

r is fiable es of the holder is al. This which is le, "The

ed in the

onsist of

he debts

a money

ssets or

hich the

ifference drawals. ins over

ses over

ment of estment, showing ing the

PARTNERSHIP.

529. To divide the Gain or Loss, when each partner's capital has been employed for the same period of

EXAMPLE.-A. and B. formed a partnership; A. furnished \$3,000, B. \$5,000; they gained \$2,000, and agreed to share the profit or loss in proportion to the capital of each ; what was each partner's share ?

SOLUTIO? A.'s capital = 3,000 B.'s " = 5,000 Total " = \$8,000 : A. furnishes \$???? or § of capital. B. 4 \$838 or § : A.'s share of gain = 3 of \$2,000 = \$750. = # of \$2,000 = \$1,250. Total gain (\$2,000) = $\frac{2}{3}$ or $\frac{1}{2}$ of capital = .25 of capital. or. : A.'s share of gain = $$3,000 \times .25 = 750 . = \$5,000 × .25 = \$1,250.

EXERCISE 114.

1. A. and B. buy a store which rents for \$950 a year; A. advanced \$3,500, B. \$4,800; how much rent should

2. A. and B. form a partnership, A. furnishing \$2,200 and B. \$2,500; they lose \$800; what is each one's share

3. A. put \$7,500, and B. \$6,000 into a land speculation ; and A.'s share of the loss was \$225; what was B.'s share?

4. Two men formed a partnership, the former furnishing 3 times as much capital as the latter; they gained \$12,500; what was each one's share of the gain?

5. The net gains of A., B., and C. for a year are \$12,800; A. furnishes \$25,000, B. \$18,000, and C. \$15,000; how should the profit be divided?

6. X., Y. and Z. bought a ship on speculation; X. put in \$30,000, Y., \$20,000, and Z., \$15,000; they sold it at a loss of \$7,500; what was each man's share of the loss?

7. A., B., C. and D. form a partnership with a capital of \$57,000; A. furnishing \$10,000, B. 12,000, C. \$5,000, and D. the remainder; they gain 15% of the joint stock; what is each partner's share of the profit?

8. A., B. and C. entered into partnership; A. furnishing $\frac{1}{2}$, B. $\frac{1}{3}$, and C. the rest of the capital. On winding up the business, U.'s share of the profit was \$4,518; what were the respective dividends of A. and B.?

9. A. invested \$12,000 and B. \$8,000 in a business. A.'s share of the gain or loss is to be $\frac{2}{3}$ and B.'s $\frac{1}{3}$. At the close of the year their resources are \$25,000 in goods and cash, and liabilities \$15,000; what is the net capital, and what each partner's share of the gain or loss?

10. Four persons engage in the lumber trade, and invest jointly \$22,500; at the expiration of a certain time, A.'s share of the gain is \$2,000, B.'s \$2,800.75, C.'s \$1,685.25, and D.'s \$1,014; how much capital did each put in?

11. Three persons enter into partnership for the manufacture of coal oil, with a joint capital of \$18,840. A. puts in \$3 as often as B. puts in \$5, and as often as C. puts in \$7. Their annual gain is equal to C.'s stock; how much is each partner's gain?

12. A., B. and C. are employed to do a piece of work for \$26.45. A. and B. together are supposed to do $\frac{3}{4}$ of the work, A. and C. $\frac{9}{10}$, and B. and C. $\frac{13}{20}$, and are paid proportionally; how much must each receive?

13. Three men trade in company. A. furnishes \$8,000, and B. \$12,000. Their gain is \$1,680, of which C.'s share is \$800; required, C.'s stock. and A.'s and B.'s gain.

K. put in at a loss

capital \$5,000, stock ;

nishing up the t were

siness. At the ds and al, and

invest ie, A.'s 85.25, ? manu-

.. puts uts in much

work of the l pro-

3,000, share

ARTNERSHIP.

14. Six persons are to share among them \$6,300; A. is to have $\frac{1}{7}$ of it, B. $\frac{1}{7}$, C. $\frac{2}{7}$, D. is to have as much as A. and C. together, and the remainder is to be divided between E. and F. in the ratio of 3 to 5. How much does each receive?

15. A., B. and C. form a company for the manufacture of woollen cloths. A. puts in \$10,000, B. \$12,800, and C. \$3,200. C. is allowed \$1,500 a year for personal attention to the business; their expenses for labor, clerk hire, and other incidentals for 1 year are \$3,400, and their receipts during the same time are \$9,400. What is A.'s, B.'s and C.'s income respectively from the business?

530. To divide the gain or loss according to the amount of capital invested and time it is employed.

EXAMPLE.—A., B. and C. are partners in a business; A. invested \$3,000 for four years, B. invested \$5,000 for three years, and C. invested \$4,500 for two years. How should a gain of \$18,000 be divided ?

SOLUTION.

| A.'s in | vestment o | of \$3,000 for 4 y | rs. = an | investment o | f \$12,000 for 1 yr. |
|---------|--------------|----------------------|-----------------------|----------------|---------------------------------|
| B.'s | ** | \$5,000 for 3 y | ra - | | |
| C.'s | 36 | 84 100 1 | | " | \$15,000 |
| | | \$4,500 for 2 y | | a a | \$ 9,000 |
| ~ | ishes 1 0: | f investment :: " | his gain | = 17 of \$18,0 | 000 = \$6,000. 000 = \$7,500 |
| | | | or | | 00 = \$4,500. |
| Total | gain (\$18,0 | 00) = 18888 o | r l of inv | estmont r | |

 \therefore A.'s share of gain = \$12,000 × .5 = \$6.000.

| B.' | 54 | φ0,000, | |
|-----|----|----------------------------------|--|
| | | $=$ $.5,000 \times .5 = .5,500.$ | |
| с. | 66 | | |
| | | = \$ 9,000 × .5 = \$4,500. | |
| | | | |

RULE.

Multiply each partner's capital by the time it is employed, consider these products as their respective capitals and proceed as in Art. 529.

EXERCISE 115.

1. A., B. and C. form a partnership; A. furnishing \$3,000 for 9 months, B \$3,400 for 10 months, and C. \$2,800 for 15 months; they lose \$3,200; what is each man's share of the loss?

2. January 1st, 1889, A., B. and C. form a partnership; A. puts in \$8,000, but after six months withdrew \$2,000; B. puts in \$6,000, and adds \$500 after 4 months; C. puts in \$4,000 for the year; they gain \$3,600; what is the share of each?

3. Three men hire a pasture for \$175: A. put in 20 cows for 7 months, B. 120 sheep for 5 months, and C. 24 horses for 8 months; 5 sheep being considered equal to 1 cow, and 4 horses equal to 5 cows; how much should each pay?

4. A. and B. are partners, A. putting in \$4,500 and B. \$2,500; after 6 months they take in C., who furnished \$10,000; their gain for the year was \$5,000; what was the share of each?

5. X., Y. and Z. formed a partnership; X. putting in \$3,000 for 1 year, Y. \$4,500 for 8 months, and Z. \$5,000for 6 months; they lost \$4,000; what was each man's share of the loss?

6. A. and B. formed a partnership and divided the gain or loss in proportion to their average investments. A. put in \$6,000 for 12 months, and afterwards \$4,000 for 6 months. He withdrew \$3,000 for 4 months, then \$6,000 for 2 months, before the close of the partnership. B. put in \$7,000 for 12 months, then 6,000 for 8 months. He withdrew \$4,000 for 5 months, then \$8,000 for 2 months. They gained \$4,560; what was each partner's share ?

7. A., B. and C. began business Jan. 1st, when A. put in \$7,500, and July 1st he put in \$2,500 more; B. put in

rnishing and C. is each

bership;
\$2,000;
\$2,000;
C. puts
bis the

20 cows horses cow, h pay ? and B. rnished

rnished at was

ting in \$5,000 man[!]s

A. put for 6 \$6,000 3. put . He onths. ?

put in

PARTNERSHIP.

Jan. 1st \$12,000, and May 1st withdrew \$4,000; C. put in Jan. 1st \$10,000, Aug. 1st he added \$3,000, and Oct. 1st he withdrew \$7,000. At the close of the year the profit was \$8,500; how much ought each to have, the gains being divided according to their average investment?

8. Howard & Salter commenced business with a capital of which Howard furnished \$2 to Salter's \$1. At the end of 3 months, Howard withdrew half of his capital, and Salter increased his 25 %. At the end of 9 months, they had \$3,150 to divide. What was the share of each ?

9. Mills, Ross and McAdams, having been in partnership for one year, under an agreement to divide the profit proportionally to their respective shares of capital, have made \$2,403. On the first day of the year, each put in \$10,000; but Ross in 4 months withdrew 20% of his share, and McAdams at the end of six months put in \$2,000 more. Find each partner's share of the profit.

10. R. E. Walker and John Lawson engaged in a lumber business on January 1st, 1889. Mr. Walker invested \$6,000, and Mr. Lawson invested \$6,000. On March 1st, Mr. Lawson made an additional investment of \$3,000, and Mr. Walker withdrew \$1,500. July 1st, Mr. Walker invested \$2,900, and Mr. Lawson withdrew \$3,000. The profits for the year were \$4,620. What was each partner's average investment and share of the profits, if the profits were divided in proportion to the capital invested and the time it was employed ?

11. S. Morgan, J. R. Street and R. C. Cheswright formed a co-partnership, and invested respectively, \$9,600, \$8,400 and \$7,200. At the end of four months, Mr. Morgan invested \$2,000, Mr. Street \$1,400, and Mr. Cheswright \$800. The net profits for the year were \$12,800. What was each partner's share, the gains and losses being divided in proportion to their average investments ?

12. Three men take an interest in a coal mine. B. invests his capital for 4 months, and claims $\frac{1}{10}$ of the profits; C.'s capital is in 8 months; and D. invests \$6,000 for 6 months, and claims $\frac{2}{5}$ of the profits; how much did B. and C. put in?

13. A. and B. are partners. A.'s capital is to B.'s as 5 to 8; at the end of 4 months A. withdraws $\frac{1}{2}$ of his capital, and B. $\frac{2}{3}$ of his; at the end of the year their whole gain is \$4,000; how much belongs to each?

14. Three men engage in trade. A.'s money was in 10° months, for which he received \$456 of the profits; B.'s was in 8 months, for which he received \$342.20 of the profits; and C.'s was in 12 months, for which he received \$750 of the profits. Their whole capital invested was \$14,845; how much was the capital of each?

15. A., B. and C. engage in manufacturing shoes. A. puts in \$1,920 for six months; B. a sum not specified for 12 months; and C. \$1,280 for a time not specified. A. received \$2,400 for his stock and profits, B. \$4,800 for his, and C. \$2,080 for his. Required, E.'s stock and C.'s time?

16. B. commenced business with a capital of \$15,000. Three months afterward C. entered into partnership with him, and put in 125 acres of land. At the close of the year their profits were \$4,500, of which C. was entitled to \$1,800; what was the value of the land per acre?

17. B., C. and D. form a manufacturing company, with capitals of \$15,800, \$25,000, and \$30,000 respectively. After 4 months, B. draws out \$1,200, and in two months more he draws out \$1,500 more, and four months afterwards puts in \$1,000. C. draws out \$2,000 at the end of 6 months, and \$1,500 more 4 months afterwards, and a month later puts in \$800. D. puts in \$1,800 at the end of

mine. B. of the prosts \$6,000 much dià

o B.'s as 5 his capital, ole gain is

was in 10 ; B.'s was he profits; d \$750 of \$14,845;

bloes. A. ecified for ified. A. 00 for his, C.'s time?

\$15,000. ship with se of the ntitled to

months months as aftere end of ds, and a he end of

PARTNERSHIP.

7 months, and 8 months after draws out \$5,000. If their gain at the end of 18 months be \$15,000, how much should each receive?

18. July 1st, 1886, A. and B. commenced business with a capital of \$7,500, for which A. furnished $\frac{2}{5}$ and B. the remainder; May 1st, 1887, B. invested \$1,500, and A. withdrew \$600; Oct. 1st, 1887, they admitted C. as a partner, with an investment of \$4,500; Jan. 1st, 1888, each partner invested \$1,000, and on Jan. 1st, 1889, each partner withdrew \$500. On closing business, Oct. 1st, 1889, it is found that a net loss of \$3,000 has been sustained. Find each partner's proportion of the loss.

19. Gibson and Montague dissolved a three-years partnership Aug. 1st, 1888, having resources of \$16,500, and liabilities of \$2,150. At first Gibson invested \$2,750, and Montague \$2,500; at the end of the first year Gibson drew out \$1,500, and Montague invested \$3,000; six months later each invested \$1,200. No interest account being kept, what has been the gain or loss, and the share of each partner, if apportioned according to average investments?

20. Day, Scott and Carruthers, each invested \$15,500 in a business that gave the firm a profit of \$21,000 in one year. Nine months before dissolution, Day increased his investment \$3,000, and Scott and Carruthers each withdrew \$3,000; six months before dissolution, Scott invested \$2,000, and Day and Carruthers each drew out \$2,000; three months before dissolution, Carruthers invested \$1,000, and Day and Scott each drew out \$1,000. If no interest account was kept, and the gain be divided according to average investment, what is each partner's share ?

21. A. and B. formed a co-partnership for 3 years, A. investing \$7,200, and B. investing \$5,400. At the end of 6 months A. increased his investment by \$1,500,

and B. withdrew \$900; one year before the expiration of the partnership, each withdrew \$1,000, and six months later each invested \$500. The net loss was \$2,400. How much should be sustained by each, if the partners receive credit for interest at the rate of 6 % on all investments, and are charged interest on all sums drawn out, and the loss be sustained in proportion to average investment?

22. April 1st, 1884, Craig and Cowan commenced business as partners, Craig-investing \$8.000, and Cowan \$6,000; six months later each increased his investment \$1,500; and on Jan. 1st, 1885, Allan was admitted as a partner with an investment of \$2,400. On Oct. 1st, 1885, each partner drew out \$1,500; on Apr. 1st, 1886, Craig and Cowan each drew out \$1,000, and Allan invested \$6,000. On Jan. 1st, 1889, it was found that a net gain of \$37,590 had been realized. What was the share of each, if by agreement Craig, at final settlement, was to be allowed \$1,200 per year for keeping the books of the concern ?

531. To find the net gain or loss, the net resources or the liabilities of a partnership.

EXAMPLE 1.—A. and B. commenced business with a capital of \$10,000 cash; merchandise as per inventory, \$5,000; bills payable, \$1,500. At the end of the year they had cash \$6,500; merchandise as per inventory, \$5,400; bills receivable, \$3,200; debts owed by firm, \$650. What was the net gain or loss of the firm?

SOLUTION.

| ASSETS AT | COM | MEN | 3EM | ENT. | ASSETS | AT | CLO | SE. | |
|--------------|-----|------|-----|----------|------------------|------|-----|-----|----------|
| Cash | •• | •• | | \$10,000 | Cash | | •• | •• | \$6,500 |
| M'dse | | •• | •• | 5,000 | M'dse | •• | •• | •• | 5,400 |
| Total Assets | э | •• | ••• | £15,000° | Bills receivabl | 0 | •• | •• | 3,200 |
| Liabilities | •• | •• | •• | 1,500 | Total Assets | •• | •• | | \$15,100 |
| Net Capital | | | •• | \$13,500 | Liabilities | •• | •• | | 650 |
| | | | | | Net Capital | •• | •• | | \$14,450 |
| | Net | gain | 1 = | \$14,450 | - \$13,500 = \$1 | .950 |). | | |

expiration x months 00. How rs receive restments, s, and the ment?

d business \$6,000; ,500; and ef with an ther drew ench drew 1st, 1889, realized. g, at final r keeping

esources

a capital of able, \$1,500. s per inven-650. What

| Е. | |
|-----|----------|
| ••• | \$6,500 |
| •• | 5,400 |
| •• | 3,200 |
| •• | \$15,100 |
| •• | 650 |
| | \$14,450 |

PARTNERSHIP.

EXAMPLE 2.—A. and B. are partners, A. sharing $\frac{2}{3}$ of the gain or loss and B. $\frac{1}{3}$. A. invests \$5,000, and B. \$2,350. At the end of the year their resources and liabilities are as follows: merchandise on hand, as per inventory, \$2,000; real estate, \$7,000; cash on hand and in bank, \$1,532; due on personal accounts, \$1,640.25; bills receivable, \$1,000bills payable, \$800; owing by the firm to sundry persons, \$4,471.69. What is the amount of net resources belonging to each partner ?

SOLUTION.

RESOURCES.

| M'dse. on hand | | •• | •• \$ | \$2,0 | 00.00 | |
|-------------------|-------|------|-------|-------|-------|----------------|
| Real estate | •• | •• | •• | 7,0 | 00.00 |) |
| Cash on hand and | in ba | nk | •• | 1.5 | 82.00 | 1 |
| Personal account | | | | 1.6 | 10.25 | |
| Bills receivable | •• | •• | •• | 1,0 | 00.00 | |
| LIABILITIES. | | | • | | | \$13,172.25 |
| Bills payable | •• | | •• | \$80 | 00.00 | |
| Personal accounts | •• | •• | •• | 4,47 | 1.69 | \$5.271.69 |
| Present worth | •• | •• | •• | | | \$7.900.56 |
| Less investmen | ts | •• | •• | •• | •• | 7.850.00 |
| Total net g | ain | •• | ••• | | | \$550.56 |
| § of \$550.56 = | \$367 | .04, | A.'s | sha | re of | gain. |
| 1 of \$550.56 = | \$183 | .52, | B.'s | | ** | 0 |
| A.'s investment | | | | | | |
| A.'s gain | - | | 36 | 7.0¥ | | |
| A.'s present wor | | | | | \$5.1 | 367.0 4 |
| B.'s investment | = | \$ | 2,350 | 0.00 | | |
| B,'s gain | | | | | | |
| B.'s present wor | | | | | | 533.52 |
| Present worth a | s bef | ore | •• | •• | | 00.56 |

532. To find each partner's interest, when each partner is allowed to withdraw a certain sum, and when no interest account is kept.

EXAMPLE.— A. and B. are partners, each invested \$6,000, and agreed to share the gains and losses equally. A. drew out \$1,200 and B. \$1,000. Required their gains at the end of the year, their books showing the following result:

| RESOURCES. | LIABILITIES. |
|------------------------------------|--------------------------------------|
| Cash \$7,000 | Debts firm owe as per ledger \$3 000 |
| Mdse. per inventory 7,200 | Bills payable 1,600 |
| Bills receivable 2,400 | Total liabilities \$4.600 |
| Debts due firm as per ledger 5,000 | |
| Total resources \$21,600 | |
| Net capital at closing, \$21,600 | - \$4,600 = \$17,000 |
| A. invested \$6,000 | |
| A. withdrew 1,200 | |
| A.'s credit balance \$4. | B00 · |
| B. invested \$6.000 | |
| B. withdrew 1,000 | |
| B.'s credit balance \$5 | ,000 |
| | ¥1 \$9.800 |
| Net gain of firm | \$7,200 |
| A.'s 1 net gain = \$3,600 | |
| B.'s 1 " = \$3,600 | |

PROOF.

| A. invested \$6,000 | B. invested \$6,000 |
|-------------------------------------|-------------------------------------|
| A. withdrew 1,200 | B. withdrew 1,000 |
| \$4,800 | |
| A.'s 1 net gain 3,600 | B.'s ½ net gain 3,600 |
| A.'s net capital at closing \$8,400 | B.'s net capital at closing \$8,600 |
| \$8,400 + \$8,600 = \$17 | ,000, firm's net capital. |

533. To find each partner's interest, when one or more partners are allowed a fixed salary and no interest account is kept.

EXAMPLE.—A., B. and C. entered into partnership January 1st, 1899. A. invested \$14,000, B. \$14,000, and C. \$28,000. A. to share $\frac{1}{2}$ of the gains and losses; B. $\frac{1}{2}$, and C. $\frac{1}{2}$. A. was to receive a salary of \$1,000 per year, B. \$1,200, and C. \$600 for services. A. drew out \$1.300, B. \$900, and C. \$1,800. What was each partner's interest in the firm Jannary 1st, 1890, when their resources were \$108,000, and their liabilities \$27,000 ?

| ger | \$8 000 |
|-----|---------|
| • | 1,600 |
| •• | \$4,600 |

)00

300 200

.. \$6,000 .. <u>1,000</u> \$5.000 .. <u>3,600</u> g \$8,600

i one or interest

nuary 1st, share 1 of y of \$1,000 \$1.300, B. firm Janliabilities

| Sources. |
|---|
| Resources |
| Firm's net capital |
| Less amount withdrawn 1,300 |
| A.'s oredit balance |
| \$15,200 Less amount withdrawn 900 |
| B.'s oredit balance |
| \$28,600 Less amount withdrawn 1,800 |
| \$26,800 \$54,800 |
| A.'s credit bal. \$13,700 B.'s oredit bal. \$14,300 C.'s oredit bal. \$26,800 A.'s 1 gain 6,550 B.'s 1 gain 6,550 C.'s 1 gain 13,100 A.'s net capital \$20,350 B.'s net control 2000 C.'s 1 gain 13,100 |
| PROOF. |

| A.'s net | capital | \$20,250 |
|-----------|---------|----------|
| B.'s | | 20,850 |
| 0.'s | ** | 39,900 |
| irm's not | 00mit-1 | 0.01.000 |

Firm's net capital \$81,000

534. To find each partner's interest at the end of the year or close of partnership when amounts withdrawn are averaged, and interest is charged and allowed.

EXAMPLE.—A. and B. entered into partnership January 1st, 1889, and agreed to share the gains or losses equally. A. invested \$6,000, and B. \$7,250; each partner was allowed 6% on his investment and was charged 6% for the sums withdrawn. A. drew as follows: March 1st, \$300; July 9th, \$250; September 10th, \$200; December 18th, \$150. B. drew, April 17th, \$100; August 4th, \$400; November 23rd, \$250. What was each partner's interest in the business January ist, 1890, their reserves and liabilities being as follows:

RESOURCES. LIABILITIES. Cash \$1,800 Personal debts firm owe \$5,750 Personal debts due firm .. 8,000 Bills payable .. 250 Bills receivable 700 Total liabilities ... M'dse. as per inventory .. 18,000 \$6,000 . . C. P. R. Railway Stock .. 3,000 Firm's net capital \$20,500 Total resources \$26,500 \$26,500

SOLUTION.

A.'s amount withdrawn \$900; average date July 7th. From July 7th to January 1st = 178 days.

B.'s amount withdrawn \$750; average date August 27th. From August 27th to January 1st = 127 days.

| A.'s investment |
|---|
| Int. on investment for 1 year \$360.00 |
| Less Int. on \$900 for 178 da. at 6% 26.33 333.67 A.'s credit balance \$5,433.67 B.'s investment \$7,250.00 |
| Less withdrawn |
| Less int. on \$750 for 127 da. at 6% 15.66 419.34 B.'s oredit balance. \$6.919.34 |
| Firm's net capital |
| Firm's net gain \$8,146.99 |
| A.'s credit balance \$5,433.67 B.'s credit balance \$6,919.34 A.'s ½ gain 4,073.49½ B.'s ½ gain 4,073.49½ |
| A.'s net capital \$9,507.16} B.'s net capital \$10,992.83 Firm's net capital \$20,500. |

EXERCISE 116.

1. At the expiration of a year from the commencement of their business, Baker, Morgan & Co., after taking an account of stock, find the amount of merchandise, as per inventory, to be \$17,450; cash on hand, \$10,250; debts due the firm, \$11,300; amount of firm's indebtedness,

\$15,500. Make out a statement, showing the resources and liabilities of the firm, with net capital and gain; and find each partner's share of the latter, the respective shares of capital being as follows: J. Baker, \$8,000; S. Morgan, \$5,000; and J. Murray, \$3,000.

2. A. put \$10,000 into a partnership and B. \$5,000. They agreed to divide the gain or loss in proportion to their original investments, and to keep no interest account. During the year A. withdrew \$800 and B. \$500; what was the net capital of each at the close of the year, their resources being \$25,800 and their liabilities \$18,500 ? What per cent of their investment was the gain or loss ?

8. Duff, Fry & Rowat became partners, each investing \$15,000, and each to have one-third of the gains or sustain one-third of the losses. Duff withdrew \$2,100 during the time of the partnership, Fry \$1,800, and Rowat \$2,000. At close of business their resources were: cash, \$3,540; mdse., \$14,785; notes, acceptances, and accounts receivable, \$16,250; real estate, \$28,500. They owed on their outstanding notes \$8,125, and on sundry personal accounts, \$1,950. Find the present worth of each partner at closing.

4. A., B., and C. formed a partnership; A. put in \$5.000, B. \$4,000, and C. \$2,500. A. withdrew \$1,000, B. \$800, and C. \$500. They agreed to share the gain or loss in proportion to their original investments, no interest account being kept. At the close, what was each partner's share of gain or loss, and the net capital of each, as shown by the following statement:

| Hills manima L1. | LIABILITIES. Bills payable |
|------------------|--------------------------------------|
|------------------|--------------------------------------|

•• \$5,750 •• 250 •• \$6,000

** \$20,500 \$26,500

n July 7th

h. From

00

37 57

4 4 0

1

6,919.34 4,073.493 0,992.833

ing an as per debts dness,

5. At the time of closing business, the resources of a firm were: cash, \$981.50, mdse., per inventory, \$18,196.25; notes and accounts due it, \$8,154; interest on same, \$211.50; real estate, \$11,150. The firm owed, on its notes, acceptances and bills outstanding, \$7,142, and interest on the same, \$948.50; and there was an unpaid mortgage on the real estate of \$2,500, with interest accrued thereon of \$88.50. If the invested capital was \$22,500, what was the net solvency or net insolvency of the firm at closing, and how much has been the net gain or net loss?

6. The firm of A. & B. formed a partnership Jan. 1st for 1 year, investing \$8,000 each. They were to have 6% interest on their capital and be charged 6% on sums withdrawn. The gains or losses were to be shared equally. April 4th, A. drew out \$500, July 10th, \$400, and Sept. 5th, \$200. B. drew out May 6th, \$700, Aug. 12th, \$800, and Oct. 4th, \$400. What was each partner's net capital on closing, the net gains being \$3,850?

7. Johnston and Atkinson became partners April 1st, 1888, under an agreement that each should be allowed 6% simple interest on all investments, and that, on final settlement, Johnston should be allowed 10% of the net gains, before other division, for superintending the business, but that otherwise the gains and losses be divided in proportion to average investment. April 1st, 1888, Atkinson invested \$18,000, and Johnston, \$4,000; Jan. 1st, 1889, Atkinson withdrew \$5,000, and Johnston invested \$8,000; Aug. 1st, 1889, Atkinson withdrew \$1,500; Dec. 1st, 1889, the partners agreed upon a dissolution of the partnership, having resources and liabilities as follows:

| RESOURCES | • | | |
|-------------------------|----------|----|--|
| Cash on hand | \$ 1,101 | 05 | |
| Accounts receivable | 16,405 | 50 | |
| Bills receivable | 2,550 | 00 | |
| Interest | 287 | 41 | |
| Mdse., as per inventory | 9,716 | 55 | |

LIABILITIES.

 Bills payable
 \$6,520 00

 Outstanding accounts
 1,246 50

 Rent due
 1,200 00

-322

If, of the accounts receivable, only 80% prove to be good, what has been the net gain or loss? What has been the gain or loss of each partner? What is the firm's net insolvency at dissolution? What is the net insolvency of each?

8. A., B., and C., formed a co-partnership for 2 years, investing equal sums, with the agreement that each shall receive interest at the rate of 6% on all sums invested, be charged interest at the same rate on all sums withdrawn, and the gains or losses shown on final settlement be apportioned according to average net investment. Three months after the formation of the partnership A. drew out \$1,200, and eix months later B. and C. each drew out \$1,000, and A. invested \$6,000; at the end of the first year each drew out \$500. On closing the affairs of the firm, the following statement was made: net gain, \$15,000; present worth, \$75,000. What was the original investment of each ? What was the present worth of each at the time of the dissolution? What was each partner's share of the gain ?

9. A. and B. became partners for one year; A. investing § of the capital, and B. §; the agreement being that the gains or losses shall be apportioned according to average net investment, and that each partner be allowed 6% interest per annum on all investments, and be charged interest at that rate on all sums withdrawn. At the end of the year the firm had as resources: mdse., per inventory, \$21,460; real estate, \$15,000; cash, \$1,950; bills receivable, \$13,146.50; interest accrued on the same, \$519.25; accounts due it, \$11,218.50; store furniture, \$1,320; delivery wagons and horses, \$2,100. The liabilities were: mortgage on real estate, \$7,000; interest on same accrued, \$210; notes outstanding, \$26,950; interest accrued on same, \$811.75. The firm owes H. W. Darling & Co., Toronto. \$38,560. It is found that $33\frac{1}{3}$ % of the

rces of entory, interest n owed, \$7,142, unpaid accrued 22,500, firm at et loss? an. 1st ave 6% s withqually. l Sept. \$300. capital

cil 1st, a final gains, ss, but roporkinson 1889, 8,000; 1889, arship,

3,520 00 1,246 50 1,200 00

accounts due the firm are uncollectable. If the firm's losses during the year have been \$12,000, how much was invested by each partner? What is the present worth or net insolvency of the firm, and of each partner, at closing?

10. Sills and Jones became partners July 1st, 1886, under a 3-year's contract, which provided that Sills should have \$1,500 each year for superintending sales, and that Jones should have \$1,000 each year for keeping the books of the concern, and that these salaries should be adjusted at the end of each year, and before other apportionment of gains or losses was made. July 1st, 1886, each invested \$12,500. Six months later, each increased his investment \$5,000. July 1st, 1887, Sills drew out \$3,600 and Jones drew out \$3,000. Oct. 1st, 1887, Sills withdrew \$1,000 and Jones invested \$2,000. July 1st, 1888, each drew out \$1,500. At the expiration of the time of the contract, the resources exceeded all liabilities by \$47,280. What was the gain of each, and the present worth of each ?

11. A. and B. commenced business as partners. A. invested \$20,000, and B. \$10,000, A. sharing $\frac{2}{3}$ and B. $\frac{1}{3}$ of the gains and losses. No interest account was kept. A. drew out \$1,700, and B. \$2,150. Their assets at the close of the year consisted of—cash, \$4,200; bills receivable, \$8,800; mdse., \$26,000; and personal debts, \$16,000. 10% of the personal debts are considered bad. Their liabilities are—bills payable, \$3,250; personal accounts, \$11,250. If B. should retire from the firm, how much ought he to receive?

12. On January 1st, 1889, A. E. Brock, W. McMaster and H. Crawford entered into a co-partnership. Brock was to invest $\frac{1}{2}$ of the capital and share $\frac{1}{2}$ of the gains. McMaster was to invest $\frac{3}{2}$ of the capital and share $\frac{3}{2}$ of the gains, and Crawford was to invest $\frac{3}{2}$ of the capital and share $\frac{3}{2}$ of

the gains. Interest at the rate of 10% per annum was to be allowed to each partner should he invest more than his proportion; and interest, at the same rate, was to be charged each partner if he failed to invest his proportion. A settlement was made at the end of the year, and the net gain was \$3,600. Find Brock's and McMaster's net interest, and Crawford's insolvency Jan. 1st, 1890, the following being a statement of each partner's account.

Dr.

A. E. BROCK.

| | 0 |
|---|----|
| | Ur |
| | |
| - | |

825

| | DROCK. | Cr. |
|------|--|--------------------------------------|
| ** | -April 23, Drew out \$3,000 [1889Jan. 1, Inv. June 16, " 1,600 " Mar. 18, Aug. 17, " 1.800 " Oct. 20, Total withdrawn \$6,400 " Total investr | ested \$32,000 4 4,800 4 6,000 |
| Dr. | W. MCMASTER. | Cr. |
| 1889 | -July 28, Drew out \$1,200 1889 - Jan 1 7 | |
| 41 | Dec. 4, " 1600 " " Inves | sted \$24.000 |
| 66 | Total withdr wn \$2,800 " May 17, " | 3,600 |
| | 5 | 1,200 |
| - | " Total investm | ent \$28,800 |
| Dr. | H. CRAWFORD. | Cr |
| ** | Bept, D. " Occo | d \$12,000 |
| | Total withdrawn 100 and Aug. 8, " | 1,200 |
| | Total withdrawn \$20,000 " Total invested | \$13,200 |

's losses nvested or net ng?

5, under ld have t Jones of the at the f gains 12,500. \$5,000. ew out Jones 00. At sources gain of

8. A. B. 1 of ot. A. e close ivable, 16,000. Their counts, much

er and was to Master gains, :e 🔒 of

BANKRUPTCY.

BANKRUPTCY.

535. Bankruptcy is the formal acknowledgement in accordance with the law, by a person or firm, of inability to pay indebtedness.

536. A Bankrupt is a person who is insolvent, or unable to pay his debts.

537. After the assets of a bankrupt have been applied to meet his liabilities, he still remains liable for them unless discharged, or unless a compromise has been effected with his creditors.

538. The Assets of a bankrupt are his entire property.

539. The Liabilities of a bankrupt are the debts and obligations due by him to his creditors.

540. The Net Proceeds are the assets less the expense of settlement. They are divided among the creditors according to their claims.

The claims of a certain class of creditors, as employees and others, are paid in full up to a certain amount. These are called "Preferred Creditors."

541. An Assignce is a person appointed in accordance with the law, to take charge of the bankrupt's property, to make collections of debts due the estate, and after deducting the expenses of the assignment, to pay such proportion of the debts due the creditors as the available assets will allow.

BANKRUPTCY.

542. To find each creditor's dividend, the liabilities and net proceeds being given.

EXAMPLE.-A merchant failing in business gave the following statement of his assets and liabilities : Assets, oash, \$5,474; real estate, \$3,000; merchandise, \$4,000; personal accounts. \$1,900. Liabilities, bills payable, \$2,400; due R. E. Walker & Co., \$5,000; due A. Boyle & Co, \$17,500. The expenses of assignment were \$430. How much did

SOLUTION.

| ASSETS. | |
|--|-------------------------------|
| Cash \$5,474 Real estate 8,000 Mdse. 4,000 Personal accounts. 1,900 Total. \$14,374 Less expenses 430 Net assets. \$13,944 | LIABILITIES. Bills payable |
| $$13,944 \div $24,900 = .56$, or 5 $$2,400 \times .56 = $1,344$ on bi $$5,000 \times .56 = $2,800$ to R. $$17,500 \times .56 = $2,800$ to R. | 19 |

= \$9,800 to A. Boyle & Co. \$24,900

\$13,944

EXERCISE 117.

1. A bankrupt owes A. \$6,500, B. \$4,600, and D. \$3,800; his assets are \$5,950, and the expenses of settling \$1,700; what per cent. and how much will each creditor receive ?

2. J. Gould & Co. failed with liabilities amounting to \$300,000. The assets of the firm were \$186,294. How much should each creditor receive on the dollar, and what sum was allowed J. P. Hume & Co., whose claim was \$17,814, the expenses of settling being \$6,294?

8. J. Wild & Co., went into bankruptcy, owing \$48,500, and having \$13,300 assets; the expense of settling was 5 %of the amount distributed to creditors. What per cent. and how much did a creditor receive on \$8,350?

ient in nability

ent, or

applied unless ed with

operty.

bts and

expense reditors

thers, are ed Credi-

ordance erty, to deductportion sets will

BANKRUPTCY.

4. A grain firm failed with liabilities amounting to \$24,500. The assets were: cash, \$1,080; real estate, \$8,250; notes on hand, \$1,170. The expenses of settling were 2% of the assets. How much should W. H. Hull & Co. receive, whose claim against the firm was \$6,308.50?

5. A manufacturer failed, owing A. \$12,260, B. \$18,850, and C. \$14,560; his assets were \$28,350, and the expenses of settling were \$1,250. He owed \$850 to employees who were to be paid in full; what per cent. and how much did the other creditors receive?

6. The real estate of a bankrupt firm was sold by an assignee for \$24,000, goods in store for \$12,244. There were collected on notes due the firm \$4,214, and on personal accounts \$5,346. The total liabilities of the firm were \$54,067.50, and the expenses of settling \$1,350. How much on the dollar can be paid, and what should Howard Bros. receive, whose claim is \$12,430?

7. A. Reid's claim against a bankrupt firm was \$7,200, and J. Taylor's 70% of that of A. Reid's. After the expenses of the assignment were deducted from the assets, there remained \$18,260. The total liabilities were \$24,480. How much did A. Reid and J. Taylor respectively receive?

8. A firm failed with liabilities amounting to \$26,125. The assets of the firm exclusive of real estate were \$1,521.25. The assignee obtained for a warehouse and three building tots the sum of \$15,675. The expenses for settling the bankruptcy was \$237.50. W. Alexander's claim against the firm was \$3,642; J. Moblo's, \$3,191; B. A. Harrison's, \$2,897; D. McGregor's, \$2,383.50; W. Ayer's, \$1,982. How much did each of these creditors receive?

ANNUITIES.

nting to l estate, settling ull & Co. 50 ?

\$13,850, expenses rees who auch did

d by an There personal m were). How Howard

\$7,200, xpenses s, there 524,480. receive ?

26,125. 521.25. uilding ng the against rison's, \$1,982.

ANNUITIES.

543. An Annuity is a specified sum of money paid annually, or at equal periods as, half-yearly, quarterly, etc., to continue a given number of years, for life, or for ever.

544. A Certain Annuity is one which begins and ends at a fixed time.

Continues for ever.

546. A Contingent Annuity is one whose time of commencement or ending, or both, is uncertain, and which depends upon some unforeseen event, as the death of an individual, or his arrival at a certain age. Life insurance, pensions, dowers, leases, etc., belong to this class of incomes.

547. An Annuity in Possession or an Immediate Annuity is one that begins immediately.

548. A Deferred Annuity or an Annuity in Reversion is one that begins at some future time, it may be at some specified time, or at the occurrence of some event.

549. An Annuity in Arrears or Forborne is one on which the payments were not made when due.

550. The Amount or Final Value of an annuity is the sum to which all its payments with interest on each, will amount at its termination.

ANNUITIES.

551. The Present value of an Annuity is the sum which at the given rate of interest, will amount to its final value.

Note 1.—The present value of a deferred annuity is that principal which will amount, at the time the reversion expires, to what will then be the present value of the annuity.

2. The present value of a perpetual annuity is the sum whose interest equals the annuity.

8. Annuities and their values are computed by simple interest or by compound interest.

552. To find the amount of an annuity at simple interest when the time and rate are given.

EXAMPLE — What is the amount of \$500 annuity for 5 years at 6 % simple interest?

SOLUTION. EXPLANATION. ANNUITY. INT. AMT. The interest on \$500 for 1 year at 6 % \$500 + C120 = \$620 = \$30. The first annuity is not due 500 + 90 = 590 until the end of the first year, and 500 + 60 =560 hence draws interest for only 4 years = 500 + 530 \$120. The second is not due until the 30 -500 + 0 = 500end of the second year, and hence draws Amount \$2,800 interest for only 3 years, etc.

553. To find the present worth of an annuity at simple interest.

EXAMPLE.—What is the present value of an annuity of \$500 for 5 years, when money is worth 6% simple interest?

SOLUTION.

By the preceding example the final value of the annuity is \$2,800. The present worth of \$2,800 due in 5 years at $6\% = \frac{1}{2}$ of \$2,800 = \$2153.846.

EXERCISE 118.

1. What is the amount of an annuity of \$150 for 8 years, when money is worth 6% simple interest?

the sum o its final

at principal at will then

ose interest

erest or by

t simple

vears at 6 %

year at 6 % is not due t year, and y 4 years = e until the nence draws

nuity at

of \$500 for

,800. The \$2153.846.

8 years,

ANNUITIES.

2. A man works for 1 year and 6 months at \$20 per month, payable monthly; and these wages remain unpaid until the expiration of the whole time of service. How much is due to the workman, allowing simple interest at the rate of 6% per annum?

8. A father deposits \$50 a year for his son, commencing on the son's 10th birthday. What amount will the son have on his 21st birthday, if the payments draw simple interest at the rate of 8% per annum?

4. A lady has \$300 a year left to her for 10 years. What is its present cash value, at 7% simple interest?

5. What is the present worth of an annuity of \$600 for 4 years, money being worth 6% simple interest?

6. How much will an annuity of \$100 amount to in 8 years at 8% simple interest?

7. An annuity of \$200 for 12 years is in reversion for 6 years. What is its present worth, simple interest at 6%?

ANNUITIES AT COMPOUND INTEREST.

554. The labor of computing the values of annuities at compound interest is greatly diminished by the use of the following tables. The tables are always used in practice.

TABLE 1.

Amount of \$1 annuity at compound interest, from 1 year to 40, inclusive.

| Yr | в. <u>3%</u> . | 31 %. | 4%. | 5%. | 6%. | 7%. | Yrs. |
|----------------------------|--|---|---|--|---|---|----------------------------|
| 19345 | 2.030 000 3.090 900 4.183 627 | 2.035 000 3.100 225 4.214 943 | 2.040 000 3.121 600 4.246 464 | 2.050 000 3.152 500 4.310 125 | 2.060 000 3.183 600 4.374 616 | 2.070 000 3.214 900 4.439 91 | 234 |
| 6 7 8 9 10 | 7.662 462 8.892 336 10.159 106 | 7.779 408 | 6.632 975 7.898 294 9.214 226 10.582 795 12.006 107 | 8.142 003 9.549 109 11.026 564 | 6.975 319 8.393 838 9.897 468 11.491 316 13.180 795 | 7.153 291 8.654 021 16.259 803 | 6 7 8 |
| 11 12 13 14 15 | 12.807 796 14.192 030 15.617 790 17.086 324 18.698 914 | $\begin{array}{c} 18.141 & 992 \\ 14.601 & 962 \\ 16.113 & 030 \\ 17.676 & 986 \\ 19.295 & 681 \end{array}$ | $\begin{array}{c} 13.486 \ 351 \\ 16.025 \ 805 \\ 16 \ 626 \ 838 \\ 18.291 \ 911 \\ 20 \ 023 \ 588 \end{array}$ | 14.206 787 15.917 127 17.712 988 19.598 632 21.578 501 | 14.971 6 3 16.869 941 18.882 138 21.015 066 23.275 970 | 15.783 599 17.888 451 20.140 643 22.550 488 25.1 2 9 022 | 11 12 13 14 15 |
| 18 17 18 19 20 | 20.156 881 21.761 588 23.414 435 25.116 868 26.870 374 | 20.971 030 22.705 016 24.499 691 26.357 180 28.279 682 | 21.824 531 23.697 512 25.645 413 27.671 229 29.778 079 | 23.657 492 25.840 366 28.132 385 30.539 004 33 065 954 | 25.670 528 28.212 880 30.905 653 33.759 992 36.785 591 | 27.888 054 30.840 217 33.999 033 37.378 9.5 40.995 492 | 16 17 18 19 20 |
| 21 22 23 24 25 | 28.676 486 30.536 780 32.452 884 34.426 470 36.459 264 | 30.269 471 32.328 902 34.460 414 30.666 528 38.949 857 | 31.969 202 34.247 970 36.617 889 39.082 604 41.645 908 | 85.719 252 88.505 214 41 430 475 44.501 999 47.727 099 | 30.992 727 44.392 290 46 995 828 50.815 577 54.864 512 | 44.865 177 49.005 789 53.436 141 58 176 671 63.249 030 | 21 22 23 24 25 |
| 28 27 28 29 30 | 38,553 042 40,709 631 42,930 923 45,218 850 47,575 416 | 41.313 102 42.759 060 46.290 627 43.910 799 51.622 677 | 44.311 745 1 47.084 214 49.967 583 52.966 286 56.084 938 | 51.113 454 54.669 126 68.402 583 62.322 719 66.438 848 | 59.156 883 63.705 766 63.628 112 73 639 798 79.058 186 | 68,676 470 74,483 823 80,697 691 87 346 529 94,460 780 | 26 27 28 29 30 |
| | 50.002 678 52.502 759 55.077 841 57.790 177 60.462 082 | 57.334 502 60.341 210 63.453 152 | 50.328 335 62.701 469 66.209 627 69.857 909 73.652 225 | 75.298 829 80.063 771 86.066 959 1 | 90.899 778 97.843 165 04.183 755 | 102.073 041 110.218 154 118.933 (25) 128.258 76) 138.236 878 | 31 32 33 34 35 |
| 7 8 9 | 66.174 222 69.159 449 72.234 233 | 73.457 869 8 77.028 895 8 80.724 906 9 | 81.702 240 1 85.970 336 1 90.409 150 1 | 101.628 139 1 107.709 546 1 14.095 023 1 | 27.263 119 1 35.904 206 1 45.058 458 1 | | 38 37 38 39 |

REST.

nnuities at use of the practice.

rom 1 year

| Yrs | 12345 | 67 8 9 10 | 11 12 13 14 15 | 16 17 18 19 20 | 21 22 23 24 25 | 16 17 18 9 | 23 | 73 |
|-----|---|--------------------------------------|----------------------------|----------------------------|---------------------------------|---------------------------------|------------------|----------------|
| | 0 | 1 3 9 | 3 | | 1 2 | 200 | 30000 | 333334 |
| %. | 00 00 10 00 14 90 19 91 10 75 | 3 29 4 02 9 80 7 98 3 44 | 3 599 3 45: | 033 9.5 492 | 177 759 141 671 030 | 823 691 529 | 154 25 16) | 00 20 92 |
| 7 | 2.07 3.21 4.43 | 3.65 5.250 .977 | .140 | 840 999 378 995 | 965 005 136 176 149 | 76 83 97 46 60 7 | 33 7 | |

TABLE 2.

555. Present worth of \$1 annuity at compound interest, from 1 year to 40, inclusive.

| 1 | 7rs | | 3 | %. | | | 3 | 12% | | | | 4 | %. | | Ι | | 59 | %. | | | | 6% | | T | | 7 | ~ %. | | Yrs. |
|----------------------------------|------------------------|--------------------------------------|--------------------------|--------------------------------------|-------------------|-----------------------------------|--------------------------|--|---------------------------------|--|--|-------------------|--------------------------------------|--------------------------------------|---------------------------------|--------------------------|-------------------|-----------------------------------|----------------------|---------------------------------|----------------------|--|--------------------------|----------------------|---|--------------------------|---|----------------------|----------------------------------|
| | 19345 | 1 2 3 | .91 .62 71 | 0 87 3 47 8 61 7 09 9 70 | 0 | | 1.8 2.8 3.6 | 99 01 73 | 184 094 637 079 052 | ; | 123 | .88 .77 .62 | 51 5 56 0 5 0 9 8 51 8 | 95 91 95 | - - | 1.2.8. | 859 723 548 | 2 3 0 41 9 2 5 9 7 47 | 10 18 51 | | 1.8 2.6 3.4 | 13 133 73 65 12 | 393 012 106 | | 128 | .93 .80 .62 | 4 5 8 0 4 3 7 2 | 17 14 09 | 1 2 3 4 |
| 1 | | 6. 7 7. 8. | 230 019 786 530 | 7 19: 28: 69: 10: 203 | | 6 6 7 8 | 1 .87 .60 .31 | 14 1 73 9 77 6 6 6 | | 1 | 6. 6. 7. | 00 73 43 | 2 12 2 05 2 74 5 83 0 89 | 55 15 12 | | 5.0 5.7 6.4 7.1 | 075 786 163 | 69 37 21 82 73 | 2333 | 4566 | .9 .5(.2(| 17 3 52 5 09 7 01 6 | 324 381 744 592 | | 4. 5. 5. 6. | 76(39(97) 51(| 0 1 3 5 9 2 9 2 9 2 9 2 9 2 9 2 9 2 9 5 7 | 37 36 35 35 | 5 67 89 |
| 12 12 14 14 14 14 | | 9.9 10.6 11.2 11.9 | 154 131 196 137 | 624 004 955 975 935 | | 9. 10. 10. 11. | 66 30 92 51 | 1532 3275 4 | 34 38 20 11 | 1 | 9.9 9.9 10,0 | 885 185 | 47 07 64 12 38 | 483 | 200 | 8.8 9.3 9.8 | 63 93 98 | 414 252 572 641 658 | | 7.8.8.9. | 88 38 85 29 | 68 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 | 75 44 83 84 | | 7.9 7.9 8.1 8.7 | 198 142 157 145 | 60 67 63 45 89 | 0152 | 10 11 12 13 14 15 |
| 17 18 19 20 | | 12.5 13.1 13.7 14.3 14.8 | 66 53 23 77 | 118 513 799 475 | | 12.0 13.1 13.1 13.1 | 851 189 709 212 | 4 1. 1 3: 9 6: 9 8: 9 8: 9 8: | 21 82 37 33 | 1 | $2.1 \\ 2.6 \\ 3.1 $ | 65 59 33 | 296 669 297 939 326 | | 11 11 12 | .2 .6 | 74 39 : 5 : | 770 066 587 321 210 | | 10.4 10.8 11.1 | 47) 32) 158 | 5 89 7 20 7 60 3 11 0 42 | 30)3 16 | 1 | 9.4 9.7 0.0 0.3 | 46 63 59 35 | 63: 200 070 578 997 | 200 | 16 17 18 19 |
| 21 22 23 23 24 25 | 11111 | 5.41 5.92 6.44 6.93 7.41 | 3 6 3 6 5 6 3 1 | 917 308 542 148 | | 5.1 5.6 6.0 | 67 20 58 | 97 12 41 36 51 | 5 0 8 | 1. | 1.45 1.85 5.24 | 51 16 16 | 160 115 812 963 080 | | 12 13 13 13 13. | 16 48 79 | 3 (8 5 8 6 | 42 | | 1.7 2.0 2.3 2.5 | 64 41 03 50 | 07 58 37 35 35 | 729 | 11111 | 0.8 1.00 1.27 | 15 | 527 241 187 334 | | 20 21 22 23 24 |
| 26 27 28 29 30 | 18 18 19 | 7.87 3.32 3.76 1.18 .60 | 701134 | 91 08 55 41 | 11111 | 7.28 7.60 3.05 | 35 | 359 369 019 767 045 | 5 | 16 16 | .98 .92 .66 .98 | 9486 | 58 6 063 | | 14. 14. 14.8 15.3 | 27(64: 598 141 | 51 | 85 34 27 74 | 1 1 1 1 | 8.00 3 21 3.4(3.5(| 03 10 96 | 16(534 164 721 831 | 3 | 11 11 12 12 | .82 .98 .13 | 57 67 71 76 | 79 09 11 | A CONTRACT | 25 26 27 28 29 |
| 31 32 33 34 35 | 20 20 21. 21. | 000 .338 .765 .131 .487 | 7(75 85 22 | 36 92 87 80 | 19 19 19 | 0.06 | 8 9 9 9 | 276 865 208 384 361 | | 17. 18. 18. | 589 873 147 411 864 | 6 | 52 46 98 | $ 1 \\ 1 \\ 1 \\ 1 $ | 5.5 5.8 6.0 6.1 6.9 | 302 102 92 | 67 54 20 | 19 | 18 14 14 14 | .92 .08 .23 | 9 | 086 043 230 141 | | 12 12 12 12 | .40 .53 .640 758 .854 .947 | 85 | 14 55 90 | 00000 | 1 12 13 |
| 36 37 38 39 40 | 22.22 | 832 167 492 808 114 | 23 40 21 | 525 | 20. 20. 21. | .20 .57(.841 102 355 | 0 5 | 25 87 00 | | 19. 19 1 19 1 | 008 142 367 584 792 | 51 80 48 | 79 34 35 | 10 10 17 | 8.5 5.7 5.8 7.01 | 11 67 17 | 28 89 04 | 731 | 14 14 14 14 | 620 730 840 949 046 | | 987 780 019 | | | 035 117 193 264 | 20 01 47 92 | 08 | 3 33334 | 6 7 8 9 |

556. To find the final value of an annuity by compound interest.

EXAMPLE 1.—What is the final value of an annuity of \$500 for 6 years at 5 %.

SOLUTION.

By Table 1 the final value of an annuity of

\$1, at 5 % for 6 years = \$6.801913. ∴ final value of an annuity of \$500 = 6.801913 × 500 = \$3400.9565. Norz.—When payments are made half-yearly, take from the table double the time, and ½ the rate.

557. To find the present value of an Annuity.

EXAMPLE.—What is the present worth of an annuity of \$500 for 5 years at 6 %.

SOLUTION.

By Table 2 the present worth of an annuity 34 \$1 for 5 years at 6 % is \$4.212364.

: The p. w. of an annuity of $500 = 4.212364 \times 500 = 2106182$.

558. To find the present worth of an annuity in reversion.

EXAMPLE.—What is the present worth of an annuity in reversion of \$500 at 6 %, which begins in 4 years, and then terminates after 6 years. SOLUTION.

The p. w. of an annuity of

\$1, at 6 % for 10 yrs. = \$7.360087.

" 4 yrs. = \$3.465106.

: The present worth of an annuity of \$1 to

begin in 4 years, and then to continue 6 years = \$3.894991, the difference ... p.w. of \$500 = 3.894991 × 500 = \$1947.4905.

559. To find the present worth of a perpetual annuity.

EXAMPLE 1.—A perpetual scholarship of \$150 per year is established at Queen's University. What sum must be invested at 5% to yield this income.

SOLUTION.

5 % of the investment = \$150.

: the investment = $\frac{150}{5} \times 100 = $3,000$ Ans.

EXAMPLE 2.--What is the present worth of a perpetual annuity of \$300 in arrears for 20 years, allowing 5% compound interest.

SOLUTION.

There is now due the amount of \$300 for 20 years at 5% compound interest, together with the present worth of the perpetual annuity of \$300.

nnuity by

of \$500 for 6

= \$6.801913. = \$3400.9565. om the table

ity.

of \$500 for 5

ars at 6% is

\$2106 182.

nnuity in

reversion of er 6 years.

e difference

annuity. established

nnuity of

compound nuity of

ANNUITIES AT COMPOUND INTEREST.

The p. w. of the perpetual annuity of \$300, by Example 1 = 192 × 100 = \$6,000.
Amount of annuity of \$1 for 20 years at 5 % = \$33.065954. (Table 1). \$300 :: = \$33.065954 × 300 = \$9919.7862.
∴ total present worth = \$9919.7862 + \$6,000 = \$15919.7862. Ans.

EXERCISE 119.

1. Money being would 6 %, how much must be presented to a college, to insure 50 a year forever, for an annual prize?

2. A person left \$5,000 for the poor of his native town. How great was the perpetuity realized from it, at 6 %?

3. What is the final value of an annual pension of \$150 for 15 years at 4% compound interest?

4. A widow is entitled to \$140 a year for 18 years, at 10% semi-annual compound interest: what is its final value?

5. An annuity of \$350 was left to A., and one of \$550 to B., by the same person; both were to run 12 years. Allowing compound interest, at 6%, by how much would the amount of A.'s exceed that of B.'s in the given time?

6. How much will an annuity of \$100 amount to, in 8 years, at 8% simple interest? How much at 6% compound interest?

7. A soldier 57 years old, having a pension of \$80 a year, agreed to sell it for cash at 10 % less than its present value, compound interest being allowed at 7 %. How much should he receive, his expectation of life being 74 years of age?

8. A lawyer collected for a client an annuity of \$700, in arrears for 4 years, the legal rate of interest being 6%. He charged 15% on the amount collected. At this rate, how much greater would have been his fee had he been able to collect compound interest?

9. A clerk saves from his salary \$50 every year, and pute it in a savings bank which allows interest compounded annually at 6%. If he draws no checks on the bank, how much will he have there at the end of 10 years?

10. A person aged 54 has a life annuity of \$400. What is its present value, allowing compound interest at 4%, his expectation of life being 19 years?

11. At the age of 20, and every year after, a young man places 200 at compound interest at 5%. How much will he have at the age of 30? At the age of 40?

12. How much a year must be invested for a boy 11 years old, that the sums thus invested, with compound interest at 5 %, may make a total of 10,000 by the time he becomes of age ?

13. What is the present worth of an annuity of \$500 for 8 years, at 4% compound interest?

14. What is the present worth of an annuity of \$3,000 for 20 years at 3% compound interest?

15. What is the present worth of an annuity in reversion of 1,000, at 6 % compound interest, which begins in 3 years and then terminates in 8 years?

16. The reversion of a lease of \$450 per year, at 5%, begins in 3 years and continues 16 years. What is its present worth?

17. A father bequeathed to his son, 11 years of age, a 5% annuity of \$1,000, to begin in 8 years and continue 10 years. What would be the amount when the son was 21 years old? What is its present worth?

• 18. What is the present worth of a perpetual annuity of \$250, in arrears for 10 years, allowing 3%, compound interest?

19. What is the present worth of a perpetuity of 500 in arrears for 30 years, allowing compound interest at 5 %?

r.

ar, and pute compounded e bank, how 2

100. What at 4%, his

young man much will

a boy 11 pound ine time he

f \$500 for

of \$3,000

reversion in 3 years

r, at 5%, hat is its

of age, a tinue 10 n was 21

nuity of ound in-

\$500 in 5%?

SINKING FUNDS.

SINKING FUNDS.

360. Sinking Funds are sums of money set apart at cegular intervals for the payment of indebtedness.

561. Sinking Fund Bonds are securities issued by corporations, based on the pledge of a special income, which is funded for their redemption.

562. To find what sum wust be set apart annually, as a sinking fund, to pay a debt in a given time.

EXAMPLE .- The Town of Woodstock borrowed \$20,000 to build a High School, and agreed to pay 5% compound interest. What sum must be set apart annually, as a sinking fund, to pay the debt in 12 years?

Amount of

SOLUTION.

\$1 at 5% compound interest for 12 years = \$1.795856.

: \$20,000 = \$1.795856 × 20,000 = \$35,917.12.

Amount of annual payment of \$1 for 12 years at 5% = \$15.917127. Art. 554. .. amount necessary to pay a debt of

\$35,917.12 will require \$35,917.12 ÷ 15.917127 = \$2,256.58. Ans.

BULR.

Divide the amount of the debt at its maturity at compound interest, by the amount of an annuity of \$1 for the given time and rate, and the quotient will be the sinking fund required.

563. To find the number of years required to pay a given debt, by a given annual sinking fund.

EXAMPLE .- The Town of Port Hope built a Court House at a cost of \$15,000, and raised \$1,300 a year to pay for it. Allowing 6% compound interest, how many years will it require to cancel the debt?

SINKING FUNDS.

SOLUTION.

A sinking fund of \$1,800 has a present worth of \$15,000 for a certain till to at 6%.

... A sinking fund of \$1 has a present worth of $\frac{16000}{18000} = 11.538461 , for the required time at 6 %.

Looking in Table 2, Art. 555, in the column 6% we find the nearest number less than 11.538461, to be 11.469421, the present worth of \$1 annuity for 20 years.

20 years is therefore the number of whole years required. Again :

The amount of the debt \$15,090 at 6% compound interest

Balance due at ond of 20 years = \$236.13

RULE.

Divide the debt by the given sinking fund, and the quotient will be the present worth of \$1 annuity for the given time.

Look for this number in Table 2, Art. 555, in the column denoting the given rate, and opposite in the column of time will be found the number of whole years.

Notes 1.-If the exact number is not found in the column, take the years standing opposite the next smaller number.

2. To ascertain the balance due at the end of the number of whole years, find the difference between the amount of the debt, at the given rate, for the time taken, and the amount of the sinking fund for the same time and rate.

EXERCISE 120.

1. If a railroad company sets apart an annual sinking fund of \$20,000, and loans it at 5% compound interest. What will be its amount in 12 years?

2. What will be the amount in 15 years of a sinking fund of \$12,000, yielding 4 % compound interest?

3. What sum must be set apart annually to rebuild a bridge costing \$30,000, estimated to last 17 years, allowing 5% compound interest?

r a certain

538461, for

the nearest orth of \$1

1.107 40

,821.27 \$286.13

quotient time. column of time

take the

of whole the given the same

inking terest.

inking

uild a lowing

SINKING FUNDS.

4. A railroad company bought \$103,000 worth of rolling stock, payable in 5 years with 6% compound interest; what sum must be set apart annually as a sinking fund to discharge the debt?

5. A man buys a farm for \$5,000, and agrees to pay for it in six equal annual instalments. What is the amount of each payment, money being worth 5% compound interest?

o. A railroad company issued sinking fund bonds at 6% for \$200,000, payable in 10 years. If at compound interest, what sum must be see apart annually to meet interest and principal when due?

7. What would be the amount in 10 years, at 6% simple interest?

8. If the funded securities were drawing an annual income of 4% compound interest, by how much would the amount necessary to meet principal and interest at 6% be reduced?

9. With the above reduction, what sum would be needed annually as a sinking fund to pay the amount when due at 4%.

10. A man buys a farm for \$6,000, and agrees to pay \$700 each year until paid, allowing 6% compound interest, both on the debt and on the payments. How many number of whole years will he be in paying for the farm ? What is the balance then due?

11. A village built a school-house costing \$12,000, and raised \$1,700 a year to pay for it; allowing 6% compound interest. How many whole years will it require to cancel the debt? What will be the balance then due?

GROUND RENTS.

GROUND RENTS.

564. Ground Rents is a term applied to leases of building lots, the rent of which is considered equal to the interest on the valuation of the land. The payment is generally secured by a claim on the building erected on the land occupied.

565. When the party who rents the ground has the privilege of purchasing it, the Ground Rent is said to be redeemable; otherwise, it is irredeemable. The rentor of the land usually erects buildings thereon in his own right and pays a specified sum quarterly, semi-annually, or yearly, for the use of the ground. In some cities the issue of irredeemable ground rents is prohibited.

566. Building lots are sometimes sold at so much per foot frontage ground rent. Thus, a lot valued at \$4,000, with a frontage of 20 feet, drawing interest at 8%, is said to be worth \$16 per foot. The interest on \$4,000 for 1 year at 8% is \$320, which, being divided by 20, the number of feet on the front, gives \$16 as the price.

When a 6% ground rent yields the owner \$180 per year, the value of the ground is estimated at \$3,000, since \$180 is the interest on \$3,000 for 1 year at 6%.

EXERCISE 121.

1. What is the capitalized value of ground, which at 5% ground rent, yields the owner \$600 per year?

ò

GROUND RENTS.

2. What will be received as ground rent for a lot valued at \$5,000, leased at a ground rent of 8 % ?

8. What is the ground rent price per foot frontage of a lot 30 feet front, valued at \$12,000 and paying a ground rent of 7 %.

4. If \$192 be received yearly from a ground rent bought for \$3,840, what is the rate per cent. ground rent?

5. I bought three lots, each 25 feet front and 140 feet in depth, at \$50 per foot frontage, and leased them at $4\frac{1}{2}$ % ground rent. What income do I receive from my investment?

6. A real estate owner sold a ground rent of \$75 at 6%. What did he receive for it?

7. The annual income received on a 6% ground rent was \$540. If the ground rent be sold at its value and the proceeds applied to the purchase of a mining stock at \$50 per share, how many shares can be bought?

8. Find the present worth of a ground rent of 8% on a lot valued at \$4,500, to commence in 3 years and to then continue 15 years, if money be worth 5% compound interest.

to the ent is on the

to be centor own ually, es the

h per ,000, said 0 /for num-

year, \$180

1 at

Ø

LIFE INSURANCE.

567. Life Insurance is a contract by which a company (the insurer), in consideration of certain payments, agrees to pay to the heirs of a person, when he dies, or to himself, if living at a specified age, a certain sum of money.

568. The principal kinds of policies issued by Life Insurance Companies are the following: Ordinary Life, Limited Payment Life, Endowment, and Annuity.

569. An Ordinary Life Policy is one on which a certain premium is to be paid every year until the death of the insured, when the policy becomes payable to the persons named in the policy as the beneficiaries.

570. A Limited Payment Life Policy is one on which the premium is paid annually for a certain number of years, fixed upon at the time of insuring, or until the death of the insured, should that occur prior to the end of the selected period. The policy is payable on the death of the insured.

571. An Endowment Policy is one which is payable to the person insured, if he survives a certain number of years, or to his heirs, if he should die before the expiration of such period, in consideration of certain regular payments from the person insured.

572. An Annuity Policy is one which secures to the holder the payment of a certain sum of money every year during his life-time. It is secured by a single payment.

573. A Non-Forfeiting Policy is one which does not become void on account of non-payment of premium.

574. The Surrender Value of a policy is the amount of cash which the Company will pay the holder on the surrender of the policy. It is the legal reserve less a certain per cent. for expenses.

575. The Reserve of Life Insurance Policies is the present value of the amount to be paid at death less the present value of all the net premiums to be paid in the future.

576. The Reserve Fund of a Life Insurance Company is that sum on hand which invested at a given rate of interest together with future premiums on existing policies, should be sufficient to meet all obligations as they become due. It is the sum of the separate reserves of the several policies outstanding.

577. The Premium is the sum paid for the insurance of a person's life. It is paid annually, semi-annually, or quarterly.

578. The Premium consists of three elements: 1st. The Reserve, or that portion of each premium which must be kept and improved by interest, to pay the policy at its certain maturity.

2nd. An estimated amount for each man's share of the annual losses of the company.

3rd. Loading, or a certain per cent. to be added to the net premium to cover the general expenses of the business, and to provide against unusual contingencies.

579. The Sum Insured is the sum which is payable by the company upon the conditions mentioned in the contract.

580. Tables of Mortality are tables showing the average rate of deaths in every ten thousand persons.

581. Expectation is the average number of years which a person of a certain age is expected to live, based on a Table of Mortality.

582. The Rates of premium for Life Insurance, as fixed by different companies, are based on the probabilities of life, determined by a table of mortality, and the probable rates of interest which money will bear, and a loading or margin for expenses.

comnents, or to im of

Life Life,

ich a death o the

which er of l the nd of th of

vable er of ation aents

the year at. not

the

LIFE INSURA. OE.

583.

Expectation of Life.

The following table shows the number living, the number dying, and the expectation or duration of life of each individual, calculated from the Combined Experience Mortality Table :

| Age. | Living | g. Dying. | Expectation | . Age | Living | Dying | Expectation. |
|------|---------|-----------|-------------|-------|--------|-------|--------------|
| 10 | 10000 | | 48.36 | 55 | 63469 | | |
| 11 | 99324 | | 47.68 | 56 | 62094 | | 16.86 |
| 12 | 98650 | | 47.01 | 57 | 60658 | 1497 | 16.22 |
| 13 | 97978 | | 46.33 | 58 | 59161 | 1497 | 15.59 |
| 11 | 97307 | | 45.64 | 59 | 57600 | 1627 | 14.97 |
| 15 | 96636 | | 44.96 | 60 | 55973 | | 14.37 |
| 16 | 95965 | 672 | 44.27 | 61 | 54275 | 1698 | 13.77 |
| 17 | 95293 | 673 | 43.58 | 62 | 5250 | 1770 | 13.18 |
| 18 | 94620 | 675 | 42.88 | 63 | | 1044 | 12.61 |
| 19 | 93945 | 677 | 42.19 | 64 | 50661 | 1917 | 12.05 |
| 20 | 93268 | 680 | 41.49 | | 48744 | 1990 | 11.51 |
| 21 | 92558 | | 40.7) | 65 | 46754 | 2061 | 10.97 |
| 22 | 91905 | 686 | 40.09 | 66 | 44693 | 2128 | 10.46 |
| 23 | 91219 | 690 | | 67 | 42565 | 2191 | 9.96 |
| 24 | 90529 | 694 | 39.39 | 68 | 40374 | 2246 | 9.47 |
| 25 | 89835 | 698 | 38.68 | 69 | 38128 | 2291 | 9.00 |
| 26 | 89137 | | 37.98 | 70 | 35837 | 2327 | 8.54 |
| 27 | 88434 | 703 | 37.27 | 71 | 33510 | 2351 | 8.10 |
| 28 | 87726 | 708 | 36.56 | 72 | 31159 | 2362 | 7.67 |
| 29 | . 87012 | 714 | 35.86 | 73 | 28797 | 2358 | 7.26 |
| 80 | . 07012 | 720 | 35.15 | 74 | 26439 | 2339 | 6.86 |
| BI | 86292 | 727 | 34 43 | 7.5 | 2410 | 2303 | 6.48 |
| 32 | 85565 | 734 | 33.72 | 76 | 2170 | 2249 | 6.11 |
| | 84831 | 742 | 33 01 | 77 | 19548 | 2179 | 5.76 |
| 34 | 84089 | 750 | 32.30 | 78 | 17369 | 2092 | 5.42 |
| | 83339 | 758 | 31.58 | 79 | 15277 | 1987 | 5.09 |
| 35 | 82581 | 767 | 30.87 | 80 | 13290 | 1866 | 4,78 |
| 6 | 81814 | 776 | 30.15 | 81 | 11424 | 1730 | |
| 17 | 81038 | 785 | 29.44 | 82 | 9694 | 1582 | 4.48 4.18 |
| 8 | 80253 | 795 | 28.72 | 83 | 8112 | 1427 | |
| 9 | 79458 | 805 | 28.00 | 84 | 6685 | 1268 | 8.90 |
| 0 | 78653 | 815 | 27.28 | 85 | 5417 | 1111 | 8.63 |
| 1 | 77838 | 826 | 26.56 | 86 | 4306 | 958 | 8.36 |
| 2 | 77012 | 839 | 25.84 | 87 | 3348 | 811 | 8.10 |
| 8 | 76173 | 857 | 25.12 | 88 | 2537 | 673 | 2.84 |
| 4 | 75316 | 881 | 24.40 | 89 | 1864 | 545 | 2.59 |
| 5 | 74435 | 909 | 23.69 | 90 | 1319 | 427 | 2.35 |
| 6 | 73526 | 944 | 22.97 | 91 | 892 | 427 | 2.11 |
| 7 | 72582 | 981 | 22.27 | 92 | 570 | 231 | 1.89 |
| 8 | 71601 | 1021 | 21.56 | 93 | 839 | | 1.67 |
| 9 | 70580 | 1063 | 20.87 | 94 | | 155 | 1.47 |
| 0 | 69517 | 1108 | 20.18 | 95 | 184 | 95 | 1.28 |
| | 68109 | 1156 | 19.50 | | 89 | 52 | 1.12 |
| 2 | 67253 | 1207 | 18.82 | 96 | 37 | 24 | 0.99 |
| | 66046 | 1261 | 18 16 | 97 | 13 | 9 | 0.89 |
| | | 1316 | | 98 | 4 | 3 | 0.75 |
| | 01100 1 | 1010 | 17.50 | 97 | 1 | 1 | 0.50 |

the numfe of each Experience

Expectation. $\begin{array}{c} 16.86\\ 16.22\\ 15.59\\ 14.97\\ 14.87\\ 13.77\\ 13.18\\ 12.61\\ 12.05\\ 11.51\\ 10.97\\ 10.46\\ 9.9.00\\ 8.54\\ 0.9.00\\ 8.54\\ 0.17\\ 5.42\\ 5.09\\ 4.78\\ 6.86\\ 6.48\\ 6.11\\ 5.76\\ 5.42\\ 5.09\\ 4.78\\ 8.10\\ 2.84\\ 2.59\\ 2.35\\ 2.84\\ 2.59\\ 2.84\\ 2$ 0.75 0.50

584.

Table of Rates.

RATES FOR WHOLE LIFE INSURANCE.

PREMIUMS TO INSURE \$1,000 PAYABLE AT DEATH, WITH PROFITS.

| Age. | Annual Premiums. | Single Pramiums. | Annual Premiums for 5 Years. | Annual Premiums for 10 Years. | Annual Premiums for 15 Years. | Annual Premium for 20 Years | Age |
|------|---------------------|---------------------|---------------------------------------|--|--|--------------------------------------|-----|
| 20 | 17.80 | 265.17 | 60.22 | | | | |
| 21 | 18.20 | 270.07 | 61.34 | 35.03 | 26.95 | -23.10 | 20 |
| 22 | 18.62 | 275.11 | 62.50 | 35.69 | 27.46 | 23.59 | 21 |
| 23 | 19.06 | 280.38 | 63.71 | 36.38 | 00.62 | 24.05 | 22 |
| 24 | 19.51 | 285.79 | 64.95 | 37.09 | 28.55 | 24.54 | 23 |
| 25 | 19.99 | 291.39 | 66.24 | 87.82 | 29.13 | 25.04 | 24 |
| 26 | 20.49 | 297.17 | 67.57 | 38.58 | 29.72 | 25.55 | 25 |
| 27 | 21.01 | 803.15 | 69.94 | 89.87 | 80.34 | 26.09 | 26 |
| 28 | 21.56 | 809.32 | 70.36 | 40.18 | 80.97 | 26.65 | 27 |
| 29 | 22.13 | 815.70 | 71.83 | 41.02 | 81.64 | 27.23 | 28 |
| 30 | 22.78 | 822.28 | 78.85 | 41.90 | 82.32 | 27.83 | 29 |
| 31 | 23.36 | 829.08 | 74.92 | 42.80 | 88.03 | 28.45 | 30 |
| 32 | 24.02 | 336.10 | 76.55 | 43.73 | 88.76 | 29.10 | 31 |
| 33 | 24.71 | 843.33 | 78.22 | 44.70 | 84.52 | 29.78 | 32 |
| 34 | 25.44 | 350.81 | 79.95 | 45.70 | 35.31 | 30.48 | 33 |
| 35 | 26.21 | 858.53 | 81.74 | 46.73 | 36.13 | 81.21 | 34 |
| 36 | 27.01 | 866.50 | 83.59 | 47.80 | 86.98 | 31.97 | 35 |
| 37 | 27.86 | 874.73 | 85.50 | 48.90 | 87.87 | 32.77 | 36 |
| 38 | 28.76 | 883.23 | 87.48 | 50.05 | 38.79 | 33.60 | 37 |
| 39 | 29.71 | 892.02 | 89.53 | 51.24 | 89.75 | 34.47 | 38 |
| 40 | 30.71 | 401.10 | 91.67 | 52.48 | 40.76 | 85 39 | 39 |
| 41 | 31.78 | 410.49 | 93.84 | 53.77 | 41.81 | 36.35 | 40 |
| 42 | 82.91 | 420.19 | 96.13 | 55.12 | 42.92 | 37.37 | 41 |
| 13 | 34.11 | 430.22 | 98.50 | 56.53 | 44.08 | 38.45 | 42 |
| 14 | 35.39 | 440.54 | 100.96 | 58.01 | 45.30 | 89.58 | 48 |
| 15 | 86.74 | 451.13 | 103.51 | 59.55 | 46.59 | 40.78 | 44 |
| 16 | 38.17 | 461.96 | 106.13 | 61.15 62.82 | 47.93 | 42.04 | 45 |
| 17 | 39.67 | 472.99 | 108.81 | 64.53 | 49.33 | 43.37 | 46 |
| 18 | 41.26 | 484.23 | 111.57 | 66.31 | 50.79 | 44.76 | 47 |
| 19 | 42.93 | 495.66 | 114.89 | 68.04 | 52.32 | | 48 |
| 50 | 44.70 | 507.27 | 117.28 | 70.05 | 53.90 | | 49 |
| 51 | 46.56 | | 120.24 | 72.01 | 55.56 | | 50 |
| 52 | 48.53 | | 123.28 | 74.05 | 57.30 | | 51 |
| 53 | | | 126.38 | 76.16 | 59.11 | | 52 |
| 54 | ó2.81 | | 129.55 | 78.33 | 61.00 | 54.75 | 53 |
| 5 | | 567.70 | 132.79 | 80.61 | 63.00 | 56.75 | 54 |
| 6 | 57.61 | | 186.11 | 82.97 | 65.09 | | 55 |
| 7 | 60.22 | 100 | 139.51 | 85.43 | 67.29 | | 56 |
| 8 | 63.00 | 505.41 | 143.00 | 88.00 | 69.61 | | 57 |
| 9 | 65.94 | 318.17 | 46.58 | 90.69 | 72.07 74.68 | | 58 |
| 0) | 69.07 | | 50.26 | 93.51 | 74.68 | | 59 |
| | | | | 00.01 | 11.44 | 71.63 | 50 |

845

ţ

A Rain

585. RATES FOR ENDOWMENT INSURANCE.

ANNUAL PREMIUMS TO INSURE \$1,000, PAYABLE AT DEATH OS TAK EXPLICATION OF THE FOLLOWING TERMS, WITH PROFITS.

| Age. | 10 Years. | 15 Years. | 20 Years. | 25 Years. | 30 Years. | 25 Years | Age |
|------|-----------|-----------|-----------|-----------|-----------|-----------------|-----|
| 20 | 95.33 | 61.63 | 45.02 | 05.05 | | | - |
| 21 | 95.39 | 61.70 | 45.10 | 35.31 | 29.10 | 24.94 | 26 |
| 22 | 95.45 | 61.77 | 45.19 | 35.41 | 29.22 | 25.10 | 21 |
| 23 | 95.51 | 61.85 | 45.29 | 85.52 | 29.36 | 25.27 | 22 |
| 24 | 95.58 | 61.94 | 45.39 | 35.63 | 29.50 | 25.46 | 23 |
| 2.5 | 95.65 | 59.01 | | 35.76 | 29.66 | 25.66 | 24 |
| 16 | 95.78 | SE 1:3 | 45.50 | 85.89 | 29.83 | 25.87 | 25 |
| 27 | 95.81 | 62 22 | 4ŏ.61 | 36.04 | 30.02 | 26.11 | 26 |
| 8 | 95.80 | 62.33 | 45.74 | 36.19 | 30.22 | 26.36 | 27 |
| 9 | 25.98 | | 45.87 | 36.36 | 30 44 | 26.64 | 28 |
| 0 | 96.08 | 62.44 | 46.01 | 36.54 | 30.67 | 26.94 | 29 |
| 1 | 96.18 | 62.55 | 46.16 | 36.74 | 30.93 | 27.27 | 30 |
| 2 | 96.28 | 62.68 | 46.32 | 36.96 | 31.21 | 27.63 | |
| 3 | | 62.81 | 46.50 | 87.20 | 31.52 | 28.01 | 31 |
| 4 | 96 39 | 62.95 | 46.69 | 37.46 | 31.86 | 28.44 | 32 |
| 5 | 96.50 | 63.11 | 46.90 | 87.74 | 32.23 | | 88 |
| 6 | 96 63 | 63.28 | 47.14 | 88.06 | 32.63 | 28.90 | 34 |
| 2 | 96.76 | 63,46 | 47.40 | 88.40 | 83.07 | 29.40 | 35 |
| | 96.90 | 63.67 | 47.69 | 38.78 | 33.56 | | 36 |
| 5 | 97.05 | 63.90 | 48.01 | 89.20 | 33.00 | | 87 |
| | 97.23 | 64.16 | 48.37 | 89.67 | 34.09 | | 38 |
| | 97.43 | 64.46 | 48.77 | 40.19 | 34.68 | | 39 |
| | 97.66 | 64.80 | 49.22 | 40.19 | 35.33 | | 40 |
| | 97.94 | 65.18 | 49.72 | | •••• | / | 41 |
| | 98.25 | 65.61 | 50.28 | 41.41 | | | 42 |
| | 98.62 | 66.10 | 50.91 | 42.12 | | | 48 |
| | 99.02 | 66.63 | 51.60 | 42.91 | | 10 | 44 |
| | 99.47 | 67.23 | 52.36 | 43.77 | •••• | | 45 |
| | 99.96 | 67.87 | 52.10 | | | | 1¢ |
| | 100.50 | 68.58 | 53.18 | •••• | | | 17 |
| | 101.08 | 69.35 | 54.09 | •••• | | | 18 |
| | 01.72 | 70.19 | 55.07 | | | | 19 |
| | 02.41 | 71.12 | 56.15 | | | | 50 |
| | 03.17 | 72.12 | •••• | | | | 51 |
| | | 73.22 | •••• | | 1 | | 12 |
| | | | | | | | 3 |
| | | 74.42 | •••• | | | | 4 |
| | 06.97 | 75.74 | | | | | 5 |
| | 08.16 | •.••• | | | | | |
| | | •••• | | | | •••• 6 | |
| | 09.47 | •••• | | | | · · · · · · · · | |
| | 10.91 | •••• | | | | •••• 1 | * |
| 1 1. | 12.50 | | | | | | ~ |

EXERCISE 122.

1. Find the amount of premium for an ordinary life policy of $$\pm,000$, issued to a person 40 years of age. (Art. 583.)

2. Find the annual premium for a 10-payment life policy of \$5,00C, issued to a person 35 years of age. (Art. 585.)

8. When 40 years of age, a person took out a 20-year endowment policy of \$10,000. He survived the endowment period. How much less did he receive than he paid as premiums, not reckoning interest?

4. The annual premium, without profits, on a life policy of 55,000 at the age of 35 is 111. How much would be necessary to invest at 6% interest to secure the payment of the annual premium?

5 Mr. A., age 30, insures his life for 10,000, ordinary life plan, with profits. How much must he place in trust so that the interest at 5% will be sufficient to pay the premiums on the policy?

6. A single premium for an insurance of \$1,000, without profits, for a person 32 years of age, is \$300. What would be the excess of the insurance over the amount produced by placing the money at compound interest at 4%, supposing the insured to live 20 years ?

7. Mr. A., aged 36, insured his life for \$5,000, and paid an annual premium of \$185; supposing he died at the age of 68, how much did the premiums he paid exceed the face of his policy, money being worth 6 % compound interest?

8. Mr. A., at the age of 35, takes out a 20-year endowment policy for \$3,000 and pays an annual premium of \$141. By what amount will the premiums exceed the face of the policy at the end of the endowment period, money being worth 5% compound interest?

JE.

TH OR TA

| Coars, | Age |
|--|--------------------------|
| 4.94 5.10 5.27 5.46 5.66 5.87 3.11 5.86 6.64 .94 .94 40 40 | 412345678901234567890123 |
| 1 | |

MISCELLANEOUS.

MISCELLANEOUS.

EXERCISE 120.

I.

1. Which is the better investment, a \$3,000 7 % bond, or a house which rents for \$240 a year, taxes being \$30.50, and annual repairs \$40 ?

2. A person exchanges 250 shares of 6% stock, at 70, for stock bearing 8%, at 120; what is the difference in his income?

8. A gentleman has been receiving 12% on his capital in Canada. He goes to England to reside, and invests it in the 3 per cents. at 943, and his income in England is £2,400. What was his income in Canada, the £ being equal to \$4.863?

4. Find the alteration in income occasioned by shifting £3,200 stock from the 3 per cents. at 863, to 4 per cent. stock at $114\frac{7}{5}$: the brokerage being $\frac{1}{5}$ %.

5. Suppose a railroad stock, actually worth 100 a shares, to be "watered" by the issue of a stock dividend of 20% to the stockholders, what would the watered stock be worth?

6. A person bought stock at $95\frac{1}{4}$, and after receiving the half yearly dividend at the rate of 7% per annum, sold out at $92\frac{3}{2}$ and made a profit of \$37.50. How much stock did he buy?

7. At what price must U. S. $4\frac{1}{2}$'s be bought, to yield the interest on the investment that 5 % bonds will at 110?

What amount of the latter bonds (par value) must be sold at 109, leaving brokerage out of account, that with the proceeds a sufficient amount of $4\frac{1}{2}$'s may be bought, at par, to yield a semi-annual income of \$364.50 ?

MISCELLANEOUS.

7 % bond, ng \$30.50,

ock, at 70, fference in

his capital rvests it in ngland is eing equal

y shifting per cent.

0 a share, d of 20 % stock be

annum, w much

to yield at 110? must be hat with ought, at

8. A person invests the proceeds of a note for \$9,607.50, due 18 months hence, discounted (true discount) at $4\frac{1}{2}$ %, in 6% stock at 91, brokerage $\frac{1}{2}$ %. Find his net annual income from this investment after deducting an income tax of $2\frac{1}{2}$ %.

3. The present income of a railway company would justify a dividend of $3\frac{3}{4}$ %, if there were no preference shares; but as \$1,200,000 of the stock consists of such shares, which are guaranteed 5% per annum, the ordinary shareholders receive only 8%. What is the whole amount of stock?

10. A gentleman has \$25,000 of Bank of Commerce stock which pays a dividend of 8%. When money is worth 7% he sells out, and invests in Bank of Toronto stock at 205, which pays a dividend of 12%. What difference in his income after allowing his agent $\frac{1}{2}$ % commission for each transaction ?

11. A man invests \$19,450 in Bank of Montreal stock at 194, and \$19,850 in Bank of Toronto stock at 198, paying his broker in each case $\frac{1}{2}$ % on the amount of stock purchased. If the former pays a half-yearly dividend of $6\frac{1}{2}$ %, and the latter a half-yearly dividend of $6\frac{1}{4}$ %, find his total income for the half-year.

12. A man invested a certain sum in Bank of Commerce stock, which is at 120, and pays $4\frac{3}{5}$ % half-yearly dividends; and $62\frac{1}{2}$ per cent. more than that sum in Dominion Bank stock, which is at 180, and pays $4\frac{1}{2}$ % half-yearly dividends; his income from both investments is \$222.50. Find the amount of money invested in each kind of stock.

Π.

1. Jan. 1st. 1889, three persons began business. A. put in \$1,200, B. put in \$500, and May 1st \$800 more, C. put in \$700, and July 1st \$400 more. At the end of the year the profits were \$875. How shall it be divided?

S. SCELLANEOUS.

2. A. B. and C. commence business; A. puts in 250 firkins of butter, B. puts in \$2,500, and C. \$4,100. Their profits amounted to \$2,210, of which A. took \$560. How much was his butter a pound, and to how much were B. and C. entitled?

8. A building worth \$28,500 is insured in the Ætna for \$3,200, in the Western for \$4,200, and in the Mutual for \$6,500. It having been partially destroyed, the damage is set at \$10,500. What should each company pay?

4. A. had \$3,800 at interest for 60 days; B. had \$4,100 at interest for 45 days; and C. had \$4,950 at interest for 70 days. They received \$162 interest money. What did each get, and what was the rate per cent?

5. A. and B. formed a partnership Jan. 1st, 1889. A. put in \$6,000, and at the end of 3 months \$900 more, and at the end of 10 months drew out \$300; B. put in \$9,000, and 8 months after \$1,500 more, and drew out \$500 Dec. 1st. At the end of the year the net profits were \$8,900. Find the share of each.

6. Two persons commence trade with the same amount of money. The first man spends 43% of his money yearly, and the second spends a sum equal to 25% of what both had at first. At the end of the year they both together had \$3,468. How much had each at the end of the year?

7. A. commenced business with a capital of \$10,000, on the 1st of January, 1889; on the 1st of May, B. entered into partnership with him, and, in 1,500 barrels of flour. On the first of January, 1890 beir offits were \$5,100, of which B. was entitled to \$2,100. What was the value of the flour per barrel?

8. Three persons formed a partnership, with a capital of \$4,600. The first man's stock was in trade 8 months and

MISCELLANEOUS.

its in 250 00. Their 560. How vere B. and

Ætna for Iutual for damage is

ad \$4,100 aterest for What did

1889. A. more, and in \$9,000, \$500 Dec. e \$8,900.

e amount ey yearly, both had ether had ear?

0,000, on entered of flour. 5,100, of value of

apital of aths and gained \$752; the second man's stock was in trade 12 months and gained \$600; and the third man had his stock in 16 months and gained \$640. What was each man's stock?

9. Three men engaged in the manufacture of pails; A. put in \$2,550 for 8 months; B., a sum not specified for 12 months; C., \$1,080 for a time not specified. A. received for his.stock and profit \$3,400; B., \$4,200 for his; C., \$1,485 for his. Required, B.'s stock and C.'s time.

10. On the 1st of January, 1889, James Wilson opened a hardware store with a stock of 17,200; on the 1st of April, Joseph Brooks entered into partnership with him, and advanced 12,000; on the 1st of July, Abraham Miller put in goods to the amount of 16,000; on the 1st of January, 1890, when the balance sheet was exhibited, there appeared a net profit of 8,060. To how much was each partner entitled ?

11 A., B. and C. engaged in business. A. puts in \$400 at fine, and \$400 more at the end of 6 months; B. puts in \$900 at first, and withdraws one-third of his capital at the end of 6 months; C. puts in \$200 at the end of every 6 months. At the end of two years they have gained \$6,700. What share of the profits should C. receive in addition to 25 % of the total profit for managing the business?

12. A., B. and C. formed a partnership for 2 years; A. put in \$10,000, B. \$5,000, and C. \$2,500; it was agreed that C. should receive \$1,500 a year for superintending the business. A. drew out \$1,000 at the end of each quarter for one year, and at the end of 13 months put in \$15,000 more; B. withdrew \$600 at the end of each quarter. At the time of settlement the net gain was \$22,500. Required each one's share.

III.

1. A draft on Winnipeg bought at $\frac{3}{4}$ % premium for \$12,000, was sent to an agent to pay for cotton purchased at $2\frac{1}{2}$ % commission; what was the value of the cotton?

2. A commission merchant in Peterborough wishes to remit to his employer in Belleville \$512.36 by draft at 60 days; what is the face of the draft that he can purchase with this sum, exchange being at $2\frac{1}{2}$ % discount, interest 7%?

3. Shipped to Liverpool, 2,000 barrels of flour, which cost in Montreal \$4.50 per barrel; it was sold at £1 18s. 6d. per barrel, when the premium was $8\frac{1}{2}\%$; how much was the gain ?

4. A grain dealer bought 10,000 bushels of corn, at $38\frac{3}{2}$ cts. a bushel. He sent it to London, where it brought 28s. 9d. a quarter, when the premium was $9\frac{1}{2}\%$; the cost of transportation was $12\frac{1}{2}$ cts. per bushel; how much was gained?

5. A person in Barrie received £1,000 sterling, from England, when the premium was 9%. He put it out at interest for 9 months, 18 days at 6% per annum; to how much did it amount?

6. A merchant sent his agent in London 425 bales of cotton weighing 356 lbs. apiece, which cost him $9\frac{1}{2}$ cents a lb.; the agent paid $\frac{2}{3}$ d. a lb. for freight, £48 for cartage, sold it at 8d. a lb., and charged $2\frac{1}{2}$ % commission. If the merchant sells a bill of exchange for the amount, at $10\frac{1}{2}$ %, will he make or lose by the operation. How much?

MISCELLANEOUS.

7. Received from my correspondent in New York \$6,150 U. S. currency, with instructions to deduct my commission at $2\frac{1}{2}$ %, and invest the remainder in Canadian Tweeds worth \$1.09 $\frac{1}{2}$ per yard. How many yards should I send him, gold being quoted at 115?

8. An importer bought 1,565 yards of silk, at 5s. 6d. per yard; paid £7 12s. for freight, 25% duties, and remitted a bill on London at $9\frac{1}{2}$ % premium; how must he sell it per yard on 6 months, in order to make $12\frac{1}{2}$ %, allowing 7% interest?

9. Exchange between Paris and Amsterdam being at the rate of 2 francs 20 centimes to the guilder, that between London and Paris at the rate of 25 francs 80 centimes to the £, and that from New York on London at $9\frac{1}{2}$ % premium, what will be the cost of a remittance for 1,000 guilders from New York to Amsterdam by bills of exchange through London and Paris?

10. A merchant in Toronto wishes to pay £3,000 in London. Exchange on London is $9\frac{1}{2}$ % premium; on Paris, 5 francs 25 centimes per \$1; and on Amsterdam, 40 cents to a guilder. The exchange between France and England at the same time is 25 francs to £1, and that of Amsterdam on England 12½ guilders to £1. Which is the most advantageous, the direct exchange, or through Paris, or through Amsterdam?

11. A Hamilton merchant, owing 2,400 florins in Amsterdam, can buy exchange on that city for $41\frac{1}{4}$. Is it better for him to do so, or to remit to London, and thence to Amsterdam,—exchange on London being 4.87 in Hamilton, exchange on Amsterdam being 12 florins to the pound sterling in London, and brokerage for purchasing. the exchange in London being $\frac{1}{4}$ of 1%?

purchased cotton ?

wishes to lraft at 60 purchase t, interest

which cost 1 18s. 6d. much was

n, at 385 brought 92%; the ow much

ng, from it out at num; to

bales of 9½ cents for carmission. amount, How

MISCELLANEOUS.

12. A banker in Toronto remits \$10,000 to Liverpool as follows: First to Paris, at 5 frances 40 centimes per \$1; thence to Hamburg, at 185 frances per 100 marcs; thence to Amsterdam, at $17\frac{1}{2}$ stivers per marc; thence to Liverpool, at 220 stivers per £ sterling; how much sterling money will be have in bank at Liverpool, and what will be his gain over direct exchange at 10% premium?

IV.

1. Allowing 6% compound interest on an annuity of \$200 which is in arrears 20 years, what is its present amount?

2. What is the present worth of an annuity of \$500 for 7 years, at 6 % compound interest ?

9. Find the annuity whose amount for 25 years is \$16,459.35, allowing compound interest at 6 %.

4. The present worth of an annuity to be continued 10 years at 6 %, compound interest, compounded annually, is \$7,360.08. What is the annuity?

5. A man bought a farm for \$4,500, and agreed to pay principal and interest in 4 equal annual instalments; how much was the annual payment, interest being 6%?

6. A man bought a piece of property for \$10,000, and agreed to pay principal and interest in 8 equal annual instalments. How much was the annual payment, interest being 7%?

7. A father bequeathed his son, 11 years of age, a 6% annuity of \$2,500, to begin in 3 years and continue 10 years; what would be the amount when the son was 21. years old ?

erpool as per \$1; ; thence to Liversterling t will be

nuity of present

\$500 for

ears is

ued .10 ally, is

to pay s; how

0, and ual innterest

10 10 % as 21.

MISCELLANEOUS.

8. A man took out a life policy for \$3,000, at the rate of \$21.50 per \$1,000. What sum must he deposit in a savings bank, the compound interest of which, at 5%, payable semi-annually, shall discharge his annual premium?

9. A man died leaving \$5,000 to be divided between his three sons, aged 13, 15, and 16 years respectively, in such a proportion that the share of each being put at simple interest at 6%, should amount to the same sum when they should arrive at the age of 21. How much was each one's share?

10. A man paid annually \$10 for tobacco from the age of 14 until he was 50, when he died, he left \$1,000 for his heirs. What sum might he have left them had he dispensed with tobacco, and loaned the money thus saved at the end of each year at 6 % compound interest?

11. A mortgage of \$1,000, repayable in 5 years at \$200 a year with interest at 6% on the unpaid principal, is sold; what is its value allowing the purchaser 8% for his money?

12. A mortgage on a farm is payable in four equal annual instalments of \$1,000 each. When the first instalment falls due the mortgagor offers in part payment \$2,000 in 6% municipal debentures upon which interest is due, and which mature in one year. What balance in cash should the mortgagor demand in exchange for the mortgage, money being worth 10%?

POWERS AND ROOTS.

POWERS AND ROOTS.

586. A Power of a number is the number itself, or the product of equal factors, each of which is that number. Thus, 8 is a power of 2, since $8 = 2 \times 2 \times 2$.

587. The First Power is the number itself.

588. The Second Power is the product of a number taken twice as a factor, and is called a Square.

Thus, 16 is the square of 4, since $16 = 4 \times 4$.

589. The Third Power is the product of a number taken three times as a factor, and is called a Cube.

Thus, 125 is the cube of 5, since $125 = 5 \times 5 \times 5$.

590. A Root is one of the equal factors of a number. Note .- Roots are named from the number of equal factors they contain.

591. The Square Root is one of the two equal factors of a number.

Thus, 7 is the square root of 49, since $49 = 7 \times 7$.

592. The Cube Root is one of the three equal factors of a number.

Thus, 7 is the cube root of 343, since $343 = 7 \times 7 \times 7$.

593. The Radical Sign is the character \checkmark , which, placed before a number, indicates that its root is to be found.

594. The Index of the root is the figure placed above the radical sign to denote what root is to be taken. When no index is written, the index 2 is always understood.

Note.-The names of the roots are derived from e corresponding pawers, and are denoted by the indices of the radical argn.

Thus $\sqrt{9}$ denotes the square root of 9, the $\sqrt{9}$ denotes the oube root of 9, etc.

595. A Perfect Square is one whose exact square root can be found ; as 9, 16, 36, etc.

596. A Perfect Cube is one whose exact cube root can be found ; as 27, 61, 216. etc.

SQUARE ROOT.

SQUARE ROOT.

597. Extracting the Square Root of a number is the

process of finding one of the two equal factors of a number. Note.-The student should memorize the squares of the first nine digits.

The squares of 1, 2, 3, 4, 5, 6, 7, 8, 9, are respectively 1, 4, 9, 16, 25, 36, 49, 64, 81.

598. To extract the square root of a number.

EXAMPLE 1.—Extract the square root of 5,625.

| PROCES | 88. |
|------------------------|-----|
| 56 25 (49 725 | 78 |
| 725 | |

EXPLANATION OF THE METHOD.

Separate the given number into periods of two figures each, beginning at the units' figure.

Find the greatest square in the first period (56), which is 49, and place it under 56, also write the root of 49, which is 7, as the first figure in the required root.

Subtract 49 from 56, and to the remainder (7) affix the next period (25), giving 725 for a dividend. At the left of the dividend (725), write twice the root already found (7), which gives 14.

Divide 72 by 14, which gives a quotient (5).

145

A fix 5 to 14, giving 145, also place 5, as the second figure of the root. Multiply 145 by 5, giving 725, which subtracted from the dividend (725), leaves no remainder.

75 is the required root.

Example 2.-Extract the square root of 6,838,225.

PROCESS. 46 | 83 | 82 | 25 (2015 4 288 276 521 782 522 521 5225 26125 26125

f, or the number.

number

number

5. umber. ors they

factors

. factors

7 × 7. which, to be

above When

be root

e root

t can

SQUARE ROOT.

EXPLANATION OF THE METHOD.

Separate the given number into periods of two figures each, commencing at the units' figure.

Find the greatest square in the first period (6), which is 4, and place it under 6. also write the root of 4, which is 2, as the first figure of the required root.

Subtract 4 from 6, and to the remainder (2) affix the next period (83), giving 283 as the dividend.

At the left of the dividend (283), write twice the root already found (2), which gives 4.

Divide 28 by 4, which gives 7 as a quotient.

Affix 7 to 4, giving 47, also place 7 as the second figure of the root, and multiply 47 by 7, which gives 329, a number greater than the dividend (283), showing that 7 is too large a number.

We next try 6 as the second figure of the root.

Affix 6 to 4, giving 46; and place 6 as the second figure of the root.

Multiply 46 by 6, giving 276, which subtracted from the dividend 283, leaves a remainder 7, to which affix the next period (82), giving as the next dividend 782.

Multiply the part of the root already found (26) by 2, obtaining 52, which place to the left of the dividend 782.

Divide 78 by 52, which gives a quotient of 1.

Affix 1 to 52, giving 521, also place 1 as the third figure of the root. Multiply 521 by 1 and subtract from the dividend 782, after which proceed as before.

No ES 1.-If there is a remainder after the root of the last period is found, annex periods of ciphers, and proceed as before. The figures of the root thus obtained will be decimals.

2. If the trial divisor is not contained in the dividend, annex a cipher both to the root and to the divisor, and bring down the next period.

3. It sometimes happens that the remainder is larger than the divisor; but it does not necessarily follow that the figure in the root is too small.

599. To extract the square root of a decimal.

RULE.

Begin at the units' place, and proceed towards the left and right, to separate into periods of two figures each, then extract the root as in whole numbers.

Notes 1.- The left hand period in whole numbers may have but one figure ; but in decimals, each period must have two figures. Hence, if the number of decimals is odd, a cipher must be annexed to complete the

SQUARE ROOT.

2. It must be kept in mind that no period should contain an integer and decimal, and that, if there is an odd number of decimal places in the given number, the last period must be completed by annexing a cipher.

600. To extract the square root of a fraction.

RULE.

Reduce the fraction to its simplest form and find the square root of each term separately.

Notes 1.—If the denominator of the given fraction, when reduced, is an imperfect square, reduce the fraction to a *decimal*, and proceed as above.

2. Mixed numbers should be reduced to improper fractions, or the fractional part to a decimal.

EXERCISE 123.

Find the square root of--

| | | + | | | | | | | |
|---|---|---|--|----------------------------|--------------------------|---|--------------------------|----------------------|---|
| 1. 2. 8. 4. | 81225. 168921. | 6. 7. | 244036, 258064, 396900, 499849, | 1 1 | 0. / 1. 8 | 579121. 734449. 520836. 550625. | | 14. 15. | 966289. 1081600. 1177225. 1234321. |
| | Find one | of the f | wo equ | al fact | ora | of | | | |
| | 17. 68382 18. 90480 19. 68853 | 25. 6 4. | 20. 21. 22. | 296356 319694 192282 | 225. 4. | 01 | 23. 24. 25. | 6168 | 2241. 55. \. 868 01. |
|] | Extract th | ie squa | re root | of | | | | | |
| 26. 27. 28. 29. | .0961. 15.21. 22.09. .0004. | 30. 28 31. 33 32. 4.1 | 9867. 489. 2849. 7.3056. | 84. 85. 86. 87. | 1.32 226 | 9.24 38649. .8036. 001024. | 38. 39. 40. 41. | 50.1 .007 | 6.96. 1264. 120801. .225296. |
| 1 | Extract th | e squar | re root | of— | | | | | |
| 42. 43 . 44 . 45 . | 5. .5. | 46. 47. 48. 49. | 2. .06. | | 50. 51. 52. 53. | $20\frac{1}{4}$. 153 7 . 1565. 23.1. | | 54 55 56 57 | 5. 357. 5. 273. |
| k | ind the s | quare r | oot of- | _ | | | | | |
| 58. 59. 60. | 8. 1. 3. | 61. 62. | (78. 1999. 1999. | | 64. 65. 66. | 25. 17 <u>18</u> . 11 <u>75</u> . | | 67. 68. 69. | 8. |

mmencing

nd place it are of the

eriod (83),

found (2),

root, and dividend

e root. lend 283, ig as the

ining 52,

he root.

period is as of the

a cipher od. divísor; small.

t and then

, if the

CUBE ROOT.

CUBE ROOT.

601. Extracting the Cube Root of a number is the process of finding one of the three equal factors of the number.

NorE .- The student should memorize the cubes of the first nine digits. The cubes of 1, 2, 3, 4, 5, 6, 7, 8, 9 are respectively 1, 8, 27, 64, 125, 216 843, 512, 729.

602. To find the cube root of a number.

EXAMPLE.-Find the cube root of 32768.

I.

9

PROCESS. II. III. 3 32 | 768 27 2 270) 5768 184 2884 5768

32 is the cube root.

EXPLANATION OF THE METHOD.

First separate the given number into periods of three figures each, beginning at the units' figure.

Then take the nearest perfect cube not greater than 32, which is 27,

and set down its cube root, which is 3 in column II., in line with 32768. Then subtract 27 from 32, and to the remainder (5) annex the next

period (768), giving 5768.

Next place 3 times the first figure (3) of the root, already found, which is (3×3) 9 in column I , and 3 times the square of the root (3) already found, which gives $(3 \times 3 \times 3)$ 27, with two ciphers annexed to it, in column III. each opposite 5768.

Divide 5768 by 2700, which gives a quotient of 2.

Place 2 in column II., opposite 9.

Read 9-2 as one number 92, multiply this by 2, and place the product 184 under 2700, add and multiply their sum, 2884 by 2, and place their product 5768 under 5768, and subtract. As there is no remainder 32768

The figures in column II, taken in order give the cube root 32.

er is the rs of the

nine digits 4, 125, 216

es each,

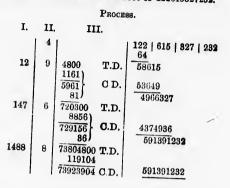
h is 27. 32768. he next

which found, n III.,

roduct their 32768

CUBE ROOT.

EXAMPLE 2.-Extract the cube root of 122615327232.



EXPLANATION OF THE METHOD.

Separate the given number into periods of three figures, each beginning at the units' figure.

Then as in Example I, take the nearest perfect cube not greater than 122, which is 64, and set down its cube root which is 4 in column II., in line with the given number.

Subtract 64 from 122, and to the remainder (58) annex the next period (615), giving 58615.

Next place 3 times 4 (the first figure of the root), that is 12 in column I; and 3 times 4 × 4 (the square of 4), which equals 48 in column III; each in line with 58615, and annex two ciphers to 48 giving 4800.

Divide 58615 by 4800, and a quotient 12 is obtained.

Now 9 is the largest number we can have as a figure of the root, and we therefore use 9, placing it in column II. opposite 12.

Read 12-9 as one number 129. Multiply 129 by 9, and place the product 1161 under 4800, to which it is then added, giving as a result 5961.

Multiply 5961 by 9, and place the product 53649 under 58615 and subtract, and to the remainder 4966 annex the next period 327.

Next place the square of 9, which is 81, under 5961, add the three numbers connected by the bracket, and to their sum 7203 annex two

Then place 3 times 49 (the part of the root already found), wh oh is 147, in column I., in the position indicated in the solution.

Divide 4966327 by 720300, and a quotient 6 is obtained. Place 6 in column II. opposite 147.

CUBE ROOT.

Read 147--6 as one number 1476. Multiply 1476 by 6, and add the product 8856 to 720300. Multiply their sum 729156 by 6, and place their product 4374936 in the position given in the solution, etc.

The attention of the student is directed first to the method of obtaining the numbers in column I. from those in column II; $12 = 4 \times 3$; $147 = 49 \times 3$; $1488 = 496 \times 3$; etc.

Second, to the formation of the following numbers :

 $1161 = 129 \times 9$; $8856 = 1476 \times 6$; $119104 = 14888 \times 8$.

Third, to the formation of trial divisors marked T.D.

Fourth, to the formation of complete divisors marked C.D.

Notes 1.—If there is a *remainder* after the root of the last period is found, annex periods of ciphers, and proceed as before. The root figures thus obtained will be *decimals*.

2. If a trial divisor is not contained in the dividend, put a cipher in the root, two ciphers on the right of the divisor, and bring down the next period.

8. If the product of the divisor completed into the figure last placed in the root *exceeds* the dividend, the root figure is too large. Sometimes the remainder is *larger* than the divisor completed; but it does not necessarily follow that the root figure is too small.

603. To extract the cube root of a decimal.

RULE.

Begin at the units' place, and proceed both toward the left and right to separate into periods of three figures each, then extract the root us in whole numbers.

Note.—The left hand period in whole numbers may have but one or two figures, but in decimals each period must have three figures. Hence, ciphers must be annexed to the right of the decimal to complete the periods, when necessary.

604. To extract the cube root of a fraction.

RULE.

Reduce the fraction to its lowest terms, then extract the root of its numerator and denominator.

Notes 1.—When the denominator is not a *perfect cube*, the fraction should be reduced to a decimal, and the root of the decimal be found as above.

2. A mixed number should be reduced to an improper fraction.

 $\mathbf{362}$

add the pro-

d of obtain- $1 = 4 \times 3;$

: 8.

st period is root figures

pher in the m the next

st placed in netimes the necessarily

the left ach, then

ne or two Hence, nplete the

the root

fraction found as

)n.

CUBE ROOT.

EXERCISE 124.

| Find | the cube roo | t of- | _ | | |
|-------|----------------|------------|-------------|-----|-------------|
| 1. | 6859. | 4. | 3869898. | 7. | 49027896. |
| 2. | 12167. | 5. | | 8. | 66430125. |
| 3. | 27000. | 6. | | 9. | 929714176. |
| Extra | ict the cube r | oot | of— | | |
| 10. | 1412467848. | 12. | 3341362375. | 14. | 3616805375. |
| 11. | 1865409391. | 18. | 2857243059. | 15. | 4065356736. |
| Find | the cube root | of- | _ | | |
| | 830.584. | 18. | 1.092727. | 20. | .000175616. |
| | .970299. | 19. | .002197. | 21. | .007645373. |

Find the cube root of the following numbers carrying incomplete roots to three or five decimal places, as may be required :

| 22. 23. | | .01. .02. | 26. 27 | .001. | 28. 29. | | 80 | |
|------------|--|--------------|-----------|-------|------------|----|----|---|
| | | | | | 20. | ž. | 81 | T |

PRACTICAL MENSURATION.

PRACTICAL MENSURATION.

605. Mensuration treats of the measurement of lines, surfaces and solids.

GOG. Lines are measured by expressing their length in inches, feet, yards, etc. (Linear Measure), or in links, chains, etc. (Surveyors' Measure.):

607. A Surface is that which has length and breadth only.

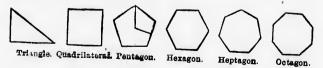
GOS. Surfaces are measured by expressing the number of times they contain the units of surface measure, *i.e.*, the sq. inch, sq. yard, etc. (Square Measure), or the sq. link, sq. chain (Surveyors' Square Measure).

609. If a straight edge laid anywhere upon a surface touches at every point, the surface is a plane surface.

610. A Polygon is a plane surface bounded by straight lines.

GII. The Area of a plane surface is the space enclosed by the lines which bound it

612. A polygon takes its name from the number of sides which bound it, thus:



QUADRILATERALS.

ION.

ent of lines.

ir length in r in links,

d breadth

ie number re, *i.e.*, the e sq. link,

a surface

y straight

enclosed

mber of



QUADRILATERALS.

613. A Right Angle is an angle formed by two lines perpendicular to each other.

614. Parallel Lines are lines in the same plane, which being produced both ways never meet, and which are therefore the same distance apart throughout their entire length.

615. Quadrilaterals are of three kinds, as follows:

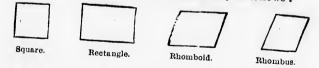




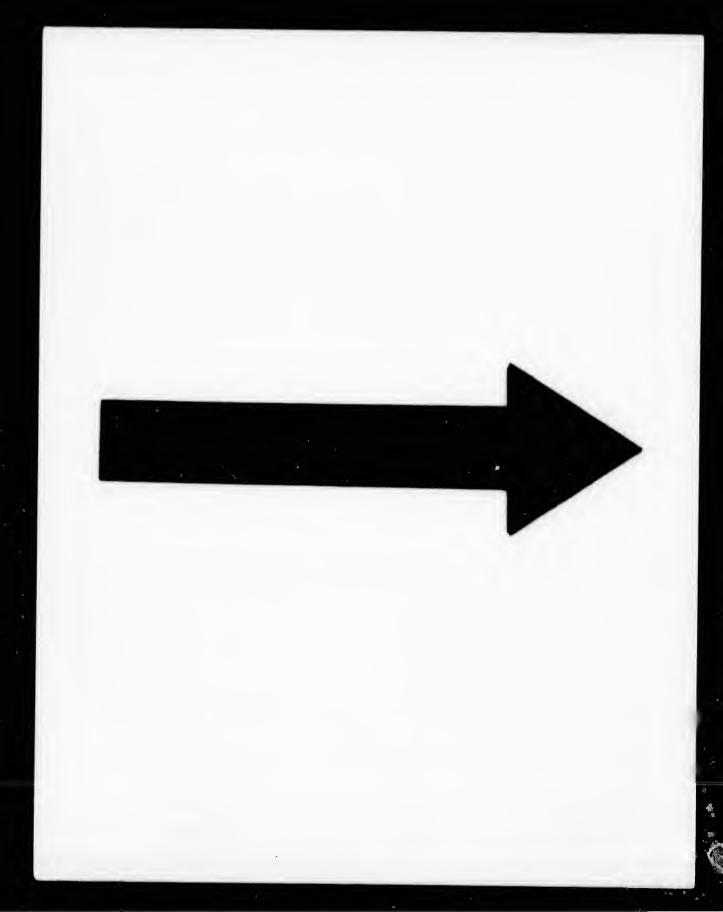


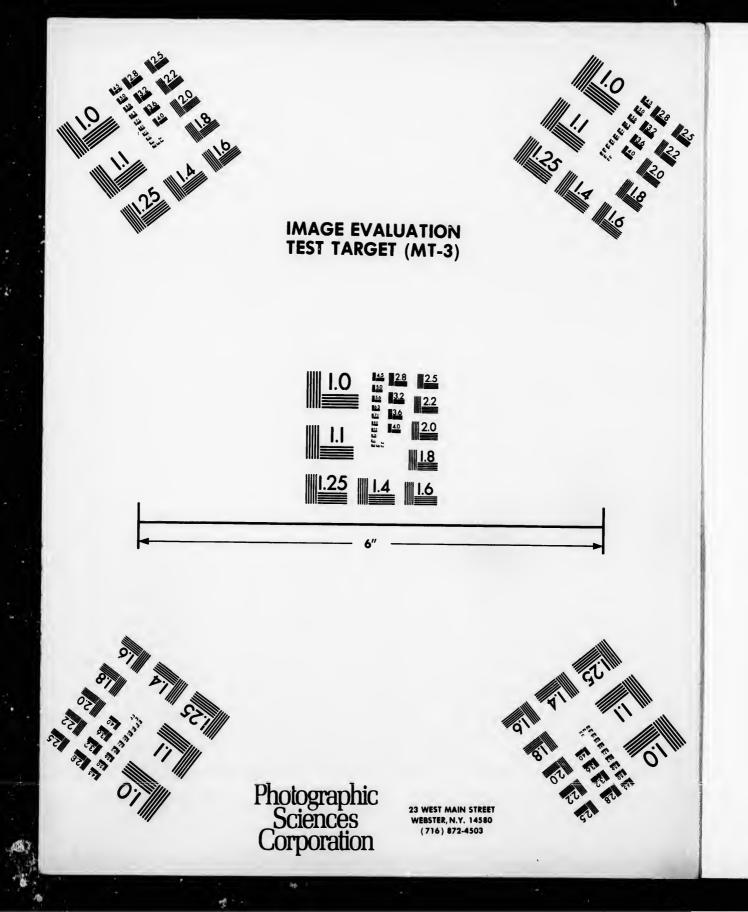
BIG. A Parallelogram has its opposite sides parallel; a Trapezoid has only two sides parallel; a Trapezium has has no two sides parallel.

617. Parallelograms are of four kinds, as follows :



61%. A Square has all its sides equal and all its angles right angles; a Rectangle has its opposite sides equal, and all its angles right angles; a Rhomboid has its opposite sides equal, and none of its angles right angles; a Rhombus has all its sides equal and none of its angles right angles.







QUADRILATERALS.

G19. The Altitude of a parallelogram or trapezoid is the perpendicular distance between the parallel sides.

620. The Diagonal of a quadrilateral is a straight line joining two opposite corners.

621. To find the area of a rectangle or square.

EXAMPLE 1.-Find the area of the rectangle whose sides are 3 inches and 5 inches in length.



In the figure A B C D, let A B be 5 inches, and A D be 3 inches. Let A B be divided into 5 equal parts, each 1 inch in length, and let A D be divided into 3 equal divisions each, 1 inch in length. Draw through these divisions the lines represented in the

EXPLANATION.

figure. The whole figure will then be divided into squares, each of whose sides is 1 inch in length, and hence each square is a square inch. In each horizontal row there are 5 square inches, and in the three horizontal rows there will be 3 times 5 square inches, or 15 square inches, and hence the solution, $5 \text{ sq. in.} \times 3 = 15 \text{ sq. in.}$

EXAMPLE 2.—Find the area of a square whose side is 8 inches. SOLUTION. 8 sq. in × 8 = 64 sq. in. Ans. Same as Example 1. BULE.

Multiply the length by the breadth and the result will be the area.

Norzs 1.—The student will observe that the rule is only a shortened form of expressing the longer rule. Multiply the measure of the length expressed in units of square measure by the measure of the breadth.

2. All the following rules will be expressed in a shortened form.

The converse of the preceding rule must be true :

If the area of a restangle be divided by a side, the quotient will be the other side, or if the square root of the area of a square be extracted, the result will be the length of a side.

trapezoid is lel sides.

straight line

square.

whose sides are

NATION.

C D. let A B be 3 inches. Let 5 equal parts, and let A D be divisions each, w through these resented in the s, each of whose einch. In each horizontal rows , and hence the

is 8 inches. ATION. ample 1.

It will be the

ly a shortened e of the length e breadth. d form.

rue:

the quotient e area of a faside.

QUADRILATERALS.

622. To find the area of a rhomboid or rhombus, the length of a pair of opposite sides and the perpendicular distance between them being given.

EXAMPLE .- Find the area of a rhomboid, one pair of whose oprosite sides are 10 feet in length, and the distance between them 6 feet.

SOLUTION.

10 sq. ft. \times 6 = 60 sq. ft. Ans. It is proved in Euclid, Book I, proposition 35, that the area of a paral. lelogram is equal to the area of a rectangle on the same base, and of the same altitude, and hence the solution given.

RULE.

Multiply the length of one of the parallel sides by the perpendicular distance between them.

623. To find the area of a trapezoid, the lengths of the parallel sides and the perpendicular distance between them being given.

EXAMPLE.—Find the area of a trapezoid, the lengths of the parallel sides being 6 feet and 10 feet, and the perpendicular distance between

SOLUTION.

(6 ft. + 10 ft.) ÷ 2 = 8 ft. 8 sq. ft. × 5 = 40 sq. ft. Ans. RULE.

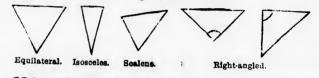
Multiply one-half the sum of the parallel sides by the perpendicular distance between them.

TRIANGLES.

TRIANGLES.

624. A Triangle is the space enclosed by three straight lines.

625. Triangles are named according to their sides, and also according to their angles, as follows :



626. An Equilateral Triangle has its three sides equal.

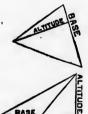
627. An Isosceles Triangle has only two sides equal.

628. A Scalene Triangle has all of its sides unequal.

629. A Right Angled Triangle has one of its angles a right angle.

630. The Base of a triangle is any side or a triangle upon which a perpendicular is let fall from the opposite angle.

631. The Altitude of a triangle is the length of the perpendicular let fall from an angle on the opposite side or the opposite side produced.



Norg.-Dotted lines represent the altitude.

682. To find the area of a triangle.

EXAMPLE 1.—Find the arc $\cdot c i$ a triangle whose base is 16 feet, and whose altitude is 9 feet.

SOLUTION. (16 sq. ft + 2) \times 9 = 72 sq. ft.

ree straight

ir sides, and



sides equal. sides equal. s unequal. its angles a



3 16 feet, and

TRIANGLES.

EXPLANATION.

it is proved in Euclid, Book I, proposition 41, that the area of a mangle is half the area of a parallelogram on the same base and of the same altitude, hence the solution given.

BULE.

Multiply one-half the base by the altitude.

The following rule is also necessary when three sides are given.

RULE

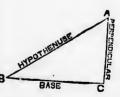
From half the sum of the sides subtract each side separately; then multiply half the sum and the three remainders together, and extract the square root of the product.

EXAMPLE 2.-What is the area of a triangle whose sides are 12 feet, 16 feet, and 18 feet?

> SOLUTION. $(12 + 16 + 18) \div 2 = 23$ 23 - 18 = 5 $23 \times 5 \times 7 \times 11 = 8,855.$ 23 - 16 = 723 - 12 = 11√ 8858 = 94.1 sq. ft. Ano.

633. It is proved in Euclid, Book I, proposition 47, that in any right angled triangle the area of the square described on the side opposite the right angle, is equal to the sum of the reas of the squares described on the sides containing the .ight angle.

In the accompanying figure, if ABC be a triangle having a right ungle at C, the area of the square described on A B is equal to the sum of the areas of the squares described on A C and B C.



A B, the side opposite the right angle, is called the hypothenuse; B C the bass; and A C the perpendicular.

Hence, the square on the hypothenuse = square on the base + the square on the perpendicular.

TRIANGLES.

EXAMPLE 1.-If the base of a right angled triangle be 9 foot, and the perpendicular be 6 feet, what is the length of the hypothenese *

SOLUTION.

In the preceding figure, sq. on A B = 8 × 8 + 6 × 6 = 100 sq. ft. \therefore A B = $\sqrt{100} = 10$ ft. Ans.

EXAMPLE 2.-The hypothenuse of a right angled triangle is 35 feet and the perpendicular is 28 feet, find the base.

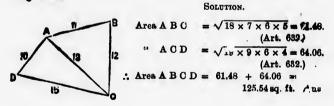
SOLUTION.

 $35 \times 35 =$ sq. on the base + 28 \times 28 \therefore sq. on the base = $35 \times 35 - 28 \times 28 = 441$ \therefore the base = $\sqrt{441} = 21$ ft. Ans.

634. To find the area of a trapezium.

A trapezium may be divided into two triangles by joining two opposite corners, and hence it is only necessary to find the areas of the two triangles and to take their sum.

EXAMPLE.—Find the area of a trapezium whose sides are 10 feet, 11 feet, 12 feet, and 15 feet, the length of the line joining opposite corners being 18 feet.



:

then a set, and

angle is 35 feet

s by joining sary to find sum.

les are 10 feet,

POLYGONS.

POLYGONS.

SES. To find the area of a regular polygon containing more than four sides.

RULE.

Multiply the perimeter (sum of all the sides) of the base by one-half the perpendicular distance from the centre to one of the sides.

EXAMPLE.—What is the area of a hexagon, side 8 feet, the perpendicular distance from the centre to one of the sides being 6.928 + feet.

SOLUTION.

Perimeter = 8 ft. x 6 = 48 ft Area = $48 \operatorname{sq} \operatorname{ft}$. x $\frac{6.928}{2}$ = $166.272 + \operatorname{sq}$. ft.

The area of an equilateral triangle equals the square of a side multiplied by .438, and the area of a hexagon, which is made up of 6 equilateral triangles, is therefore $6 \times .433$ ames the square of a side.

87i

THE CIRCLE.

636. A Circle is a plane figure bounded by a curve line called the circumference, every point of which is equally distant from a point called the centre.



637. The Diameter of a circle is a line drawn through the centre, and terminated at both ends by the circumference.

638. A Radius is a straight line drawn from the centre to the circumference and is equal to half the diameter.

Note.—From the definition of a circle, it follows that all the radii are equal; also, that all diameters are equal.

639. PRINCIPLES. 1. The circumference = the : iameter 3.1416 nearly.

2. Therefore the diameter = the circumference + 3.1416 nearly.

3. The area of a circle = the square of the radius \times 3.1416 nearly.

4. The area of a circle = the circumference \times half the radius.

5. Therefore the radius of a circle = sq. root of (the area \div 3.1416) nearly.

Note.—The fraction 3¹/₄ is commonly used in place of the decimal 3.1416, and is near enough for common practical operations, and will be used in this work.

MANYTER SAMPLE

n through e circum-

he centre neter. he *radii* are

∵:**i**ameter

+ 3.1416

× 3.1416

half the

(the area

he decimal and will be

THE CIRCLE.

EXAMPLE 1. What is the circumference of a circle whose radius is 7 feet?

SCLUTION.

7 ft. $\times 2 = 14$ ft. diameter, 14 ft. $\times 3\frac{1}{7} = 44$ ft. Ans. (Prin. 1.)

EXAMPLE 2. The circumference of a circle is 176 feet. What is the diamster i

SOLUTION.

176 ÷ 34 = 56 ft. Ans. (Prin. 2.)

EXAMPLE 3. What is the area of a circle whose diameter is 14 fect γ

SOLUTION 1.

14 ft. \div 2 = 7 ft. the radius, 7 × 7 × 31 = 154 sq. ft. Ans. (Prin. 3.)

SOLUTION 2.

14 ft. \times $3\frac{1}{7}$ = 44 ft. the circumference. (Prin. 1.) 14 ft. \div 2 = 7 ft. the radius. 44 $\times \frac{7}{2}$ = 154 sq. ft. Ans. (Prin. 4.)

EXAMPLE 4. The area of a circle is 616 square feet. Find the ruders, diameter, and circumference.

SOLUTION.

Radius = $\sqrt{616 \div 3\frac{1}{2}}$ = 14 ft. (Prin. \vec{v}_{ij} 14 ft. × 2 = 28 ft. the diameter. \vec{v}_{ij} is \vec{x}_{ij} = 88 ft. the circumference. (Prin. 1.)

EXERCISE 125.

1. How may acres in a piece of woodland 220 yards in length and 40 rods in width?

2. How many square miles in a township 5 miles and 40 chains square?

8. How many square feet in a floor 20 feet long and 5 yards wide?

4. Find the surface of a pane of glass measuring $37\frac{1}{2}$ inches long and 23 inches wide.

5. How many square yards in the four walls of a room 15 ft. 6 in. high and 80 feet in compass?

6. A rectangular pavement, 50 ft. 9 in. long and 12 ft. 6 in. wide, was laid with a central line of stone 5 feet wide at \$1.75 a running foot; the sides were flanked with brick at 80 cents per square yard. What did the paving cost?

7. How many square feet in a surface 24 feet long 20 feet wide? How many in another surface of half these dimensions?

8. Two fields contain 10 acres each; one is in the form of a square, the other is 4 times as long as it is wide. What would be the difference in expense of fencing them at 2.25 per rod?

9. If the fence were built $4\frac{1}{2}$ feet high, of boards 8 inches wide, the lower one raised 2 inches above the ground, and a space of 8 inches between the boards, how many square feet of boards would be required for both fields ?

10. How many more for one than for the other?

11 A piece of land containing 2 acres is 5 times as long as it is broad. What is its length and breadth ?

12. How many bricks 8 inches long and 4 inches wide will pave a yard that is 100 feet by 50 ?

18. What will it cost to pave a roadway 80 feet long and 15 feet wide, at \$1.50 per square yard ?

14. I have a box without a lid; it is 5 feet long, 4 feet wide, and 3 feet deep, interior dimensions. How many square feet of zinc will it take to line the bottom and sides of the box ?

15. Find the area of a rhomboid whose length is 1 yd. 3 ft. 6 in., and whose width is 2 ft. 8 in.

16. The base of a rhombus is 10 ft. 6 in., and its altitude 8 feet. What is its area?

17. How many acres in a piece of land in the form of a rhomboid, the base being 8.75 ch. and altitude 6 ch.?

18. A man bought a farm 198, rods long and 150 rods wide, and agreed to give \$32 an acre. What did the farm cost?

19. A certain rectangular piece of land measures 1,000 links by 100. How many acres does it contain?

20. How many square feet in a board 16 feet long 18 inches wide at one end and 25 inches wide at the other end?

21. Required the area of a trapezoid whose parallel sides are 178 and 146 feet, and the altitude 69 feet.

0 yards in

miles and

long and 5

suring 371

of a room

and 12 ft. 5 feet wide with brick ng cost?

ng 20 feet alf these

t is wide. cing them

s 8 inches ind, and a quare feet

22. One side of a quadrilateral field measures 38 rods; the side opposite and parallel to it measures 26 rods, and the distance between the two sides is 10 rods. Find the area.

23. The parallel sides of a trapezoid measure respectively **3**¹/₃ feet and 6 inches; the perpendicular distance between them is 2 feet. What is the area?

24. Find the area of a trapezium whose diagonal is 168, and one perpendicular 42, the other 56.

25. Find the area of a trapezium whose diagonal is $85 \text{ ft. } 6 \text{ in., and the perpendiculars to this diagonal 9 feet and <math>12\frac{1}{2}$ feet.

26. How many acres in a quadrilateral field whose diagonal is 30 rods, and the perpendiculars to this diagonal 20.458 and 50.832 rods. ?

27. What is the base of a triangle whose area is 156 square feet, and its altitude 12 feet ?

28. What is the base of a triangle whose area is 144 acres and its altitude 60 rods?

29. Find the base of a triangle whose area is 5,280 square yards, and altitude 240 yards.

30. What is the area of a triangle whose three sides are 13, 14, and 15 feet?

31. What is the area in acres of a triangular field whose three sides measure 1_spectively 47, 58, and 69 rods?

'32. What is the area of a triangle whose base is 24 feet and altitude 16 feet ?

33. The base of a triangle is 28 inches and the altitude 16 inches; what is the area?

34. A board 16 feet long is 22 inches wide at one end, and tapers to a point; what is the value at $4\frac{1}{2}$ cents a square foot?

85. Find the area of a triangle whose base is 12 ft. 6 in. and altitude 6 ft. 9 in.

36. Whose base is 25.01 chains and altitude 18.14 chains.

87. What is the cost of a triangular piece of land whose base is 15.48 ch. and altitude 9.67 ch. at \$60 an acre?

38. At \$.40 a square yard, find the cost of paving a triangular court, its base being 105 feet, and its altitude 21 yards?

39. Find the area of a circular pond, its circumference being 200 chains.

40. The distance around a circular park is $1\frac{1}{5}$ miles. How many acres does it contain ?

41. How much land in a circular garden that requires 84 rods of fencing to inclose it?

42. Find the difference in cost at $87\frac{1}{2}$ cts. per rod between fencing a square field of 10 acres and a rectangular field 82 rods wide of the same area.

48. Draw a square containing 81 square inches; inscribe a circle in this square. What is the superficies of this circle in square inches?

44. A cow is tethered to a post driven in the centre of a lot 100 feet square; the tether is just long enough for her to reach the fence. How much of the surface of the field is she unable to crop?

ures 38 rods; 26 rods, and ls. Find the

e respectively ance between

gonal is 168,

diagonal is agonal 9 feet

field whose this diagonal

area is 156

area is 144

ea is 5,280

ee sides are

field whose rods?

e is 24 feet

he altitude

45. If the diameter of an iron column is 3 ft. 5 in., what is the circumference? If the girth of a tree is 5 ft. 9 in., what must be its diameter?

46. If the equatorial diameter of the earth is 7,925 miles, how long in miles and rods is the equator ?

47. The distance from the centre of the hub of a wheel to the outer edge of the felly is 15 inches. How long must the tire be?

48. If the length of an oar from the thole-pin to the end of the blade is 5 feet, how many feet would the end of the blade travel in the water during 6,000 strokes, each describing an arc of 60°? ($60^\circ = \frac{1}{2}$ of the circumference.)

49. If the circumference of a circular pond is 628.318 rods, what part of a mile must I row to pass from shore to shore across the centre of the pond?

50. If a horse is tethered to the middle post of a fence, from which he can graze out into the field in a curved line 78.539314 feet long, how long is the tether?

51. What will be the circumference of the largest circle that can be drawn on a sheet of paper 12 inches wide and 18 inches long?

t. 5 in., what is 5 ft. 9 in.,

th is 7,925 or?

b of a wheel ow long must

n to the end e end of the rokes, each sumference.)

d is 628.318 om shore to

of a fence, curved line

argest circle es wide and

SOLIDS.

SOLIDS.

640. A Solid is that which has length, breadth, and thickness.

641. A Prism is a solid whose bases are similar, equal, and parallel polygons, and whose side are parallelograms.

642. Prisms take their names from the forms of their bases, as triangular, rectangular, pentagonal, hexagonal, etc.

643. A Cube is a rectangular prism whose faces are all equal squares.

644. A Cylinder is a circular body of uniform diameter whose ends are equal and parallel circles.

645. The Altitude of a prism or cylinder is the perpendicular distance between its bases.









Triangular prism. Rectangular prism. Pentagonal prism. Hexagonal prism.







646. To find the convex surface of a prism or cylinder.

Suppose a block of the shape of one of the preceding prisms to have been fitted with a piece of paper so as to exactly cover its convex surface. Now if the paper be unrolled it will be found to be the shape of a rectangle, one side being equal to the height, and the other side equal to the perimeter of the base. Hence, the following rule.

BULE.

1. Multiply the perimeter (sum of all the sides) of the base by the altitude.

2. To find the entire surface, ada the areas of the bases to the convex surface.

EXAMPLE 1. Find the convex surface and also the entire surface of a rectangular prism whose ends are 5 inches by 7 inches, and whose altitude is 12 inches.

SOLUTION

Perimeter of the base = (5 + 7 + 5 + 7) in. = 24 in. Altitude = 12 in.

: Convex surface = 24 sq. in. $\times 12 = 288$ sq. in.

Again, area of base = 7 sq. in. \times 5 = 35 sq. in.

: Entire surface = 35 sq. in. + 35 sq. in. + 238 sq. in. = 358 sq. in

EXAMPLE 2. Find entire surface of a cylinder the diameter of whose base is 14 inches, and whose altitude is 20 inches.

SOLUTION.

Perimeter of base = $14 \times 31 = 44$ in. : Convex surface = 44 sq. in $\times 20 = 880$ sq. in. Again, area of base = $7 \times 7 \times 3\frac{1}{7} = 154$ sq. in. : Entire surface = (154 + 154 + 880) sq. in. = 1183 sq. in.

647. To find the volume of a prism or cylinder.

RULE.

Multiply the area of the base by the altitude.

EXAMPLE. 1. Find the volume of a rectangular prism whose base is 4 inches by 6 inches, and altitude 10 inches.

SOLUTION.

Area of base = 6 sq. in. \times 4 = 24 sq. in. Volume = 24 cub. in. \times 10 = 240 cub in.

ism or cylinder.

ling prisms to have rits convex surface. the shape of a rectother side equal to e.

ie sides) of the

reas of the bases

ie entire surface of inches, and whose

= 24 in.

8 sq. in. sq. in. . in. = 358 sq. in

the diameter of

i. iq. in. iq. in. sq. in.

cylinder.

rism whose base

ı. in

SOLIDS.

EXPLANATION.

The base can be divided into 24 squares each side of which is 1 inch. If a piece of the prism 1 inch in thickness be cut off by a plane parallel to the base it can be divided in 24 small blocks, corresponding to the 24 squares into which the base can be divided, each of these small blocks will therefore be 1 inch long, 1 inch wide, and 1 inch in thicl ness. Hence the part cut off will contain 24 cubic inches, 10 such pieces can be cut off the whole block, and the whole block therefore contains

 $24 \text{ cub in.} \times 10 = 240 \text{ cub. in.}$

EXAMPLE 2. What is the volume of a triangular prism π lose base is an equilateral triangle each side 8 inches, and whose altitude is 12 inches?

SOLUTION.

Area of base = $\sqrt{12 \times 4 \times 4 \times 4}$ = 27.712 + sq. in. Volume = 27.712 cub. in. \times 12 = 332 544 cub. in.

EXAMPLE. 3. Find the volume of a cylinder, the diameter of whose base is 14 inches and altitude 20 inches.

SOLUTION.

Area of base = $7 \times 7 \times 3$; = 154 sq. in. Volume = 154 cub. in. $\times 20$ = 3030 cub. in.

648. A Pyramid is a solid whose base is a polygon and whose sides terminate in a point called the vertex.

649. A Cone is a solid which has a circle for its base, and terminates in a point called the vertex.

650. The Altitude of a pyramid or cone is the perpendicular distance from the base to the vertex.

651. The Slant Height of a pyramid is the distance from the vertex to the middle point of any side of the base.

652. A Frustrum of a pyramid or cone is the part which is left after the top is cut off by a plane parallel to the base.

653. The Altitude of a frustrum is the perpendicular distance between its ends.

SOLID.

654. The Slant Height of a frustrum of a pyramid is the distance between the middle points of two parallel sides of one of its faces.



Frustrum of a pyramid. Frustrum of a cone.

655. To find the convex surface of a pyramid or cone. BULE.

1. Multiply the perimeter by one-half the slant height.

2. To find the entire surface add the area of the base to the area of the convex surface.

EXAMPLE 1.-Find the entire surface of a pyramid whose base is a square side 6 inches, and whose slant height is 10 inches.

| | Sc | LUTION. | | | | |
|-------------------|----|------------|-----|------------|---|------------|
| Perimeter of base | = | 16 in. | | | | |
| Convex surface | = | 16 sq. in. | × | 1 0 | = | 80 sq. in. |
| Area of base | = | 4 sq. in. | × | 4 | = | 16 sq. in. |
| Entire surface | = | (80 + 16) | sq. | in. | = | 96 sq. in. |

EXAMPLE 2.-Find entire surface of a cone, the diameter of the base being 14 inches, and slant height 30 inches.

SOLUTION.

| Perimeter of base | = | $14 \text{ in.} \times 3\frac{1}{4} = 44 \text{ in.}$ |
|-------------------|---|---|
| Convex surface | = | 44 sq. in $\times \frac{30}{2} = 660$ sq. in. |
| Area of base | = | $7 \times 7 \times 3\frac{1}{7} = 154$ sq. in. |
| Entire surface | = | (660 + 154) sq. in. = 814 sq. in. |

656. To find convex surface of a frustrum of a cone or pyramid.

BULE.

1. Multiply one-half the sum of the perimeters of the ends by the slant height.

2. To find the entire surface, add the areas of the ends to the area of the convex surface.

382

...

f a pyramid is f two parallel



Frustrum of a cone. a pyramid or

nt height. the base to the

whose base is a З.

0 sq. in. 6 sq. in. 6 sq. in.

meter of the base

0 sq. in. 4 sq. in. 814 sq. in.

im of a cone

rs of the ends

of the ends to

SOLIDS.

EXAMPLE .- Find entire surface of the frustrum of a cone, the diameters of wnose ends are 7 inches and 14 inches, and whose slant height is 20 inches.

SOLUTION.

Perimeter of ends = 7 in. \times 3¹/₇ = 22 in., and 14 in. \times 3¹/₇ = 44 in. $=\left(\frac{44+22}{2}\right)$ sq. in. $\times 20 = 660$ sq. in. Convex surface Area of smaller end = $\frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} = 38\frac{1}{4}$ sq. in. Area of larger end = $7 \times 7 \times 34 = 154$ sq. in. Entire surface = $(660 + 38\frac{1}{2} + 154)$ sq. in. = $852\frac{1}{2}$ sq. in.

657. To find the volume of a cone or pyramid.

RULE.

Multiply area of the base by one-third the altitude.

EXAMPLE .- Find volume of a cone, whose base is 14 inches in diameter, and whose altitude is 24 inches.

SOLUTION.

 $7 \times 7 \times 3\frac{1}{4}$ (area of base) $\times \frac{24}{3} = 1232$ cub. in.

658. To find the volume of the frustrum of a cone or Dyramid.

BULE

 $(A + a + \sqrt{A \times a}) \times h \times \frac{1}{3}$, where 'A' stands for the area of the larger end, 'a' for the area of the smaller end, and 'h' for the perpendicular height.

EXAMPLE.-Find the volume of the frustrum of a cone, whose end diameters are 7 feet and 14 feet, and whose altitude is 12 feet.

SOLUTION.

Area of smaller end = $\frac{7}{4} \times \frac{7}{4} \times 3\frac{1}{4} = 38\frac{1}{4}$ sq. ft. Area of larger end = $7 \times 7 \times 34 = 154$ sq. ft. Volume = $(154 + 38\frac{1}{2} + \sqrt{154 + 38\frac{1}{2}}) \times 12 \times \frac{1}{3} = 1078$ cub. ft.

659. A Sphere or Globe 18 a solid terminated by a curve surface, every part of which is

equally distant from a point within, called the centre.

660. The Diameter of a sphere is a straight line drawn through its centre and terminated at both ends by the surface.



884

SOLIDS.

661. A Hemisphere is one-half a sphere.

662. The Radius of a sphere is a straight line drawn from its centre to any point in its surface.

663. To find the surface of a sphere.

RULE.

Multiply the square of the diameter by 31.

EXAMPLE.—What is the surface of a sphere whose diameter is 7 feet? Solution.

 $7 \times 7 \times 3\frac{1}{7} = 154$ sq. ft. Ans.

664. To find the volume of a sphere.

RULE.

Multiply the cube of the diameter by 31, and divide the result by 6.

 $\mathrm{Example.}{-}$ What is the volume of a sphere whose diameter 10 7 feet?

SOLUTION.

 $7 \times 7 \times 7$ (oube of the diameter) $\times 2\frac{1}{7} \times \frac{1}{8} = 179\frac{2}{3}$ cub ft.

CISTERNS AND BINS.

885

line drawn

se diamete: is

l divide the

e diameter 18

a cub ft.

CISTERNS AND BINS.

665. To find the number of gallons in a cistern.

RULE.

Find the volume in cubic inches and divide the result by 231.

Norn .- There are 231 cubic inches in one gallon.

 $\mathcal{L}_{\mathbf{k}}$

EXAMPLE.—Find the number of gallons in a rectangular ofstern, d feet by 6 feet, and 3 feet deep.

SOLUTION.

Volume = $(8 \times 6 \times 3)$ cub. ft. = $(8 \times 6 \times 8) \times 1728$ cub. in. \therefore No. gallons = $8 \times 6 \times 3 \times 1,728 \div 231 = 1,077 \ddagger gal.$

666. To find the number of bushels of wheat in a bin or pile.

RULE.

Find the volume in cubic inches and divide the result by **2150.49**.

Norg .- There are 2150.42 cubic inches in one bushel.

EXAMPLE.-Hew many bushels of grain in a bin 4 feet by 6 feet, and 8 feet deep ?

SOLUTION.

Volume = 4 × 6 × 8 × 1,728 cub. in.

... No. bushels = 4 × 6 × 4 × 1,728 - 2150.42 = 58 bush. nearly.

8**86**

GAUGING OF CASKS.

667. Gauging is the process of finding the capacity or volume of casks and other vessels.

Nore.—A cask is equivalent to a cylinder, having the same length and a diameter equal to the mean diameter of the cask.

668. To find the mean diameter of a cask (nearly).

RULE.

Add to the head diameter $\frac{2}{3}$, or, if the staves are but little curved, $\frac{2}{3}$ of the difference between the head and bung diameters.

669. To find the volume of the cask in gallons.

RULE.

Multiply the square of the mean diameter by the length (both in inches), and this product by .0034.

EXAMPLE.-How many gallons in a cask whose head diameter is 24 inches, bung diameter 30 inches, and length 34 inches?

SOLUTION.

Mean diameter = $\{24 + (30 - 24) \times \frac{2}{3}\}$ = 28 in. Capacity = 28 × 23 × 34 × .0034 = 90.63 gal.

EXERCISE 126.

1. What is the solidity of a triangular prism whose length is 12 feet, and one of the equal sides of one of its equilateral ends is 3 feet?

2. How many gallons of water would a cylindrical boiler contain if 25 inches high and 12 inches in diameter ?

GAUGING OF CASKS.

8. Find the cubic inches in the largest cone that can be cut from a cylinder 2 ft. 6 in. high and 14 inches in diameter.

4. A sphere 8 inches in diameter is placed in a cubical box whose interior dimensions are 8 inches. How much vacant space is left?

5. I have a cylindrical tank which contains 160 gallons; it is 6 ft. 5 in. in diameter. How deep is it?

6. How many square feet of canvas will be required to cover a cylinder $16\frac{1}{2}$ feet in circumference and 25 feet long?

7. How many square inches of surface in a stove pipe 22 inches in circumference and 12 feet long?

8. What is the convex surface of a log 25 feet in circumference and 18 feet long ?

9. What is the convex surface of a cylinder 3 feet long and $1\frac{1}{2}$ feet in diameter? What is its entire surface?

10. What are the contents of a log 15 feet long and 2 feet in diameter?

11. The standard liquid gallon is 231 cubic inches; how many gallons in a can 22 inches in diameter and 3 feet high ?

12. How many cubic feet in a triangular prism, the area of whose base is 920 square feet and height 20 feet?

13. What are the contents of a quadrangular prism whose length is 25 centimeters, and the base a rectangle 3 by 5 centimeters?

14. What is the lateral surface of a regular pyramid whose slant height is 15 feet, and whose base is 30 feet square?

15. What is the surface of a pyramid whose base is an equilateral triangle measuring 4 feet on each side, and slant height 16 feet?

apacity or

e lengtn and

nearly).

but little and bung

ons.

he length

liameter 18

ne of its

al boiler r ?

GAUGING OF CASKS.

16. What is the convex surface of a cone, the diameter of whose base is 7 feet and its slant height 12 feet?

17. What is the entire surface of a triangular pyramid whose slant height is 25 feet, and each side of the base 10 feet ?

18. What is the entire surface of a right cone, the diameter of the base and the slant height being each 40 feet?

19. Find the cubic feet in a log 30 feet long and 2 feet in diameter at the larger and 1 ft. 10 in. at the smaller end.

20. Find the cubic contents of a pyramid, base 300 feet square, and altitude 80 feet.

21. How many cubic feet in a circular mound 48 feet high, and having a diameter of 86 feet at the top, and a circumference of 471.24 feet at the bottom ?

22. How many cubic miles in the earth, supposing it to be a perfect sphere 8,000 miles in diameter?

23. How many barrels of oil in a tank 60 feet in diameter if the oil is 5 feet deep? (40 gal. to the barrel.)

24. A monument in the form of a square pyramid, is 2 ft. 10 in. square at base, and 11 feet high; at 175 pounds to a cubic foot what is its weight?

25. What are the contents of a round log whose length is 20 feet, diameter of larger end 12 inches, and smaller end 6 inches ?

26. The altitude of a frustrum of a pyramid is 27 feet, the ends are 4 feet and 3 feet square; what is its solidity ?

27. What are the contents of a pyramid whose base is 144 square feet, and its altitude 38 feet?

28. Find the solidity of a sphere whose diameter is 12 inches.

GAUGING OF CASKS.

e diameter eet ?

r pyramid he base 10

cone, the g each 40

d 2 feet in aller end.

e 300 feet

nd 48 feet op, and a

sing it to

diameter

mid, is 2 5 pounds

smaller

feet, the lity ? base is

er is 12

29. What are the contents of a cone the area of whose base is 1,865 sq. feet, and its altitude 36 feet ?

30. Find the convex surface of a frustrum of a cone whose slant height is 15 feet, the circumference of the lower base 30 feet, and of the upper base 16 feet.

31. What will it cost to gild a ball 12 inches in diameter, at 10 cents a square inch?

82. The standard bushel of the United States is $18\frac{1}{2}$ inches in diameter and 8 inches deep; how many cubic inches does it contain?

38. How many square yards in the convex surface of a frustrum of a pyramid, whose bases are heptagons, each side of the lower base being 8 feet, and of the upper base 4 feet, and the slant height 55 feet?

84. Find the contents in gallons of a cask whose length is 54 inches, its bung diameter 42, and head diameter 36 inches.

35. Required the contents in gallons of a rectangular cistern $4\frac{1}{2}$ feet long, $3\frac{1}{4}$ feet wide, and 6 feet deep.

36. What are the contents in gallons of a cask 36 inches long, its head diameter 26 inches, and bung diameter 32 inches?

87. How many gallons in a cask whose head diameter is 24 inches, bung diameter 30 inches, and its length 34 inches?

38. What is the volume of a cask whose length is 40 inches the diameters 21 and 30 in. respectively ?

39. How many gallons in a cask of slight curvature, 8 ft. 6 in. long, the head diameter being 26 inches, the bung diameter 81 inches?

MEASUREMENT OF CARPETING.

890

MEASUREMENT OF CARPETING.

670. Carpet is sold by the linear yard, and is of various widths. The more common widths are 27 inches and 86 inches.

671. In determining the number of yards of carpet that will be required to cover a room, it is first necessary to decide whether the strips of carpeting shall run lengthwise of the room or crosswise. Economy in matching usually decides this.

672. In determining the length of each strip of carpet, allowance must be made for waste in matching.

673. To find the number of yards of carpeting required for a room of given dimensions.

EXAMPLE 1.— How many yards of carpet 27 inches wide will be required for a rectangular room 21 feet long and 18 feet wide, if the strips run lengthwise and no waste in matching ?

SOLUTION.

18 ft. = 216 in. 216 ÷ 27 = 8, No. strips of carpet. 1 strip is 21 ft. or 7 yds. long. 8 strips are, 7 yds × 8 = 56 yds. Ans.

EXAMPLE 2.—How many yards of carpet 36 inches wide will be required for a rectangular room 20 feet 6 inches long, and 16 feet 9 inches wide, if the strips run crosswise, and 4 inches per strip be allowed for matching?

SOLUTION.

- It will take 6 strapt of compet. Length of each strapt 20 ft. 6 in. > 4 in. = 0 ft. 10 in. 1 strip is 20 ft: 10 m long.
- : 6 strips are, 20 ft. 10 in. × 6 = 125 ft. or 413 yds. Ans.

MEASUREMENT OF CARPETING.

891

EXERCISE 127.

1. A rectangular room 26 ft. 3 in. long, and 16 ft. 6 in wide, is to be covered with carpet 1 yard wide. Which way of the room should the strips run that there may be the least turned under or cut off from one side of a breadth?

2. In No. 1, if the strips were 16 ft. 6 in. long, how many strips would be required ?

8. In No. 1, if the strips were 26 ft. 3 in. long, how many would be required.

4. In No. 1, if the strips were 16 ft. 6 in. long, and there was no waste in matching, how many yards would it take?

5. In No. 1, if the strips were 26 ft. 3 in. long, and there were no waste in matching, how many yards would it take?

6. How many yards of carpeting 27 inches wide will be required for a room 17 ft. 6 in. by 15 ft. 5 in., if the strips run crosswise, and 7 inches be wasted in matching each strip?

7. A room is 15 feet by 17 ft. 6 in., and the carpet is $\frac{3}{4}$ of a yard wide. What must be the length of the strips to have the least waste? How many strips will be required?

8. In No. 7, how many yards of carpet would be required if there were a waste of 8 inches in matching each strip, except the first? Why should there be no waste in the first strip?

9. Find the cost of carpeting a room 22 ft. 8 in. by 18 ft. 4 in. if the carpeting be 27 inches wide, and cost \$1.80 per yard, there being a waste of 8 inches per strip in matching, the strips running lengthwise.

10. A parlor 20 feet by 17 feet is carpeted with a carpet 1 yard wide, at \$1.20 per yard, surrounded with a carpet border 1 foot wide, at 75 cents a yard. Find the t tal cost.

NG.

s of **va**rious nches and

carpet that eccessary to lengthwise ng usually

of carpet,

carpeting

wide will be e, if the strips

wide will be 6 feet 9 inches be allowed for

0 in.

Ans.

MEASUREMENT OF CARPETING.

11. Find the cost of carpeting a room 28 ft. 10 in. long, by 17 ft. 8 in. wide, with carpet $\frac{3}{4}$ of a yard wide, at \$1.80 per yard, if the strips run lengthwise of the room, and 9 inches per strip be wasted in matching.

12. Find the cost of the carpet for a stair of 17-12 inch steps, each rising 8 inches, at 90 cents a yard.

18. Find the cost of the stair carpet at \$1.20 a yard, for a flight of stairs of 22 steps, 11 inches wide, with 7 inches rise, allowing 1 yard extra at the top.

14. Find the cost of covering the floor of a hall 24 feet long by 8 feet wide, with oil-cloth 4 feet wide, no waste in matching.

 $\mathbf{392}$

MEASUREMENT OF WALL PAPER.

10 in. long, le, at \$1.80 room, and

17-12 inch

20 a yard, th 7 inches

hall 24 feet 10 waste in

MEASUREMENT OF WALL PAPER.

674. Wall paper is sold by the roll, any part of a roll being counted as a whole roll.

675. Canadian and American wall papers are 18 inches wide, and have 8 yards in a roll. For convenience wall paper is done up in double rolls of 16 yards.

676. In estimating the number of rolls necessary for a certain room, paper-hangers ascertain the height of the room and its perimeter, making an allowance in the perimeter of 8 feet for each door or window.

677. The exact cost of papering a room can be ascertained only by taking account of the number of rolls of paper actually used in doing the work.

678. To find the number of rolls of paper required for a room.

EXAMPLE 1.—How many rolls of wall paper will be required for the walls of a rectangular room 20 feet by 16 feet, with a 12 foot ceiling, there being one door 3 feet 8 inches wide, and 2 windows each 4 feet 2 inches wide?

SOLUTION.

| Perimeter of room is $(20 \text{ ft.} + 16 \text{ ft.}) \times 2 = 72 \text{ ft.}$ | |
|--|----|
| Width of door. 3 ft. 8 in | |
| Width of 2 windows (4 ft. 2 in.) \times 2 = 8 ft 4 in 19 ft | |
| Perimeter after deducting width of door and windows = 60 ft | |
| 60 ft. = 720 inches. | |
| 720 in. \div 18 in. (width of paper) = 40, number of strips. | |
| I strip is 12 ft. long. | |
| . 40 strips are 480 ft. or 160 yds. long. | |
| 160 yards ÷ 8 yds. (No. yds. in a roll) = 20, No. of rolls. Ans | ۱. |
| | |

F

MEASUREMENT OF WALL PAPER.

EXAMPLE 2.-Find the cost of the wall paper at 80 cents a roll and bordering at 7 cents a yard for a room 18 feet 9 inches long by 16 feet 5 inches wide, with the ceiling 10 feet 9 inches above the base boards, allowing for 2 doors each 3 feet 8 inches wide, and 3 windows each 3 feet 6 inches wide, also an allowance of 9 inches on each strip for matching. (In reckoning the cost of the bordering no allowance is made for the doors and windows.)

SOLUTION.

Perimeter of room is (18 ft. 9 in. + 16 ft 5 in.) $\times 2 = 70$ ft. 4 in. Width of doors

 $(3 \text{ ft. } 8 \text{ in.}) \times 2 = 7 \text{ ft. } 4 \text{ in.}$

Width of windows (8 ft. 6 in.) × 3 = 10 ft. 6 in. 17 ft. 10 in. Perimeter of room after deducting width of doors and windows = 52 ft. 6 in.

52 ft. 6 in. = 630 in.

630 in. ÷ 18 in. = 35, No. of strips.

To allow for matching, the paper will cut into strips of (10 ft. 9 in. + 9 in.) = 11 ft. 6 in. in length.

One roll will practically cut into 2 strips.

- : No. of rolls = $35 \div 2 = 171$
- : It will take 18 rolls
 - 1 roll is worth 80 cents
- . 18 rolls are worth 80 cents × 18 = \$14.40, Cost of wall paper. 70 ft. 4 in. = 24 yds. nearly

1 yard is worth 7 cents

 \therefore 24 yds. are worth 7 cents \times 24 = \$1.68, Cost of border.

\$16.08. Total cost.

EXERCISE 128.

1. How many strips of paper will go around a room 18 feet by 24 feet?

2. How many strips of paper are required for a room 30 feet by 24, if there are 4 windows and 2 doors? (Art. 676.)

3. How many rolls will paper a ceiling 24 feet by 18 feet?

4. How many double rolls are required for a hall 21 feet long and 13 feet high, with a cornice 1 foot deep?

5. Find the cost of the paper for a room 36 feet by 24 feet and 11 feet high, with a cornice 1 foot deep, and a wainscoting 2 feet deep, at 50 cents per double roll.

MEASUREMENT OF WALL PAPER.

80 cents a roll nches long by 16 above the base e, and 3 windows on each strip for lowance is made

0 ft. 4 in.

l7 ft. 10 in. and windows =

trips. f

of wall paper.

of border. al cost.

d a room 18

or a room 30 ? (Art. 676.) t by 18 feet ? ball 21 feet ep ?

36 feet by deep, and a roll.

6. How many double rolls of wall paper will be required for a room 18 ft. 6 in. by 15 ft. 4 in., the ceiling 8 feet above the base-boards, allowance being made for 1 door 3 ft. 8 in. wide and 2 windows each 4 feet wide ?

7. If a roll of paper cuts into two strips, and 10 strips be allowed for doors and windows, find the cost of papering a room 24 ft. 8 in. long by 16 feet wide with paper at 45 cents a roll and bordering at 7 cents a yard, the hanging of the paper costing 15 cents a roll.

8. Find the cost of paper for a hall 72 feet by 44 feet, 14 feet high, below the cornice, allowing for 8 windows each 4 ft. 2 in. wide and 2 doors each 3 ft. 8 in. wide, the paper costing 45 cents per double roll.

9. With paper at $12\frac{1}{2}$ cents per roll, and border at 3 cents a yard, what is the cost of paper and border for a room 24 feet by 20 feet and $12\frac{1}{2}$ feet high, with cornice 6 inches deep, there being 5 openings of an average width of 3 feet?

10. If the paper-hanger charges \$3, and the paper costs 80 cents a double roll and the border 4 cents a yard, find the cost of papering a room 18 ft. 9 in. long, 16 ft. 8 in. wide, with a ceiling 18 ft. 6 in. high, allowing for two doors, each 3 ft. 9 in. wide, and 3 windows, each 4 ft. 2 in. wide ; also for a base-board 18 inches deep.

MEASUREMENT OF SAW-LOGS.

MEASUREMENT OF SAW-LOGS.

679. TABLE OF LUMBER AND LOG MEASUREMENT.

Showing net proceeds (fractions of feet omitted) of logs in 1 inch boards, deducting saw kerf and slabs. The length will be found in the left hand column, and the diameter in inches on the head of the other columns.

| 35 | | | | | | | | | | | | | : | | | 20 46 | 43 | 18 41 | 17 38 | 16 36 | 19 34 | 14 32 | 13 29 | 12 27 | 11 25 | 10 23 | Length of log in Feet Diam. 10 |
|-----|-----|-----|-----|-----|------|------|-----|-----|------|-----|-----|-----|-----|-----|-----|-------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|---|
| | 107 | 104 | 101 | 98 | 95 | 92 | 89 | 86 | 8 25 | 80 | 77 | 74 | 70 | 67 | 64 | 61 | 58 | 55 | 52 | 49 | 46 | 43 | 40 | 37 | 34 | 31 | Diam. 11 |
| TAA | 140 | 136 | 132 | 128 | 124 | 07.1 | 116 | 112 | 108 | 104 | 100 | 96 | 92 | 88 | 84 | 80 | 76 | 72 | 68 | 64 | 60 | 56 | 52 | 48 | 44 | 40 | Diam. 12 |
| 189 | 177 | 172 | 169 | 162 | 157 | 152 | 147 | 142 | 137 | 132 | 127 | 122 | 116 | 111 | 106 | 101 | 96 | 91 | 86 | 18 | 76 | 71 | 66 | 61 | 55 | 50 | Diam. 13 |
| 224 | 219 | 212 | 206 | 200 | 193 | 188 | 182 | 175 | 169 | 163 | 156 | 150 | 144 | 137 | 131 | 125 | 119 | 112 | 106 | 100 | 94 | 88 | 81 | 75 | 69 | 62 | Diam. 14 |
| 272 | 265 | 256 | 249 | 242 | 234 | 226 | 219 | 212 | 204 | 196 | 189 | 181 | 174 | 166 | 158 | 151 | 143 | 136 | 128 | 121 | 113 | 106 | 86 | 91 | 83 | 75 | Diam. 15 |
| 394 | 315 | 306 | 297 | 288 | 279 | 270 | 261 | 252 | 243 | 234 | 225 | 216 | 207 | 198 | 189 | 180 | 171 | 162 | 153 | 144 | 135 | 126 | 117 | 108 | 99 | 90 | Diam. 16 |
| 340 | 369 | 358 | 348 | 338 | 327 | 316 | 306 | 296 | 285 | 274 | 264 | 254 | 243 | 232 | 222 | 211 | 201 | 190 | 179 | 169 | 158 | 148 | 137 | 126 | 116 | 105 | Diam. 17 |
| 410 | 428 | 416 | 404 | 392 | 38() | 368 | 355 | 342 | 330 | 318 | 308 | 294 | 281 | 269 | 257 | 244 | 232 | 220 | 208 | 196 | 184 | 171 | 159 | 147 | 135 | 122 | Diam. 18 |
| 206 | 492 | 478 | 464 | 450 | 436 | 422 | 408 | 394 | 380 | 366 | 351 | 338 | 323 | 309 | 293 | 280 | 267 | 253 | 239 | 225 | 211 | 197 | 183 | 169 | 154 | 140 | Diam. 19 |
| 576 | 560 | 544 | 528 | 512 | 496 | -180 | 464 | 448 | 432 | 416 | 400 | 381 | 368 | 352 | 336 | 320 | 304 | 288 | 272 | 256 | 240 | 224 | 208 | 192 | 176 | 160 | Diam. 20 |

896

ٽيو

s.

LOGS.

ASUREMENT.

of logs in 1 inch ll be found in the head of the other

| | • | | | | | | | | | | |
|--------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------------|-------------|
| Length of log in Feet | Diam. 10 | Diam. 11 | Diam. 12 | Diam. 18 | Diam. 14 | Diam. 15 | Diam. 16 | Diam. 17 | Diam. 18 | Diam. 19 | Diam. 20 |
| 10 | 25 | 31 34 | 40 44 | 55 55 | 62 69 | 83 | 99 90 | 105 116 | 122 135 | 14 0 154 | 160 |
| 12 | 27 | 37 | 48 | 61 | 75 | 91 | 108 | 126 | 147 | 169 | 192 |

MEASUREMENT OF SAW-LOGS.

| | 36 | | 04 | | 33 | 32 | 31 | 50 | 43 | 20 | 30 | 20 | 20 | 0 | 20 | 22 | 21 | 20 | 19 | 10 | 17 | 10 | 10 | 14 | 10 | 12 | 1 | 10 | Length of log in fect. |
|-------|--------|------|--------|--------|--------|---------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|-----|-----|-------|-----|-----|-----|---------------------------|
| - | 650 | 632 | 614 | 080 | | 578 | 560 | 542 | 0.24 | 006 | 488 | 470 | 451 | 433 | 415 | 397 | 379 | 361 | 343 | 325 | 307 | 289 | 271 | 253 | 235 | 217 | 198 | 180 | Diam 21 |
| | 728 | 708· | 688 | 800 | | 619 | 627 | 606 | 586 | 999 | 546 | 526 | 506 | 486 | 465 | 445 | 425 | 404 | 384 | 364 | 344 | 324 | 303 | 283 | · 263 | 243 | 223 | 202 | Diam 22 |
| 1 | 819 | 789 | 766 | 742 | 110 | 710 | 695 | 672 | 649 | 626 | 606 | 586 | 562 | 541 | 519 | 496 | 473 | 452 | 429 | 406 | 383 | 359 | 336 | 313 | 293 | 271 | 248 | 225 | Diam. 23 |
| 000 | 8 | 875 | 850 | 825 | 000 | | 777 | 750 | 725 | 700 | 675 | 650 | 625 | 600 | 575 | 550 | 525 | 500 | 475 | 450 | 425 | 400 | 375 | 350 | 325 | 300 | 275 | 250 | Diam. 24 |
| 000 | | 064 | 986 | 606 | 288 | 100 | | 968 | 200 | 772 | 744 | 716 | 689 | 662 | 632 | 605 | 579 | 550 | 523 | 496 | 468 | 441 | 413 | 386 | 358 | 331 | 302 | 275 | Diam. 25 |
| | | | | | | | | | | | | | | | | 665 | | | | | | | | | | | | | Diam. 26 |
| 11921 | L ROTT | | 1196 1 | 1003 1 | 1060 1 | 10.50 T | 266 | 000 | 070 | 966 | 893 | 860 | 897 | 794 | 760 | 726 | 603 | 661 | 620 | 506 | 562 | 520 | 406 | 162 | 420 | 307 | 363 | Use | Diam. 27 |
| 296 | 260 | 224 | 001 | 100 | 152 | 116 | 080 | 044 | | | 079 | 220 | | 264 | 200 | 709 | 750 | 790 | 6010 | 610 | 610 | 010 | 004 | | 400 | 120 | 206 | 960 | Diam. 28 |
| 1406 | 1367 | 1328 | 6921 | 1200 | 1950 | 1211 | 1172 | 1133 | TO04 | 1004 | 1022 | 116 | 000 | 000 | | 020 | 287 | 142 | 103 | 004 | 620 | 080 | 047 | 200 | 409 | 430 | TRC | | Diam. 29 |
| 1522 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Diam. 30 |
| 1640 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | Diam. 31 |
| 1764 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | Diam. 32 |
| 1892 | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1: | Diam. 33 |
| 2024 | | | | _ | - | - | | | - | - | - | _ | - | | _ | _ | _ | | _ | _ | | | | | | | | 1 | Diam. 84 |
| 2012 | | | | _ | | _ | _ | _ | | | - | - | - | - | - | _ | | | | | | | | | | | | 1 | Diam. 35 |
| 2240 | 21.12 | 0110 | 0110 | 9010 | 1984 | 1920 | 0001 | 1070 | 1700 | 1798 | 1664 | 1600 | 1526 | 1479 | 1408 | 1344 | 1990 | 1916 | 1120 | 1022 | 1094 | 060 | 200 | 000 | 760 | 701 | 640 | r | iam . 36 |

897

ł

MEASUREMENT OF SAW-LOGS.

680. In some parts of Canada saw-logs are bought and sold by the *Standard*, in other parts with reference to the number of feet of inch lumber which they will produce.

681. A Standard Log is 12 feet long and 21 inches in diameter, and will produce 1,085 feet of inch lumber.

682. The measurement of a log is always taken at the small end and between the bark.

683. To find the number of standards in a given number of saw-logs.

EXAMPLE 1.—How many standards are there in 4 saw-logs, each 12 feet long, the diameters of which are 16 inches, 20 inches, 22 inches and 25 inches respectively?

| | 0 | 010 | TION. | |
|----|------------------------|-----|-------|--|
| | 16 ² | = | 256 | |
| | 2_{1}^{2} | = | 400 | |
| | 22^{2} | = | 484 | |
| | 25^{2} | = | 625 | |
| Su | n | = 3 | L,765 | |

1,765 + 212 = 1,765 + 441 = 4. No. standard. Ans.

EXAMPLE 2.—How many standards are there in 5 logs, each 16 feet long, the diameters of which are 18, 20, 21, 24, and 30 inches respectively?

SOLUTION.

 $18^{2} = 324$ $20^{2} = 400$ $21^{2} = 441$ $24^{2} = 576$ $30^{2} = 900$

Sum = 2,641

 $2,641 \div 441 = 6$ nearly. No. of standards 12 feet long.

 $16 = 1\frac{1}{3}$ times 12

: No. of standards = $6 \times 1\frac{1}{3} = 8$. Ans.

EXERCISE 129.

1. How many standards are there in 6 saw-logs, each 12 feet long, the diameters of which are 12, 16, 20, 25, 26 and 28 inches respectively?

MEASUREMENT OF SAW-LOGS.

re bought and erence to the · ll produce.

l 21 inches in lumber.

s taken at the

s in a given

4 saw-logs, each nches, 22 inches

ard. Ans.

logs, each 16 feet 30 inches respec-

I feet long.

aw-logs, each 16, 20, 25, 26 2. How many standards are there in 5 logs, each 18 feet long, the diameters of which are 14, 20, 22, 24 and 30 inches respectively?

8. What is the side of the largest square piece of timber which can be sawn from a log, the diameter of which is 28 inches?

4. From the Table, Art. 679, find out the quantity of inch lumber that can be sawn from the following :

| Ð | loga | 10 | feet long. | diameters | 15 90 and 20 | | |
|---|------|----|------------|-----------|----------------|--------|---------------|
| 2 | ** | 14 | | " | 15, 20 and 32 | inches | respectively. |
| | | | | •• | 18 and 24 | ** | |
| 4 | •• | 16 | 66 | 66 | 16, 20, 22 and | | |
| 2 | ** | 18 | ** | | | 30 | ** |
| _ | | | | •• | 20 and 26 | 46 | 46 |

5. A man wishes a piece of timber 18 inches square, what is the diameter of the smallest log from which it may be sawn?

MEASUREMENT OF LUMBEK.

684. Lumber, as the term is used here, includes all kinds of sawed boards, plank, scantling, joists, etc.

685. A foot of lumber, or a board foot, is the unit of measurement. It is 1 foot long, 1 foot wide, and 1 inch thick.

686. The term scantling is given to lumber 3 or 4 inches wide, and from 2 to 4 inches thick.

Joist is usually from 2 to 4 inches thick, and from 6 to 16 inches wide.

Lumber heavier than joist or scantling is called timber. A broad piece of lumber thicker than a board,—usually from 13 to 4 inches thick, is called a plank.

687. All lumber less than one inch in thickness is considered inch lumber in measuring.

688. In measuring the width of a board a fraction greater than a half inch is called a half, and if less than a half it is rejected. Thus a board $5\frac{7}{3}$ inches wide would be considered 6 inches wide. a board $9\frac{3}{3}$ inches wide would be considered 9 inches wide.

689. The price of lumber is usually quoted at a certain rate per thousand feet, board measure.

690. To find the number of board feet or feet of lumber in a board, plank, joist, etc.

EXAMPLE 1.-Find the number of feet of lumber in a board 14 feet long, 12 inches wide, and 1 inch thick.

Solution. (14 × 12 × 1) \div 12 = 14 feet. Ans.

MEASUREMENT OF LUMBER.

EXAMPLE 2.—Find the number of feet of lumber in a plank 16 feet iong, 14 inches wide, and 3 inches thick.

SOLUTION.

$(16 \times 14 \times 3) + 12 = 56$ feet. Ans.

RULE.

Multiply the length in feet by the width and thickness in inches, and divide the product by 12, and the result will be the number of board feet of lumber.

EXERCISE 130.

1. Find the number of feet of lumber in 24 boards 14 feet long and 10 inches wide.

2. Find the cost of fif'y 2-inch plank 16 feet long and 10 inches wide at \$18 per thousand.

3. How many square feet are there in the surface of a board 16 feet by 9 inches ?

4. How many feet of lumber are there in a board 12 feet long, 6 inches wide and 1 inch thick ?

5. How many feet of lumber are there in the following bill ?—24 joists 16 feet by 10 inches, 2 inches thick; 210 pieces of siding, 12 feet long, 4 inches wide, $\frac{3}{4}$ inch thick; 14 beams 20 feet long, and 9 inches square; 16 scantling, 2 inches by 4 inches, 16 feet long.

6. How many feet of lumber in a 140 pieces of siding, each 12 feet long, 6 inches wide, and $\frac{1}{2}$ inch thick ?

7. How much lumber is there in eighty 2 x 4 scantling 14 feet long?

8. Find the cost of 2,250 feet of lumber at \$20 per thousand.

ek.

includes all s, etc.

is the unit of , and 1 inch

nber 3 or 4

ad from 6 to

alled timber.

ckness is con-

rd a fraction if less than a vide would be vide would be

l at a certain

et or feet of

a board 14 feet

MEASUREMENT OF LUMBER.

9. Find the cost of $1\frac{1}{4}$ inch flooring required to lay a floor 42 feet by 24 feet at \$24 per thousand.

10. Find the cost of flooring a bridge 320 yards long by 20 feet wide with 3 inch oak planks, at \$22 per thousand.

11. If 2×4 studs are used, and they are placed 16 inches apart, from centre to centre, how many feet of lumber are there in the studding of a wall 20 feet long and 12 feet high?

12. How many 12 foot boards 6 inches wide are required to put a wainscoting 3 feet high around a kitchen 12 feet by 16 feet, allowing for 2 doors, each $3\frac{1}{2}$ feet wide?

13. Find the cost of the lumber for two floors of a house 24 feet long and 18 feet wide, if the lower floor is $1\frac{1}{2}$ inches thick, and the upper floor 1 inch, at \$20 a thousand.

14. A barn is 64 feet long and 40 feet wide, and 20 feet high to the eaves; the gables are 8 feet high, and the rafters 22 feet, 6 inches long. Find the number of feet of inch boards necessary to inclose the two sides, allowing for two doors 12 feet by 16 feet.

15. In No. 5, find the number of feet of lumber in the ends and gables.

16. In No. 5, find the number of feet of lumber required to sheet the roof.

17. In No. 5, find the cost of the lumber for the doors at \$20 a thousand.

18. In No. 5, find the cost of the 2 inch plank needed for the floor at \$24 a thousand.

19. If $4 \ge 5$ rafters are used, and they are placed 30 inches apart, from centre to centre, how many feet of lumber are there in the 20 foot rafters of a double roof 40 feet long?

MEASUREMENT OF LUMBER.

20. Find the price of the following bill of lumber at \$24 per thousand :-

120 2-inch plank 10 inches wide, 14 feet long.
125 boards 10 inches wide, 16 feet long.
80 2 x 4-inch scantling, 14 feet long.
50 8 x 4-inch " 12 "
120 8 x 10-inch joist, 16 feet long.

21. How many feet of lumber are there in the 2 x 4-inch studs of a partition wall 32 feet long and 14 feet high ? Nore.—The studs of partition walls are usually placed 16 inches apart from centre to centre.

22. How many 12-foot strips $2\frac{1}{2}$ inches wide will lay a walk 4 feet wide and 80 yards long, allowing half an inch between the strips ?

23. If lumber 10 inches wide is used in sheeting the roof in No. 19, and the boards are placed two inches apart, allowing for a projection of one foot at each end, how many feet of lumber will be required ?

24. How many feet of lumber are there in the 12-inch base board of a square 10 acre field ?

25. Find the cost of the lumber for the dressed door facings of 18 doors, each 7 feet high and 2 feet 8 inches wide, the facings being 6 inches wide, at \$30 per thousand feet.

d to lay a

ds long by thousand.

d 16 inches lumber are and 12 feet

re required hen 12 feet le ?

of á house s 1½ inches sand.

nd 20 feet h, and the or of feet of .llowing for

nber in the

er required

the doors at

needed for

any feet of able roof 40

MEASUREMENT OF SHINGLING.

MEASUREMENT OF SHINGLING.

691. Shingles are sold by the bunch, each bunch contains a quarter thousand. A bunch of shingles is 20 inches wide, and has 25 courses on each side. Dealers will not sell a part of a bunch.

692. Ordinary shingles have an average width of 4 inches, and are generally laid 4 inches to the weather.

693. Allowing for waste, 1000 shingles will cover a surface of 100 square feet (a square of shingling), 4 inches to the weather; laid $4\frac{1}{2}$ inches to the weather, 900 shingles are required.

EXERCISE 131.

1. How many shingles are there in 24 bunches?

2. How many bunches are there in $15\frac{1}{2}$ thousand?

8. How many thousand are there in 48 bunches?

4. Laid 4 inches to the weather, how many square inches are covered by the exposed part of one shingle?

5. How many shingles are required for a roof having a surface of 2,400 square feet ?

6. How many bunches of shingles will shingle a roof 32 feet by 24 feet ?

7. How many shingles are required for a double roof 36 feet long, with 20-foot rafters ?

8. Find the cost of laying a double roof 48 feet long, rafters 24 feet long, with shingles 4 inches to the weather at \$3.20 per thousand.

9. Find the cost of shingles for a double roof 36 feet long, rafters 21 feet long, at 60 cents a bunch, if the shingles are laid $4\frac{1}{2}$ inches to the weather.

10. At \$3.60 per thousand, find the cost of the shingles for a roof of a building 60 feet long, 40 feet wide, having a gable 12 feet high, and the rafters having an 18-inch heel.

G.

20 inches s will not

idth of 4 ther. Il cover a

, 4 inches 0 shingles

nd? ad? ay square agle? f having a

gle a roof

ole roof 36

feet long, e weather

of 36 feet ne shingles

e shingles , having a -inch heel.

FENCING.

FENCING.

EXERCISE 132.

1. How many fence posts are required for a fence 80 rods long, if the posts are placed 8 feet apart?

2. How many posts are required for a fence around a field 40 rods square, if they are placed 8 feet apart?

3. How many posts are required for a square 10-acre fold, if they are placed 8 feet apart?

4. Find the cost of the posts for a fence around a garden plot 250 yards by 220 yards, if the posts are placed 6 feet apart and cost 10 cents each.

5. In No. 4, how many $2 \ge 4$ scantling, 12 feet long will be required for the 2 stringers of the fence?

6. In No. 3, find the cost of $2 \ge 4$ scantling, 16 feet long, that will be required for the 2 stringers of the fence, if the lumber is worth \$18 per thousand.

7. How many feet or rumper are required for a 10-inch base board around the field in No. 2?

8. How many 2-inch pickets are required for a fence 40 rods long, if the pickets are placed 2 inches apart?

9. How many $2\frac{1}{2}$ -inch pickets, placed 2 inches apart, are required for a fence around a garden 200 yards by 150 yards?

10. How much lumber is there in a common board fence 40 rods long, consisting of 5 rounds of 6-inch boards?

FENCING.

11. What will it cost to fence 5 miles of railway, both sides, with 6 rounds of 6-inch boards, at \$12 per thousand feet ?

12. What will it cost at \$10 per thousand to fence a field 40 rods by 60 rods with 1 round of 12-inch boards, and 5 of 6-inch boards?

13. What will be the cost per mile to fence a railway with 5 strands of barbed wire, which weighs 1 lb. per rod, at 8 cents a pound?

14. Find the cost of a quarter mile of fence with the posts 8 feet apart, a 12-inch base, a 2×4 rail at top, and 4 strands of barbed wire; the posts cost 10 cents each, the lumber \$12 per thousand, and the wire at 7 cents a pound. (A pound stretches 16} feet.)

MEASUREMENT OF PAINTING, ETC.

ay, both housand

ce a field ls, and 5

per rod,

the posts 4 strands 10 lumber und. (A

MEASUREMENT OF PAINTING, KALSO-MINING AND PAVING,

694. The unit of measurement of painting, kalsomining, and paving is the square yard.

EXERCISE 133.

1. How many square yards of painting are there in a floor 30 feet by 28 feet?

2. Find the cost of kalsomining the ceiling of a hall 64 feet long and 86 feet wide, at 20 cents a square yard.

8. What will it cost to paint a close board fence 6 feet high around a lot 36 yards long by 24 yards wide ?

4. What will it cost to paint a house 36 feet by 30 feet, which has an average height of 18 feet, at 18 cents a square yard?

5. What will it cost to kalsomine a room 20 feet by 18 feet and 10 feet high, at 7 cents a square yard?

6. Find the cost of painting a double roof 44 feet long by 24 feet, at 12 cents a square yard.

7. What will it cost to tuckpoint the front of a brick house 36 feet long and 22 feet high, allowing for half the openings which form one quarter of the surface, \$1.25 per square yard?

8. Find the cost of paving a street half a mile long and 60 feet wide, at 30 cents a square yard.

9. Find the cost of paving a street one-eighth of a mile long and $1\frac{1}{2}$ chains wide, at 25 cents per square yard.

10. A circular plot of ground, 4 chains in diameter, has a walk 8 feet wide, formed around the outer edge. Find the cost of gravelling the walk, at 15 cents a square yard.

MEASUREMENT OF LATHING AND PLASTERING.

695. Laths are sold by the bunch. There are 50 laths in a bunch, each lath being 4 feet long and $1\frac{1}{2}$ inches wide. They are usually laid about three-eights of an inch apart.

696. Allowing for waste, contractors reckon that a bunch of laths will cover 3 square yards of surface.

697. Lathing and plastering are estimated by the square yard. Only one-half the surface of openings is allowed.

698. To find the cost of lathing and plastering a room of given dimensions.

EXAMPLE.—A rectangular room 24 feet by 18 ft. 9 in., and 10 ft. 10 in. high. The base board is 10 inches high; there are two doors 8 feet by 4 ft. 3 in. each, and three windows 6 ft. 4 in. by 4 feet each. Find the cost of lathing and plastering the walls and ceiling at 30 cents a square yard.

SOLUTION.

| Perimeter of room = $(24 \text{ ft.} + 18 \text{ ft.} 9 \text{ in.}) \times 2 = 85 \text{ ft.} 6 \text{ in.}$ |
|---|
| Height of walls above base board -10 ft. 10 in. -10 in. $=10$ ft. |
| Area of walls = 85 ft. 6 in. x 10 ft. = 855 sq. ft. |
| Area of ceiling = 24 ft. × 18 ft. 9 in. = 450 sq. ft. |
| Total gross area = $1,305$ sq. ft. |
| Area of 2 doors = $(8 \text{ ft.} \times 4 \text{ ft.} 3 \text{ in.}) \times 2 = 68 \text{ sq. ft.}$ |
| Area of 3 windows = (6 ft. 4 in. \times 4 ft.) \times 3 = 76 sq. ft. |
| Total area of doors and windows = 144 sq. ft. |
| Half of 144 sq. ft. is allowed = 72 sq. ft. |
| Net area to be lathed and plastered = 1,233 sq. ft. |
| 1,233 sq. ft. = 137 sq. yds. |
| 1 sq. yd. is worth 30 cents. |
| 137 so, vds. are worth 30 cents x 137 = \$41.10. Ans. |

MEASUREMENT OF LATHING AND PLASTERING. 409

EXERCISE 134.

1. Including one of the spaces between the laths, how many square inches does one lath cover?

2. How many square feet will a bunch of laths cover?

3. How many bunches of laths will be required for a wall 36 feet long and 12 feet high ?

4. How many bunches of laths will be required for the ceiling of a room 32 feet by 28 feet ?

5. How many bunches of laths are required for the walls and ceiling of a room 15 feet by 18 feet, and 9 feet high?

6. How many bunches of laths are required for a hall 84 feet long, 52 feet wide, and 24 feet high, allowing for 4 doors and 10 windows, each having an average surface of 82 square feet. Art. 696.

7. At 80 cents a bunch, find the cost of the laths for a room 20 feet by 24 feet and 15 feet high, there being 3 windows and 2 doors, each 8 feet by 4 feet.

8. At 25 cents a bunch, find the cost of the laths for a room 24 feet by 16 feet and 10 feet high, allowing for a door 8 feet by 3 ft. 6 in., and a window 7 feet by 4 feet.

9. How many square yards of plastering are there in the ceiling of a room 60 feet by 32 feet?

10. How many square yards of plastering are there in the walls and ceiling of a room 36 feet by 24 feet and 12 feet high?

11. Allowing for an 18-inch base-board, find the number of yards of plastering in a room 36 feet by 30 feet and 14 feet high.

ING.

AND

re 50 laths 1ches wide. 1ch apart.

on that a ace.

the square allowed.

astering a

in., and 10 ft. wo doors 8 feet oh. Find the cents a square

= 85 ft. 6 in. = 10 ft. 5 sq. ft. 0 sq. ft. 5 sq. ft.

2 sq. ft. 33 sq. ft.

41.10. Ans.

410 MEASUREMENT OF LATHING AND PLASTERING.

12. Find the cost of plastering the ceiling of a room 36 feet by 32 feet, at 9 cents per square yard.

13. Find the cost of plastering the walls and ceiling of a room 18 feet by 24 feet, 12 feet high, at $12\frac{1}{2}$ cents a square yard.

14. At 15 cents a square yard, find the cost of plastering the walls and ceiling of a room 21 feet long, 14 feet wide, and 12 feet high, with 4 openings, each 8 feet by 4 feet.

15. At $12\frac{1}{2}$ cents a square yard, find the cost of plastering a room 20 feet by 16 feet and 12 feet high, with an 18inch base, and having 4 openings, averaging 82 square feet each.

16. Find the cost of lathing and plastering a room 16 feet by 18 feet and 12 feet high, with laths at 30 cents a bunch, and plastering at 15 cents a square yard.

17. Find the cost of cementing a circular cistern 8 feet in diameter and 9 feet high, at 8 cents per square foor.

MEASUREMENT OF STONE-WORK.

ERING.

f a room 86

l ceiling of a nts a square

of plastering 14 feet wide, by 4 feet.

of plasterwith an 18square feet

g a room 16 .t 30 cents a 1.

istern 8 feet are foo**t.**

MEASUREMENT OF STONE-WORK.

699. A cord of stone is of the same size as a cord of wood. In estimating stone-work no smaller part than quarter-cords is allowed.

700. A cord of stone will make about 100 cubic feet of wall.

701. In estimating the cost of mason-work, it is customary to take the outside measurement of the wall, and make no allowance for openings, except they are large.

702. It takes about three bushels of lime and a cubic yard of sand to lay a cord of stone.

703. Stone-work is usually estimated by the perch.

704. A perch of stone-work is 1 rod long, $1\frac{1}{2}$ feet thick, and 1 foot high. It contains $24\frac{3}{4}$ cubic feet.

EXERCISE 135.

1. How many cubic feet of stone are there in a pile 38 feet long, 6 feet wide, and 4 feet high ?

2. How many cubic feet of stone are there in wagon-box 9 feet long, $3\frac{1}{2}$ feet wide, and $1\frac{1}{2}$ feet high? What part of a cord does it contain?

3. How many cords of stone are there in a pile 20 feet long, 8 feet wide, and 3 feet high ?

4. In No. 3, how many cubic feet of wall will the stone build ?

5. How many cords of stone will build a wall 200 feet long, 6 feet high, and 8 feet thick?

6. How many cords of stone will build a wall 60 yards long, 6 feet high, and 18 inches thick? How many perch of stone-work in the wall?

MEASUREMENT OF STONE-WORK.

7. Find the cost of the stone in a wall 42 feet long, 8 feet high, 18 inches thick, at \$6 per cord.

8. How many cords of stone are required for a cellar 86 feet long, 80 feet wide, if the wall be built 8 feet high, and two feet thick? Find the cost of the mason work at 50 cents a perch.

9. How many cords of stone are required for the foundation of a bank barn 60 feet long, by 36 feet wide, if the foundation wall be 7 feet high and 8 feet thick? Find the cost of building the foundation at 60 cents a perch.

10. At 60 cents per perch, what is the cost of the stonework for the basement of a house which has an outside perimeter of 160 feet, the wall being 8 feet high and 20 inches thick?

11. How much lime and sand will be required for the mortar of an 18-inch wall 8 feet high, under a house 40 feet by 30 feet?

12. In No. 9, find the cost of the material at \$6 per cord for the stone, 30 cents a bushel for the lime, and \$1.20 per cubic yard for the sand.

13. A stone house is 36 feet by 24 feet; the cellar walls are 9 feet high and 3 feet thick; the walls of the ground floor are 12 feet high and 2 feet thick; the walls of the second floor are 8 feet high and 18 inches thick; the gable walls are 7 feet high and 12 inches thick; find—

1st. Number of perches of mason work in the building, and cost of labour at \$1.10 a perch.

2nd. Cost of the stone at \$5 a cord.

3rd. Cost of the lima at 35 cents a bushel.

4th. Cost of the sand at \$1.10 per cubic yard.

MEASUREMENT OF BRICK-WORK.

413

42 feet long,

for a cellar 8 feet high, ason work at

r the foundawide, if the ? Find the perch.

of the stones an outside high and 20

ired for the **a** house 40

al at \$6 per le lime, and

cellar walls the ground walls of the k; the gable

the building.

d.

MEASUREMENT OF BRICK-WORK.

705. Bricks vary so much in size and style, that to give the exact dimensions of the different styles is impracticable. Ordinary bricks are 8 inches long, 4 inches wide, and $2\frac{1}{2}$ inches thick.

706. It is sufficiently accurate, in making an estimate of the number of brick needed for a certain work, to reckon 20 bricks to the cubic foot *laid dry*.

707. In *half-brick* walls, such as in veneering wooden houses, each brick, with the mortar required to lay it, has an external surface of $8\frac{1}{2} \times 3$, or for about every 25 square inches of surface.

708. In single-brick walls, each brick, with the mortar required to lay it, has an external surface of $4\frac{1}{2} \times 3$, or one brick is required for about every 13 square inches of surface.

709. In a brick-and-a-half wall, a brick is required for about every $8\frac{2}{5}$ square inches.

710. In *double-brick* walls, a brick is required for about every 6¹/₂ square inches of surface.

711. In estimating material, corners are measured once, and allowance is made for doors and windows.

In estimating labor, the corners are measured twice, that is, the outside measurement is taken, and allowance is usually made for one-half the openings.

EXERCISE 136.

1. A pile of ordinary bricks is 8 feet 6 inches high, 14 feet long, and 15 feet wide. What is the pile worth at \$8 per thousand?

MEASUREMENT OF BRICK-WORK.

2. How many bricks are there in a wall 36 feet long, 12 feet high, and half a brick thick?

3. How many bricks are required to veneer the front of a house 18 feet wide and 25 feet high?

4. How many bricks are required for a single brick partition between two houses, 40 feet deep and 24 feet high?

5. How many bricks are required to build a house 30 feet by 24 feet, and 18 feet high, with single brick walls?

6. How many bricks are required for a double brick wall of a basement, 48 feet by 32 feet, and 10 feet high?

7. What will it cost to lay the brick of a house 40 feet by 32 feet, and 21 feet high, with a flat roof and double walls, at \$2.75 per thousand ?

8. Find the cost of the brick in the wall around a garden, 400 feet by 200 feet, 6 feet high, and a brick and a half thick at \$7 per thousand.

9. At \$8 per thousand, find the cost of the brick in the front walls of a terrace block, 120 feet long and 22 feet high. There are 6 doors, each 8 feet by $8\frac{1}{2}$, and 20 windows, each 8 feet by 4 feet, the wall being a brick and a half thick.

10. How many bricks will be required for a house 40 feet by 30 feet; the basement walls are 8 feet high and 2 brick thick, one door 4 feet by 6 feet; the ground floor is 11 feet between the floors, and the walls a brick and a half thick, 2 doors and 4 windows, each 8 feet by $3\frac{1}{2}$ feet; the second floor is 10 feet high between the floors, and the the walls one brick thick, 6 windows, each 8 feet by $3\frac{1}{2}$ feet; the gables are 10 feet high and half a brick thick.

5 feet long,

the front of

single brick 4 feet high ?

a house 30 ick walls ?

le brick wall nigh ?

and double

l around a brick and a

brick in the and 22 feet $8\frac{1}{2}$, and 20 brick and a

a house 40 t high and round floor brick and a by $3\frac{1}{2}$ feet; ors, and the feet by $3\frac{1}{2}$ k thick.

THE METRIC SYSTEM OF MEASUREMENT.

"The real beginning of exact knowledge, or science, lies in measuring, and the faithful observer of nature is always occupied in measuring."-Bari.



This engraving is a Decimetre (exact size), or the tenth part of a METRE. The large white and black squares at top show its division into 10 Centimetres, each of which is sub-divided into 10 Millimetres, as shown at bottom by the small white and black strips. A complete Metre can be easily constructed from this illustration.

712. The Metric System (pronounced Met'-ric) is a system of weights and measures expressed in the decimal scale. It is now legal in nearly all civilized countries. It was legalized in Canada by Act of Dominion Parliament in 1886 (chap. 104, sec. 21), and all contracts based upon it are now enforcible at law. It was legalized in the United States in 1866, and copies of the standard metre furnished to all the States. This system of measurement is used in all countries for scientific purposes on account of its exactness, and in many countries it is used for ordinary purposes. Since 1840 the metric measures have been the only ones in common use in France.

713. The Standard Metre, which is the basis of the Metric System of Measurement, is a bar of platinum 39.37 inches long. This length was chosen because it was supposed to be one ten-millionth ($1000^{1}0000$ or .0000001) of a quarter of the earth's circumference measured by a line passing through Paris, France, from the equator to the pole. The

original bar, or metre, was made by Borga in 1795 at Paris, where it is carefully preserved, accurate copies being furnished to the governments of all civilized nations. Its length being nearly 3 ft. $3\frac{3}{5}$ in., the metre may be remembered as the rule of the three threes.

714. The Standards used in a general scheme of measurement are called Units. Thus, the Mctre in France forms the foundation and starting-point of every measure in existence.

715. All the Units of measures are derived in a simple manner from the Metre. Thus:

The Metre is the unit of Length. It is a bar 39.37 inches long.

The Ar (or Are) is the unit of Land Measure. It is a square whose side is 10 metres. 1 Ar = 119.6 sq. yds.

The Litre (Lec-ter) is the unit of Capacity. It is a cubic decimeter; that is, a cube whose edge is a decimetre long. A Litre = 1.76 pint.

The Gram is the unit of Weight. It is the weight of a cubic centimetre of water.

As the terms used in the Metric System are derived from the Greek, Latin and French languages, we have thought it best to give them English spellings, dropping the final "me" in "gramme," etc.

716. The Metre is sub-divided always into tenths, hundredths, thousandths, &c., or decimal parts, thus :

Decimetre (dm) Latin decem, $ten = \frac{1}{10}$ or .1 metre (m). Centimetre (cm) " centum, hundred=100 or .01 metre. Millimetre (mm) " mille, thousand = 1000 or .001 "

The names of these lower denominations are formed by prefixing Latin numerals (deel, centi, milli,) and writing the abbreviations (dm, cm, mm,) without Capital letters. All the compound names are accented on the first syllable thus, mil'limetre.

Therefore: 1 metre=10 decimetres=100 centimetres=1000 mm. 1 decimetre = 10 centimetres = 100 mm.1 centimetre = 10 mm.

5 at Paris, being fur-Its length mbered as

e of measin France leasure in

n a simple

bar 39.37

). It is a yds.

lı is a decimetre

eight of a

Greek, Latin ish spellings,

ito tenths, is:

re (m). .01 metre. .001 ''

refixing Latin mm,) without syllable thus,

s = 1000 mm. s = 100 mm.s = 10 mm.

METRIC SYSTEM OF MEASUREMENT.

717. Multiples of the Metre are as follows:

| Decametre (Dm) | Greek | Deka, ten=10 metres. |
|-----------------|-------|------------------------------------|
| Hectometre (Hm) | | Holest |
| Kilometre (Km) | | Hekaton, hundred=100 metres. |
| Myriametre (Mm) | | Kilioi, thousand=1000 metres. |
| Megametre (Mgm) | | Myria, ten thousand=10,000 metres. |
| Megametre (Mgm) | | Mega. million=1,000,000 metres |

The names of these higher denominations are formed by pretixing Greek numerals (deka, hekto, kilo, myrla, mega) and writing the abbreviations (Dm, Hm, Km, Mm, Mgm) with Capital letters.

718. A person who wished to buy 125 metres of cloth would not ask for "1 hectometre, 2 decametres, 5 metres," any more than a Boston merchant would tell a person who owes him $\gtrsim 25.96$ that his bill is 2 eagles, 5 dollars, 9 dimes, 6 cents.

719. Comparative Lengths are as follows:

| 0899 .1093633 2809 .0109363 | |
|--------------------------------|---|
| 2 | 899 .1093633 809 .0109363 |

720. The Metre, like the yard-stick, is used in measuring cloth and short distances; the Kilometre is used in measuring long distances.

721. Since, in the Metric System, 10, 100, 1000, etc., units of a lower denomination make a unit of a higher denomination, it follows that any one of the metric measures may be expressed in terms of another measure by simply moving the decimal point to the right or left.

1. A number is reduced to a LOWER denomination by removing the decimal points as many places to the RIGHT as there are ciphers in the multiplier.

2. A number is reduced to a HIGHER denomination by removing the decimal point as many places to the LEFT as there are ciphers in the divisor.

Thus, 12,465,687^{mm} may be written as Kilo-metres by observing that Milli-metres are changed to metres by mov-

ing the point **three** places to the left, and metres are changed to Kilo-metres by carrying the point **three** places further, making in all six places.

Therefore $12,465,687^{mm} = 12.465687^{km}$

RULE.—First count the number of places needed to convert the given measures into terms of the principal unit; then the number needed to convert the principal into the required units.

Before adding or subtracting, the quantities must be written in the same unit of measure.

722. MEASURES OF LENGTH.

| 10 millimetres, | marked | mm. | are | 1 | certimetre, | marked | cm. |
|-----------------|--------|-----|-----|---|-------------|--------|-----|
| 10 centimetres, | 4.6 | cm. | | | decimetre, | ** | dm. |
| 10 decimetres, | | dm. | 66 | 1 | metre, | 44 | m. |
| 10 metres, | 64 | m. | 4.6 | 1 | dekametre, | 44 | Dm. |
| 10 dekametres, | 66 | Dm. | 66 | 1 | hektometre, | 44 | Hm. |
| 10 hektometres, | 44 | Hm. | ** | 1 | Kilometre, | 66 | Km. |
| 10 Kilometres, | | Km. | ** | 1 | Myriametre | , ** | Mm. |

723. To Reduce 3.825 m. to cm.

SOLUTION.—To reduce metres to centimetres, multiply by 100. Write 3825, and place the decimal point between 2 and 5, two orders farther to the right than it is in 3.825. Ans. 382.5 cm.

724. To Reduce 1025.5 m. to Km.

SOLUTION.—To reduce metres to kilometres, divide by 1000. Write 10255, and place the decimal point between 1 and 0, three orders farther to the left than it is in 1025.5. Ans. 1.0255 Km.

725. To Reduce 2.15 Dm. to centimetres.

Solution.—To reduce dekametres to centimetres, multiply $10 \times 100 = 1000$. Write 215 and annex a cipher. Ans. 2150 cm.

LAND OR SQUARE MEASURE.

726. The Are is the unit of Land measure (or Area). It is legal at 119.6 sq. yds. The Are is the principal unit of

419

re changed es further,

t to convert t; then the red units.

s must be

arked cm.

" dm. " m. " Dm.

" Km.

" Mm.

s, multiply nt between s in 3.825.

divide by between 1 in 1025.5.

5.

oher. Ans.

Area). It pal unit of surface of small plots of land. The area of a farm is expressed in Hektars; of a country in square Kilometres.

TABLE.

100 centiares, marked ca., are 1 Are, marked a. 100 ares "a., "1 hektar "Ha.

727. An Are is 100 square metres, marked m². The Hektar is nearly $2\frac{1}{2}$ acres (2.47).

728. For measuring other surfaces, squares of the metre and its sub-divisions are used.

| 1. | Reduce | 897.8 | a. | to | hektars. | A3.978 Ha. |
|----|--------|-------|----|----|----------------|------------|
| 2. | | 8.8 | a. | to | square metres. | |

MEASURES OF CAPACITY.

729. The Litre is the unit of capacity. It is legal at 1.0567 quarts, Liquid measure.

TABLE.

| 10 | decilitres, | marked | cl., dl., | are | 1 1 | decilitre, litre, | marked | dl. | |
|----|-------------|--------|--------------|-----|--------|----------------------|--------|------------|--|
| | litres, | 66 | | | | dekalitre | ** | Dl. | |
| 10 | dekalitres, | ** | | | | hektolitre | | HI. | |

730. The measures commonly used are the litre and the hektolitre. The litre is very nearly a quart; it is used in measuring milk, wine, etc., in moderate quantitics. The hektolitre is about 2 bu. $3\frac{1}{3}$ pk.; it is used in measuring grain, fruit, roots, etc. in large quantities.

731. For measuring wood the **Store** is used; it is a cubic metre (=35.316 cub. ft.)

MEASURES OF WEIGHT.

732. The Gram is the unit of Weight; it is legal at 15.432 grains Troy.

420

METRIC SYSTEM OF MEASUREMENT.

| 733. |
|------|
|------|

TABLE.

| 10 milligrams, | marked | mg., | are | 1 | centigram, | marked | cg. |
|----------------|-----------|------|------|---|--------------|---------|--------|
| 10 centigrams, | " | cg., | " | | decigram | ** | dg. |
| 10 decigrams | 66 | dg., | " | | gram, | " | g. |
| 10 grams, | " | g. | " | 1 | dekagram. | . " | Dg. |
| 10 dekagrams, | ** | Dg., | 66 | 1 | hektogram, | ** | Hg. |
| 10 hektograms | , " | Hg., | " | 1 | kilogram, | ** | Kg. |
| 10 kilograms, | ** | Kg., | ** | 1 | myriagram, | ** | Mg. |
| 10 myriagrams | | Mg., | ** | 1 | quintal, | 66 | Q. |
| 10 quintals or | 1000 kilc | gram | s ar | е | 1 Metric ton | , marke | 1 M.T. |



1 Kilogram=1000 grams, (exact size), commonly called the "Kilo."

734. The weights commonly used are the Gram, Kilogram, and Metricton. The Gram is used in mixing medicines, in weighing the precious metals, and in all cases where great exactness is required. The Kilogram, (commonly called the "Kilo"), is the usual weight for Groceries and coarse articles generally; it is very nearly 25 lbs. Avoir. The metric ton is used for weighing hay and other heavy articles; it is about 204 lbs. more than our ton.

735. Legal and Approximate Values are as follows:

| Denomination. | Legal Value. | Approximate Value. |
|---------------|-----------------|---------------------------|
| Metre | | |
| Centimetre | .39371 " | inch. |
| Kilometre | .62137 mile | |
| Square Metre | 1.196 sq. yards | 10 ³ sq. feet. |

Legal and Approximate Values (continued).

| Denomination. | Legal Value. | Approximate Value |
|--------------------------|------------------|----------------------|
| A10 | | |
| Hektar | | |
| Cubic Metre | 1 809 orth | |
| Stere | 9750 | |
| Stere | .2759 cord | ‡ cord. |
| Litre | 1.0567 quarts | ∫ 120 liquid quart. |
| Haktolitza | | ···· (10 dry quart. |
| Hektolitre | 2.8375 bushels | 2 bush. 31 pk. |
| Uram | . 15.432 or Trow | |
| isingram | | 01 1 |
| Metric Ton (or tonneau). | .2204 6 th " | ·····25 pounds. |
| Stere | 0.07:00 1 | ····· 1 T. 204 fbs. |
| Stere | .0.21000 cord | ‡ cord. |
| | | |

736. The legal value is used in solving the following examples.

737. MISCELLANEOUS EXAMPLES.

1. How many yards, feet, etc., in OPERATION. 4 M.?

SOLUTION. — In one metre there are 39.37 in.; in 4 metres there are 4 times 89.37 in., which are 157.48 in.; 157.48 in. reduced to integers of higher denominations are 4 yds. 1 ft. 1.48 in. 39.37412)157.483)13 ft. 1.48 in.4 yds. 1 ft.

OPERATION.

22046

13 9540 13 2276

72640

66138

2.2046)36.0000(16.329+

2. What is the value of 36 fbs. in kilograms?

SOLUTION.—In one kilogram there are 2.2046 fbs.; in 36 fbs. there are as many kilograms as 2.2046 are contained times in 36, which are 16.329+.

hich are 16.329 +. 3. What is the value of 20 Km.? 65020 44092 209280 198414 12.4274 p

4. llow many hektars in 160 acres?

12.4274 miles. 64.75 + Ha.

ed cg. dg. Dg. Hg. Kg. Mg. Q. ked M.T.

hts comare the m, and e Gram g mediing the and in reat exed. The mmonly), is the Grocerarticles is very oir. The used for id other is about nan our

ows:

e Value. inches. inches. sq. feet.

5. What is the value of 49 m.? 9 rd. 4 yd. 3.13 in.

6. How many hektolitres in 42 bu.? 14.8 + Hl.

7. How many square yards in a roll of paper 9 m. long and 5 m. wide? 5.382 sq. yd.

8. The five-cent piece weighs 5 grams; how much will 100 such pieces weigh? .5 Kg.

10. One hektogram of goods costs \$5.35; what costs onekilogram?\$53.50

11. A piece of money weighs 10 g.; how many such pieces in a bag weighing 1 Kg.? 100

12. A hektolitre of wheat costs \$6.25; what is the price of a dekalitre? \$.625

13. A hektolitre of wine costs \$25.10; what is the price of a litre? \$.251

14. A kilogram of wool costs \$1.875; what is the cost of 100 kilograms? \$187.50

15. A litre of wine weighs 880 g.; what is the weight of a hektolitre? 88 Kg.

16. Add 45 kilograms, 4 hektograms, 5 dekagrams; 35 kilograms, 8 dekagrams, 7 grams; and 45 hektograms, 4 grams. 85.041 Kg.

17. A wine merchant sold 1270 litres, 487 litres, 1563 litres, 1000 litres, and 2345 litres; how many hektolitres did he sell? 66.65 Hl.

18. A vase, weighing 24.67 hektolitres, contains 18.79 hektolitres of liquid; what is the weight of the empty vase? 5.88 Hl.

19. From a barrel containing 147 litres of wine, 42.75 litres leaked out; how much remained? 104.25 l.

20. How much will 135.60 m. of cloth cost at \$1.16 a metre? \$157.296

21. A grocer bought 3845 Kg. of sugar at 19 cents a kilogram; how much did it cost? \$730.55

22. Bought 25 hogsheads of wine, of 225 litres each, at the rate of \$.156 a litre ; how much did it cost? \$877.50

23. What is the cost of 21 pieces of cloth of 42 m. each, at \$5.69 a metre? \$5018.58

24. I have an article that sells for 26 cents a pound ; how much is R worth a kilogram ? \$.573 +

25. A man bought 25 lbs. of tea at 1.83 a pound; he exchanged it for five times its weight in coffee, which he sold at 8.86 a kilogram; did he gain or lose by the bargain, and how much? 3.76 +

26. How many metres of carpeting, .75 m. wide, will cover a floor 8 m. long and 5 m. wide? 53.33 + m.

27. I paid \$13 for a barrel of vinegar containing 140 l.; I lost 22 l. by leakage, and sold the remainder at 20 cents a litre; how much did I gain? \$10.60

.8 + Hl. n. long sq. yd. ch will .5 Kg. at is the .92 Kg. osts one \$53.50 h pieces 100 price of \$.625 ie price \$.251 cost of \$187.50 eight of 88 Kg. ams; 35 rams, 4 041 Kg.

3.13 in.

s, 1563 (tres did 6.65 Hl. s 18.79 empty

5.88 Hl. e, 42.75 104.25 l.



ORGANIZATION.

738. This Institute, which received its charter from the Ontario Legislature in 1883, comprises in its membership the leading Accountants of Canada. The chief aim of the Institute is to raise the standard of accountancy; and in order to increase the knowledge, skill and profi

ciency of its members, it is empowered to establish classes, lectures and examinations; to prescribe tests of competency; to grant diplomas entitling members to use the distinguishing letters F.C.A. (Fellow of the Chartered Accountants); and to affiliate with any other similar bodies for mutual benefit.

AFFILIATION.

739. Business Colleges and other Educational institutions having a department devoted to the study of Accounts may become affiliated with the Institute, and may conduct the Intermediate Examinations in connection therewith, on terms fixed from time to time by the Council.

740. Students-at-Accounts, of the age of 16 years or over, are admitted to registration under two classes: (1) Primary Students and (2) Intermediate Students or Book⁻ keepers. Such Students are entitled to attend the meetings of the Institute and take part in discussion of papers. Students may form an Association for the better advancement of their studies and professional knowledge, and for making recommendations to the Council affecting their joint interests.

741. The Primary Examination required of students on entrance comprises Business Composition and Correspondence, Spelling and Punctuation, Arithmetic, Penmanship, Elementary Book-keeping, Common Latin Terms and Roots, British and Canadian History, Geography, Stenography (the last optional). This examination may be conducted in any affiliated institution, or the Council may waive this examination on students showing that they have passed one equivalent, or have had practical experience at accounts which may be deemed equivalent. The object of the Primary Examination is to reasonably ensure that future candidates for membership shall be men of good general education, the Council holding the view that the comparatively slow progress made hitherto, towards obtaining recognition from the public of the claims of accountancy to be considered as a profession, has been due in no small measure to the superficial character of the education deemed to be necessary to fit a man for intelligently undertaking the duties of an accountant, or even of a book-keeper (understood in the sense of one versed in one branch only of accountancy). While it may be true that every accountant will find his own level, on the ground of natural ability alone, it is equally certain that the accountant who has had the initial advantage of a good general education, supplemented by a judicious course of special training for his calling or profession, will out-distance the accountant who has not had these advantages, everything else being equal.

ANTS.

which reom the 83, comhip the Canada. titute is accountincrease ad proficlasses, petency; guishing ; and to nefit.

titutions nts may luct the on terms

742. The Intermediate Examination is open to any one who has registered as a Student-at-Accounts, 19 years of age or over, after one year from passing the Primary or equivalent Examination. The Intermediate Examination comprises Mercantile Arithmetic, Negotiable Instruments, Book-keeping, Auditing, Shareholders' and Partners' Accounts, Insolvency. This examination may be held in affiliated institutions. Every person passing the Intermediate Examination is entitled to a Certificate to that effect, and setting forth in suitable terms his attainments as a book-keeper. The Intermediate Examinations are intended to afford to students who desire to take up accountancy as a profession, an opportunity to test their general progress in professional knowledge, to enable the Council to form an estimate of their capabilities, and to advise upon and direct, so far as may be, their course of preparation for the Final Examination, which qualifies for admission to membership as an Associate. There is the further intention to provide recognition of the attainments of those candidates who do not purpose attempting the Final Examinations, but desire to have the Certificate of the Institute of competency to undertake the duties of a bookkeeper. The scope of the Intermediate Examinations, therefore, will, generally speaking, be limited to a thorough comprehension of the duties of one required to undertake the duties of chief book-keeper in a first-class business.

743. Final Examinations. Any person who has passed the Intermediate may apply for membership in the Institute, and if of the age of 21 or over, the Council will set a Final Examination comprising Book-keeping, Auditing, Insolvency, Joint Stock Companies, Mercantile Law, Partnerships and Executorships. This Final Examination shall be held in Toronto, and any who pass, upon being admitted to the Institute by ballot, shall receive a Certificate of membership, and right to use the appellation "Chartered Accountant," and to be styled "Associate."

to any ears of ary or ination aments, counts, ffiliated Examsetting er. The tudents ion. an essional of their nav be. , which There attainting the e of the a booknations, horough take the

s passed nstitute, a Final olvency, ips and held in to the bership, .nt," and

"F. C. A."

• 744. A Chartered Accountant who has been in continuous practice as such for three years after admission as a member may be admitted a "Fellow of the Chartered Accountants" upon passing the tests, viz.: (1) Known standing and reputation as a Public Accountant, and (2) a thesis upon some subject to be approved by the Council. Upon passing these tests a "Diploma of Fellowship" is issued to the candidate, giving him the right to use the letters "F.C.A."

745. Every Commercial Student should aim to secure membership in this Institute of Chartered Accountants, and to pass through the various grades above outlined till the goal is reached—the high honors and privileges of a "Fellow of the Chartered Accountants," upon whom the stamp of this honorable fustitute is placed in the letters "F.C.A." In order to help our readers to reach this end, the above information is given and the following Examination Papers are quoted.

427

1.

MERCANTILE ARITHMETIC.

MERCANTILE ARITHMETIC.

Problems set for Candidates in Intermediate Examination, Institute of Chartered Accountants, May, 1897.

1. A nail manufacturer has 3 grades of nails which he wants to net him per keg \$2.75, \$2.80, \$2.85. He desires to make a list of prices to sell at 50%, 10%, 5% discount to net the above prices. Give the list prices and show how it is worked out.

2. A Trustee invests \$4,000 in Ontario Bank stock at 80, paying 6%. and \$1,000 in Dominion Bank stock at 200 paying 10%. After two years he sells the former at 86 and the latter at 180. What rate of interest has he received during the period of investment and how has the value of the capital changed?

3. Convert £855 5s. 10d. into currency, exchange being 9.78.

4. Convert \$750 into Francs, Sterling exchange being at 94, 254 Francs representing £1 Sterling.

5. Find the equated time of paying the balance of the following account on basis of 860 days to the year. Interest, 6%.

| 1896 | | | 1896 | | |
|----------|------------|-------|--------|----------|-------|
| Jan. 3 | Goods 4/m, | \$175 | Feb. 9 | By Cash, | \$100 |
| Jan. 20 | " 2/m, | 75 | Mar. 2 | By Cash, | 50 |
| Mar. 1 | " 1/m, | 125 | | | |
| Mar. 14 | " Net, | 50 | Apr. 3 | By Cash, | 60 |
| Apr. 9 | " 3/m, | 200 | May 7 | By Cash, | 200 |
| May 7 | " 2/m, | 100 | | Balance, | 815 |
| | | \$725 | | | \$725 |
| May 7th, | Balance, | \$315 | | | |

Adjust the interest and state what amount is due in Cash May 7th.

6. A merchant has a line of tweeds which he is selling in 50 yd. ends, for \$75 per end, a profit of 25% on cost. His clerk, in order to make quick cash sales, sells for 15% cash discount. What advance over cost did he net?

MERCANTILĖ ARITHMETIC.

7. A note of \$500, dated April 1st, 1895, payable July 1st (without grace) with interest at 6% was discounted May 1st at 8%. Find the proceeds. Interest on basis of 360 days to the year.

8. A Board of School Trustees desire to issue Debentures to the amount of \$2,500. Interest 5% payable annually 1st January each year, the whole amount with interest to be paid in five equal annual payments. Divide the amount into five debentures, one to mature each year.

Find the face amount of each debenture numbering them 1, 2, 3, 4, 5, and the amount of coupons due each year.

9. A merchant has 6 chests (of 30 lbs. each) of Tea at the following prices:—

| 1 | at | 80c. | per | lb. |
|---|----|------|------|-----|
| 1 | 44 | 75c. | - ++ | |
| 1 | " | 50c. | * * | |
| 1 | ** | 60c. | " " | |
| L | ** | 25c. | " " | |
| L | " | 20c. | 44 | |
| | | | | |

He desires to make 1 chest of a blend containing all these grades to sell at \$1.00 per lb. which will give him an advance over costs of 100%. Find how many pounds of each he must use.

10. If the profits are divided in proportion to the Capital invested and the time it was employed, at the end of a year what would be each partner's average investment and share of the profits from the following accounts. Net profit \$500.

| Jno. Roberts | Harry Jones | |
|----------------------------------|------------------------------|--|
| Dr. Cr. | Dr. Cr. | |
| Apr. 1, \$2,000 1 Jan. \$4,000 | May 1, \$300 Jan. 1, \$2,000 | |
| 1 Aug. 3,000 | Sept. 1, 1,000 | |

Problems set for Candidates in Intermediate Examination, Institute of Chartered Accountants, Nov. 1895.

MERCANTILE ARITHMETIC.

1. A merchant buys a sort of wine at \$2 per gallon, and another at \$1.50 per gallon. At what price must he sell a blend of 7 parts of the former and 8 parts of the latter to realize 20 per cent. profit?

imina-897.

list of prices.

paying After What estment

.78. 91, 251

llowing

\$100 50

n Cash

n 50 yd. n order What

MERCANTILE ARITHMETIC.

2. You manage an estate, and receive as your remuneration 5 per cent. of the net amount paid to the beneficiaries. Taxes, repairs and sundry expenses in a given year are \$540. Your commissions amount to \$350. Find the gross revenue of the estate.

3. Find the present value of \$3,250 due 3 years and 6 months hence at 4 per cent. per annum. Show working.

4. Average the following account:

| Jan. | 20Merc | handise, | 80 days | \$150 | 00 |
|------|--------|----------|----------|-------|----|
| | 27 | 66 | 4 months | 100 | 00 |
| Feb. | 15.— | " | net | 150 | 00 |
| Cr. | | \$400 | 00 | | |
| Feb. | 10Cash | | ••••• | 75 | 00 |
| | B | alance | | \$325 | 00 |

5. A certain stock pays a semi-aunual dividend of $3\frac{1}{2}$ per cent What is it worth to an investor who wants a return of $4\frac{1}{2}$ per cent. per annum upon his investment?

6. Convert \$1,000 into sterling at ten and one-half per cent.

7. Find the cost of papering a room $30 \ge 22$ feet, and 12 feet high, with paper 18 inches broad, costing eighty cents per roll of 12 yards, deducting 20 yards of paper for window and door spaces.

8. A merchant imports as follows:

850 yards sheeting at 5 cents;

1,400 yards flannel at 18 cents.

The duty on sheeting is 20 per cent. ad val., and 5 cents per lb. (9 yards to 2 lbs.); the duty on flaunel is 30 per cent. (4 yards to the lb.) Packages are charged at \$4. Freight \$6.50. Cartage \$1. Find the cost per yard of each laid down in his warehouse.

9. An insolvent estate realized, after payment of expenses, \$1,840.72. The claims to rank are as follows: A, \$3,400.60; B, \$1,847.85; C, \$890.96; D, \$870.42; E, \$391.80; F, \$102; G, \$84.58. Prepare a dividend sheet showing the rate per cent. and the amount coming to each.

10. You are being charged interest monthly at 7 per cent. per annum on an overdraft at your bankers. They offer to discount your bills at three months at $6\frac{1}{2}$ per cent. per annum. Which is the more profitable transaction, and by how much? neration 5 Taxes, re-Your come estate.

ь

6 months

per cent n of 41 per

cent.

and 12 feet per roll of oor spaces.

ents per lb. 4 yards to Cartage rehouse.

expenses, ,400.60; B, G, \$84.58. t. and the

or cent. per o discount Which is

