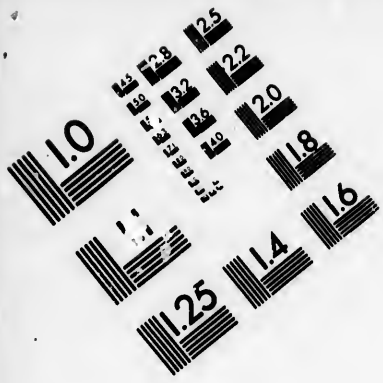

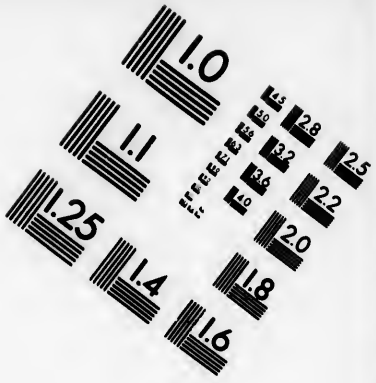

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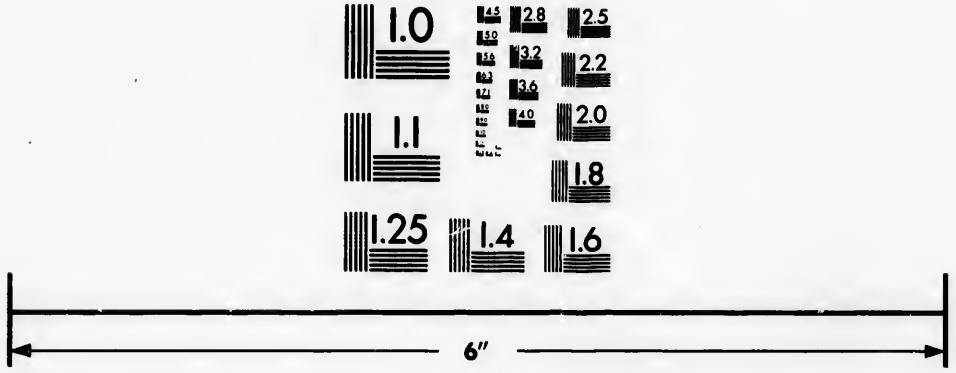

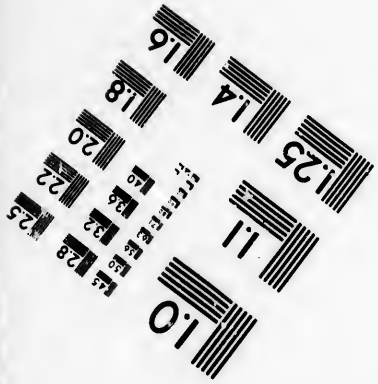

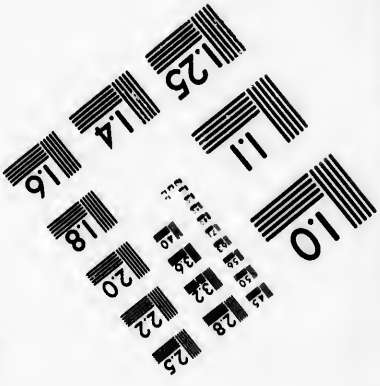

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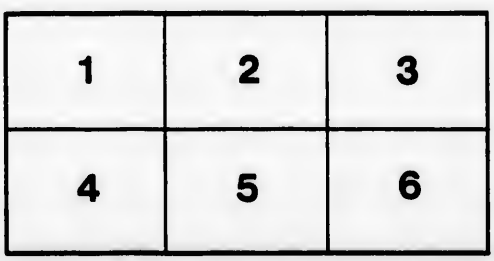

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THE

FIRST BOOK

OF

ARITHMETIC

IN DECIMAL CURRENCY.

FOR THE USE OF SCHOOLS IN NEW BRUNSWICK.

APPROVED BY

THE HONORABLE THE BOARD OF EDUCATION.

ST. JOHN, N.B.:
FOR SALE BY T. A. HALL.
1861.

J.W. LAWRENCE COLLECTION

PREFACE.

THE following little work has been prepared, under the direction of the Board of Education, by a committee of the teachers of the St. John County Institute, with a view to meet the want arising out of the adoption of the Decimal System of Computation in the Province. From the familiarity of teachers with the general arrangements of the small Arithmetic of the Board, that volume has been made the foundation of this; but, besides its adaptation to the altered currency, some new and original questions have been substituted for those considered of less practical value, by which arrangement, it is hoped, the work has been somewhat improved, while no addition has been made to its bulk or price. Great care has been taken to keep it free from typographical and other errors.

JOHN BENNET,
Chief Supt.

EDUCATION OFFICE,
FREDERICTON, 1861.

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MONEY.

= 1 penny.
= 1 shilling.
= 1 crown.
= 1 pound.
= 1 guinea.
ngs, and *d.* pence.
r one quarter of any thing.
or a half of any thing.
gs, or three quarters of any thing.

BRUNSWICK MONEY.

cents = 1 dollar,—$.

OR UNITED STATES MONEY.

		marked
nills (*m.*)	= 1 cent.	*ct.*
cents	= 1 dime.	*d.*
0 dimes	= 1 dollar.	$
10 dollars	= 1 eagle.	*E.*

AVOIRDUPOIS OR GROCERS' WEIGHT.

		marked
rams (*dr.*)	= 1 ounce.	*oz.*
ounces	= 1 pound.	*lb.*
8 pounds	= 1 quarter.	*qr.*
4 quarters, or 112 lb.	= 1 hundredweight.	*cwt.*
20 hundredweight	= 1 ton.	*T.*

14 pounds make one stone, and 8 stone 1 hundredweight.
112 pounds make one quintal of dried fish.

This weight is used for bread, meat, groceries, for goods in general, and for all the metals except gold and silver. Wool is bought and sold by this weight.

TROY OR GOLDSMITHS' WEIGHT.

		marked
24 grains (*gr.*)	= 1 pennyweight.	*dwt.*
20 pennyweights	= 1 ounce.	*oz.*
12 ounces	= 1 pound.	*lb.*

This weight is used for gold, silver, jewels, and liquors.

APOTHECARIES' q

20 grains	=	.
3 scruples	=	1
8 drams	=	1
12 ounces	=	1 l

Apothecaries use this weight
but they buy and sell by avoirdu

LONG MEASUI

12 lines	=	1 in
12 inches	=	1 foc
3 feet	=	1 yar
5½ yards	=	1 perc
40 perches	=	1 furlo
8 furlongs	=	1 mile.
3 miles	=	1 league.
60 geographical miles, or 69½ British miles	=	1 degree.
360 degrees	=	the earth's ci

An inch is supposed to be equal to three ba
in length. Four inches make one hand, used
suring horses.

CLOTH MEASURE.

			marked
2¼ inches	=	1 nail.	*nl.*
4 nails	=	1 quarter.	*qr.*
4 quarters	=	1 yard.	*yd.*

The Flemish ell is 3 quarters of a yard; the Engli
ell, 5 quarters of a yard; and the French ell, 6 quarte
of a yard.

SQUARE OR LAND MEASURE.

			marked
144 square inches	=	1 square foot.	*sq. ft.*
9 square feet	=	1 square yard.	*sq. yd*
30¼ square yards	=	1 sq. perch, pole or rod.	*sq. pe.*
40 square perches	=	1 rood.	*rd.*
4 roods	=	1 acre.	*ac.*
640 acres	=	1 square mile.	*sq. mile.*

The square of any number is obtained by multiplying it by itself. 12 multiplied by 12 = 144, the square of 12.

CUBIC OR SOLID MEASURE.

1728 cubic inches	= 1 cubic foot.
27 cubic feet	= 1 cubic yard.
40 cubic feet of rough timber, or 50 cubic feet of hewn timber	= 1 ton, or load.
42 cubic feet	= 1 ton of shipping.
128 cubic feet	= 1 cord of wood.*

Cubes are solid figures, similar to dice, and have six equal sides.

The cube of any number is obtained by multiplying it twice by itself; thus, 12 × 12 × 12 = 1728, the cube of 12.

MEASURE OF CAPACITY.

		marked
4 gills	= 1 pint.	*pt.*
2 pints	= 1 quart.	*qt.*
4 quarts	= 1 gallon.	*gal.*
2 gallons	= 1 peck.	*pk.*
4 pecks	= 1 bushel.	*bush.*
36 bushels	= 1 chaldron.	*chald.*

The gill, pint, quart, and gallon are used for liquids. The peck and bushel are used for potatoes, oats, salt, &c. The chaldron is only used for coal. The gallon contains 277.274 cubic inches.

TIME.

		marked
60 seconds (″)	= 1 minute.	*min.*
60 minutes	= 1 hour.	*hr.*
24 hours	= 1 day.	*da.*
7 days	= 1 week.	*wk.*
12 months, or 52 weeks and 1 day, or 365 days	= 1 year.	*yr.*

Every fourth year contains 366 days, and is called leap-year.

---

* The legal cord in this Province is 8 × 4 × 4½ feet, or 138⅔ cubic feet.

DAYS IN EACH MONTH.

Thirty days hath September,
April, June, and November;
All the rest have thirty-one,
February twenty-eight alone,
But in Leap-Year twenty-nine.

DIVISIONS OF THE CIRCLE.

		marked
60 seconds (″)	= 1 minute	*min.* or ′
60 minutes	= 1 degree.	*deg.* or °
30 degrees	= 1 sign.	*S.*
12 signs	= 1 circle of the zodiac.	*C.*

QUANTITIES.

		marked
12 articles	= 1 dozen.	*doz.*
20 articles	= 1 score.	*sc.*
144 articles	= 1 gross.	*gr.*
24 sheets paper	= 1 quire.	*qr.*
20 quires	= 1 ream.	*rm.*
196 pounds	= 1 barrel of flour.	
200 pounds	= 1 barrel of pork or beef.	

NOTATION AND NUMERATION.

NOTATION is the expressing of numbers by certain characters.

NUMERATION is the reading of these characters.

There are two systems of Notation in use among us,—viz. the ROMAN and the ARABIC.

By the Roman Notation, numbers are expressed by seven capital letters,—viz. I, V, X, L, C, D, M; the relative values of which are,—I = one, V = five, X = ten, L = fifty, C = one hundred, D = five hundred, and M = one thousand.

The Arabic Notation uses ten figures, and is the method in common use. The figures are 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

The value of these figures depends upon two things: *first*, what the figure itself expresses; and, *second*, what position it is placed in with respect to a certain point expressed or understood to every number.

In reading figures, we group them into periods of three figures, (one for units, one for tens, and one for hundreds,) and we give each period or group of them a separate name; thus,—

WHOLE NUMBERS. Increasing to the left.									Dec. point	DECIMALS. Decreasing to the right.								
3d Period, Millions.			2d Period, Thousands.			1st Period, Units.				1st Period, Thousandths.			2d Period, Millionths.			3d Period, Billionths.		
Hundreds.	Tens.	Units.	Hundreds.	Tens.	Units.	Hundreds.	Tens.	Units.	.	Hundreds.	Tens.	Units.	Hundreds.	Tens.	Units.	Hundreds.	Tens.	Units.
.....	.....	.....	.....	.....	.....	.....	.....	4	.	6	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	6	3	.	7	2	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	6	4	2	.	5	8	3	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	2	7	0	5	.	7	6	0	8	.....	.....	.....	.....	.....
.....	.....	.....	.....	6	0	8	6	4	.	8	6	5	0	4	.....	.....	.....	.....
.....	.....	.....	5	3	7	9	0	6	.	7	0	8	6	2	9	.....	.....	.....
.....	.....	1	0	6	7	0	4	5	.	2	8	6	4	3	7	0	.....	.....
.....	5	2	0	4	6	5	8	6	.	5	9	8	6	0	7	3	4	.....
6	8	5	2	4	6	7	8	4	.	4	2	6	0	4	3	7	8	5

Let the pupil be required to read and write this exercise in as many different ways as the figures can be read and written, the teacher illustrating on the black-board, especially with reference to the decimals.

EXERCISES IN NUMERATION.

Read, or write down in words, the numbers signified by the following figures:

1. 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.
2. 10, 11, 14, 16, 19, 20, 42, 18, 17.

3. 200, 420, 607, 986, 473, 247, 864.
4. 912, 874, 783, 650, 202, 604, 510.
5. 4000, 2700, 8601, 7036, 2101, 1060.
6. 1010, 7030, 4600, 9111, 4076, 5870.
7. 26012, 70101, 42100, 36100, 90201.
8. 700000, 701020, 9264.27, 104.206.
9. 9000000, 9764.268, 8202100, 5023.067.
10. 2600060, 4101010, 2004000, 14021.49.
11. 40000000, 2960.2687, 5002.6017, 167.002.
12. 9412.68767, 267602.607, 401467680.
13. 2960.26876, 71002001.0, 270603050.
14. 14023.6074, 8460760010, 4023.601497.
15. 704260.3714, 5079607.906, 1704070600.
16. 81462306012, 4600768.7681, 94086421360.
17. 14023641201, 20860002001, 400020.00202.
18. 907060.206204, 240026.100201, 590960126020.

EXERCISES IN NOTATION.

Express by figures the following numbers.

1. Six,—seven,—nine,—eight,—five,—ten,—twelve,—fourteen,—sixteen,—eighteen,—twenty,—nineteen.

2. Seventy-four,—twenty-six,—thirty-one,—forty-nine,—fifty-eight,—sixty-two,—seventy-six,—seventy-seven,—ninety-seven,—eighty-four,—fifty-five,—ninety-nine.

3. One hundred,—one hundred and four,—two hundred and forty-four,—six hundred and ninety-one,—seven hundred and fifty,—nine hundred and nine,—nine hundred and ninety-nine,—eight hundred and two.

4. Four thousand,—four thousand two hundred,—five thousand three hundred and fifty-two,—six thousand seven hundred and five,—seven thousand and fifty,—nine thousand and two,—eight thousand and eighty,—six thousand seven hundred and seven.

5. Ten thousand,—fifteen thousand five hundred and sixty,—nineteen thousand and nineteen,—twenty-six thousand five hundred and ninety-five,—thirty-eight thousand and thirty-eight,—forty thousand and forty,—fifty-six in whole numbers and three hundred and twenty-

five thousandths,—one hundred sixty-three and five hundred thousandths.

6. Four hundred thousand,—four hundred thousand and forty,—six hundred thousand seven hundred and seven,—nine hundred and eighty thousand,—two hundred and fifty-six thousand nine hundred and seventy-five,—three thousand eight hundred ninety-one and two hundred fifty thousandths,—fourteen thousand seven hundred eighty-two and forty thousandths,—four hundred fifty-eight thousand, two hundred fifteen, and six hundred, seventy-three thousandths.

7. Six millions,—five millions four hundred and ninety-three thousand,—eight millions forty thousand four hundred and two,—seven millions four hundred and ninety-three thousand seven hundred and sixty-five,—ten millions ten thousand and ten,—twenty millions two hundred and forty thousand six hundred and six,—fifty-three millions fifty-three thousand and fifty-three,—eighty-seven millions, three hundred thousands, ten units and five thousandths,—fourteen millions, fourteen thousands, fourteen units, fourteen thousandths and fourteen millionths.

SIMPLE ADDITION.

ADDITION is the method of finding one number equal to two or more numbers.

MENTAL EXERCISES.

1. A boy paid 13 cents for marbles, 4 cents for apples, and had 5 cents remaining; how many had he at first?

2. How many are six dollars, five dollars, four dollars, three dollars, two dollars, and one dollar?

3. James had 4 marbles. John gave him 3, George gave him 4, William gave him 5, and Thomas gave him 2; how many had he then?

4. A drover bought sheep as follows: of one man 15, of another 7, of another 4, of another 3, and of another 6; how many did he buy in all?

5. A boy bought a fish-hook for 2 cents, a line for 4 cents, and a pole for 7 cents; how many cents did he give for the whole?

N.B.—The *Teacher* is expected to supply additional and varied *Mental Exercises* wherever that heading occurs.

Add together 423, 134, 267.

RULE WITH EXAMPLE.—Write the numbers under each other, so that units may stand under units, tens under tens, hundreds under hundreds, &c. Draw a line under them. Add the figures in the right-hand column; thus, 7, 11, 14. Put down the figure 4 of the 14. Take the 1 of the 14 and add it to the next column; thus, 1, 7, 10, 12. Put down the 2, and add the 1 to the next column; thus, 1, 3, 4, 8. Put down the 8. The number 824 is called the SUM or AMOUNT.

423	
134	
267	
824	

EXERCISES.

1	2	2	3	1	4	3	3
2	3	0	1	5	1	2	4
3	4	6	4	2	4	6	5
6	9	8	8	8	9	11	12
2	4	6	3	4	5	3	4
1	2	4	4	3	4	7	6
3	3	2	5	6	7	8	9

12	21	23	14	21	42
11	12	24	35	34	23
23	24	35	43	75	97
46	57	82	92	130	162
41	84	26	37	42	23
24	24	42	25	56	59
36	53	59	74	85	64

$18.15c.	$40.26c.	$181.19c.	628.143
63.25	73.34	284.32	486.321
41.75	28.51	687.65	673.460
32.12	84.62	842.24	519.875
155.27	226.73	1945.40	2307.799

$64.28c.	$48.61c.	$624.48c.	864.21
98.63	64.28	445.30	78.346
83.41	91.46	679.84	254.7
54.24	34.25	321.76	405.638

(1)	(2)	(3)	(4)
$412.03c.	245	$623.29c.	854
346.58	325	146.03	236
427.76	678	579.42	875

(5)	(6)	(7)	(8)
264.64	450	547.804	856
368.003	407	653.673	479
752.74	679	865.407	627
865.596	536	276.306	894

(9)	(10)	(11)	(12)
$246.73c.	457	$47.61c.	8
78.21	608	602.84	70
604.48	92	68.25	926
40.30	400	720.36	47
7.91	78	79.24	5

(13)	(14)	(15)	(16)
5129	4268.342	3687	$2407.60c.
7142	2426.208	4215	798.24
9687	4276.46	708	46.38
4312	8507.2	9362	7083.07
8687	2390.4146	96	579.15

NOTE.—In adding or subtracting decimals, the figures must be put down so that the decimal points shall stand directly under each other.

(17)	(18)	(19)	(20)
5126	2427	5036	780
1472	768	784	5708
6826	9412	6070	1070
9687	893	85	687
2764	4026	7507	5368
4279	475	687	759

(21)	(22)	(23)	(24)
42674	24785.48	$48763.14c.	46537
34126	65843.242	86270.26	54263
68768	26879.65	4687.38	43986
28642	43653.219	578.24	5079
65768	68754.846	49060.56	81
74387	56287.36	18709.67	641
96728	65423.142	70471.38	98076

25. How many do 7 and 4 and 8 and 24 and 62 make?

26. How many are 42 and 64 and 40 and 68 and 79?

27. How many do 67 and 79 and 93 and 104 and 65 make?

28. How many do 426 and 67 and 240 and 742 make?

29. Add together 6479 and 846 and 70 and 567 and 7426.

30. Add 742c. + 64c. + 8c. + 341c. + 804c. + 60c. + 643c. + 790c. + 806c.

31. Add $7260 + $1404 + $8496 + $2413 + $46 + $4786 + $3326.

32. Add $4126 + $27304 + $2687 + $426 + $846846 + $746897.

33. Add $76876 + $2046 + $896874 + $6876874 + $4268 + $4276.

34. Add 367068c. + 64768c. + 94687c. + 6870c. + 2489c. + 264c.

35. What is the amount of four hundred and sixty-three,—five thousand and sixty-four,—seventy thousand and ninety-eight,—and fifty?

86. Add together seven hundred and ninety-six,—five thousand four hundred and forty,—nine hundred and eight,—five thousand four hundred and nine,—two hundred and two thousand and fifty,—ninety-six thousand and nine,—four hundred and one.

87. How much do the following sums of money amount to, when added together? $79.66,+$86.40,+ $4.60,+ $20.48,+$468.97.

88. I saw four large baskets full of apples; in one of the baskets there were four hundred and ninety-four apples, in another three hundred and sixty-eight, in another nine hundred and eighty, and in another four hundred and four; how many apples were there in the four baskets?

89. I gave John 12 apples, James 15, Patrick 20, and I had still 25 remaining; how many apples had I at first?

40. If you buy a yoke of oxen for 75 dollars, a cart for 57, three cows for 88, and a plough for 10, how much must you pay for the whole?

41. A merchant owes one man in Dalhousie 975 dollars, one in Woodstock 483.25, another in Fredericton 237.15, one in St. Andrews 87, and another in St. John 689; what is the amount of his debts?

42. If your debts to different persons are as follow, 2756 dollars, 1000 dollars, 75 dollars, 467 dollars, 395 dollars, and 5832 dollars, how much is the whole that you owe?

43. A fruiterer bought six chests of oranges. In the first chest there were 468 oranges; in the second 679; in the third 804; in the fourth 979; in the fifth 1042; in the sixth 1709; how many oranges were there in all the chests?

44. A gentleman planted on his property 478 oaks, 748 beeches, 64027 firs, 409 apple-trees, 1764 pear-trees, 878 cherry-trees, and 87 peach-trees; how many trees did he plant in all?

45. In a house there were nine windows in front, and each window had twelve panes of glass. In the rear

there were six windows, and each of these windows had nine panes of glass; how many panes of glass were there in all the windows?

46. If a boy receive a present every New Year's day of $125, how much money will he possess when he is twenty-one years of age?

47. A linendraper sold 46 yards of cloth on Monday; 78 on Tuesday; 65 on Wednesday; the same quantity on Thursday; 64 on Friday; and 97 on Saturday; how many yards of cloth did he sell during the week?

48. A grocer received for goods sold on Monday $16; on Tuesday $24; on Wednesday $40; on Thursday $36; on Friday $52; and on Saturday as much as he had received all the former days of the week; how much did he receive during the week for goods?

SIMPLE SUBTRACTION.

SUBTARCTION is the method of finding the difference between two numbers.

MENTAL EXERCISES.

1. Tom had 16 marbles, and gave Dick 7 of them; how many had he left?

2. A man bought a cow for 12 dollars, and sold her for 21 dollars; what was his gain?

3. A boy has 5 nuts in one pocket and 8 in another; how many more has he in one pocket than in the other, and how many in both?

4. John is 18 years old, and George is only 6; how many years older is John than George?

5. A man owing 48 dollars paid 19; what had he to pay?

From 6237 take 4895.

RULE WITH EXAMPLE.—Place the less number under the greater, so that units may stand under units, tens under tens, &c. Draw a line under them. Begin at the units' place, that is, at the 5. Take 5 from 7, and 2 remain. Put down the 2 under the 5. Go on to the next figure, which is 9. Take 9 from 3; this cannot be done; when this is the case, add 10 to the upper figure, which will make it 13. Take 9 from 13, and 4 remain. Put down the 4. Whenever 10 has been added, as it was to the 3, 1 is to be added to the next figure. Thus, add 1 to 8, which makes 9. Take 9 from 2; it cannot be done; then, as before, add 10 to the 2. Now take 9 from 12, and 3 remain. Put down the 3. Add 1 to 4, it will make 5. Take 5 from 6, and 1 remains. Put down the 1. The number 1342 is called the *Remainder*, the *Difference*, or the *Excess*. The number from which the subtraction is made, viz. 6237, is called the *Minuend*. The number which is subtracted, viz. 4895, is called the *Subtrahend*.

6237				
4895				
1342				

EXERCISES.

$426.20c.	647	754.382	827	$968.40c.
214.17	423	621.176	403	412.26
212.03	224	133.206	424	556.14
643.621	498	$783.72c.	869	548.460
411.348	132	172.35	217	213.263
232.273	366	611.37	652	335.197
$423.50c.	742	$834.67c.	546	$643.44c.
269.28	489	478.49	298	169.19
154.22	253	356.18	248	474.25

(1)	(2)	(3)	(4)	(5)
462	$623.81c.	821	$602.23c.	714
278	147.94	479	146.71	178

(6)	(7)	(8)	(9)	(10)
$643.25c.	741	$610.17c.	100	$101.40c.
268.12	278	79.09	4	11.52

(11)	(12)	(13)	(14)
42654	86871	78268	98643
26479	17928	47296	27896

(15)	(16)	(17)	(18)
74603.684	91020	41021.14	40000
87684.257	12647	768.35	1001

(19)	(20)	(21)	(22)
42681	$42890.52c.	81000	$45301.20c.
19697	27601.48	2641	20009.05

(23)	(24)	(25)
741026831	614102013	148120718
278904896	178906844	74198648

(26)	(27)	(28)
861264981.346	921002461.482	181201041.45
248600989.579	198007049.347	89890122.618

29. 741826421741 — 427984642814.
30. 841298471312 — 71489641264
31. 812014001013 — 107987862141
32. 431701468642 — 7126142687
33. 614214687648 — 196412741689
34. 419000100014 — 2120101706

35. From seven hundred and nine thousand four hundred and twenty-seven take two hundred and fifty-one thousand eight hundred and seventy-two.

36. From two millions two hundred and two thousand and two, take nine hundred and ninety-six thousand and seven.

37. What is the difference between six millions five hundred thousand and four, and two millions nine hundred thousand seven hundred and sixty?

38. How much does sixty-four thousand two hundred and four exceed six thousand two hundred and forty-nine?

39. John lent James $9071; of this sum he has received back $999; how much has James yet to pay?

40. On a cherry-tree there were 2046 cherries; of these 1875 were gathered; how many remained?

41. Columbus discovered America in the year 1492; how many years is it from that time to 1861?

42. In a certain school there are 436 boys; of these only 264 can write; how many are unable to write?

43. The parliaments of England and Scotland were united in 1706; that of Ireland was joined to them in 1800; how many years between these dates?

44. John had 202 nuts in his pocket, but, there being a hole in it, he lost 96 nuts; how many had he remaining?

45. On an apple-tree there were 165 apples; the wind blew off two dozen and a half; how many were left?

46. A draper bought 4786 yards of cloth, and sold 3987 yards; how many yards has he unsold?

47. What sum added to sixty-five thousand seven hundred and ninety-six, will make one million four hundred and fifty-two thousand three hundred and thirteen?

48. I was born in the year 1828; how old shall I be in the year 1861?

49. Ireland is about 300 miles in length, and 170 miles in breadth; how much greater is the length than the breadth?

50. Ben Nevis in Scotland, the highest mountain in the British Islands, is 4350 feet above the level of the sea; the summit of Magillicuddy's Reeks, the highest point in Ireland, is 3610; what is the difference in height between these two mountains?

51. The Shannon, the largest river in the British Isles, has a course of about 170 miles. The Amazon, in South America, has a course of about 3000 miles. What is the difference in the length of their course?

52. The diameter of the Sun is about 888246 miles; that of the Earth, about 7912; what is the difference between the diameter of the Sun and that of the Earth?

53. The surface of the earth is nearly 200 millions of square miles; of this it is probable that 60 millions are land; how many more square miles of water than of land are there in the earth's surface?

54. The population of London being about 2,776,556, and the population of New Brunswick being about 233,652, how many more people are there in London than in New Brunswick?

55. Mont Blanc, in Switzerland, is the highest mountain in Europe, being 15,680 feet above the level of the sea. Chimborazo, the highest mountain in America, is about 21,000 feet in height. What is the difference in height between these two mountains?

56. Sir Isaac Newton was born A.D. 1642, and died 1727; how old was he when he died?

57. The art of printing was discovered about the year 1449; how long is it from that time to the year 1861?

58. At her accession to the throne in 1837, Queen Victoria was in the 19th year of her age. In what year was she born? and how long had she reigned on the 20th June, 1860, the anniversary of her accession?

59. Between the landing of the Loyalists in 1783, and the visit of the Prince of Wales in 1860, how many years had elapsed?

MIXED QUESTIONS.

1. Tom had 264 marbles; he gave 64 to James, 75 to William, and 42 to John; how many had he left?

2. A merchant had 4268 yards of cloth; on Monday he sold 146 yards, on Tuesday 97, on Wednesday 246, on Thursday 198, on Friday 364, on Saturday 497; how much cloth had he remaining?

3. Three regiments went to battle; in the first there were 968 soldiers, in the second 769, and in the third 84[illegible]. There were 248 men killed in the first regiment, 368 in the second, and when the regiments returned there were only 436 men in the third; how many returned from the battle?

4. A man had a journey of 298 miles to make; the first day he walked 42 miles, the second 36 miles, the third 31 miles, the fourth 27 miles; how much farther had he to go?

5. Three vessels sailed to America with emigrants; in the first vessel there were 126 men, 96 women, and 42 children; in the second vessel there were 93 men, 37 women, and 26 children; in the third vessel there were 43 men, 24 women, and 8 children. In the first vessel 3 persons died; in the second 2 were washed overboard; the third vessel was wrecked, and all on board perished; how many got safe to America?

6. A little boy went to the Zoological Gardens to see the animals; he laid his hat on the ground, which contained 264 nuts; while his attention was engaged, the monkey stole 27 of his nuts; while he was pursuing the monkey, a squirrel made off with 16 more; how many had he remaining?

7. The population of Fredericton is assumed to be 6224, of Moncton 1738, of Woodstock 4978, of St. Andrews 4165; by how much does the population of St. John exceed all these towns, its population being estimated at 36,894?

8. Received on Monday 247*l.*; paid away on Tuesday 196*l.*; received on Wednesday 349*l.*; paid away on Thursday 402*l.*; received on Friday 687*l.*; paid away on Saturday 398*l.*; what money had I still remaining?

SIMPLE MULTIPLICATION.

MULTIPLICATION teaches us to find what a number will amount to when it is repeated a number of times.

MENTAL EXERCISES.

1. At 7 cents apiece, what will 9 copy-books cost?

2. What is the price of 13 yards of cloth at 3 dollars a yard?

8. What cost 17 barrels of cider at 2 dollars a barrel?

4. I bought 8 pieces of cloth; each piece was 15 yards, and I gave 4 dollars a yard for it. What was the price of each piece? and of the whole?

CASE I.—*When the Multiplier does not exceed* 12.

Multiply 53 by 7.

RULE WITH EXAMPLE.—Place the number by which you are to multiply under the number to be multiplied; then say, 7 times 3 make 21. Put down the 1 under the 7. Then, 7 times 5 make 35, and the 2 of the 21 make 37. Put down the 37. The 53 is called the *Multiplicand;* the 7 is called the *Multiplier;* and the 371 is called the *Product.* The multiplicand and the multiplier taken together are called the *Factors;* thus, 53 and 7 are factors.

```
 53
  7
---
371
```

EXERCISES.

659	427	642	748	896
2	2	2	2	2
1318	854	1284	1496	792
$ c.			$ c.	
*486.75	968	687	983.42	758
8	3	4	6	5

* The product must have as many decimals as there are in both factors. If, for instance, there are 4 in the multiplicand, and 3 in the multiplier, then the product must have 7. If there should not be as many figures in the product as are necessary to make the required number of decimals, as many ciphers must be prefixed as are necessary to make up the required number. If, for instance, the number of decimals in both factors is 7, and there are only 5 figures in the product, then two ciphers must be prefixed.

EXAMPLE:—

```
.00074
   .36
------
  444
 222
------
.0002664
```

Here there are only four; so three ciphers are prefixed.

$ c.		$ c.		$ c.
896.64	793	378.25	596	974.63
5	6	7	8	9
4488.20	4758	2647.75	4768	8771.67
(1)	(2)		(3)	(4)
$4276.17c.	$67287.26		$86453.64c.	$75268.06c.
4	2		5	3
(5)	(6)		(7)	(8)
9468.328	84076.645		43256.389	74879
7	8		9	10
(9)	(10)		(11)	(12)
$45687.16c.	$36854.12c.		$63875.31c.	$47389
11	12		9	12

13.	Multiply 87546	by 4	22.	Multiply 983.27	by 2
14.	——	— 7	23.	——	— 7
15.	——	— 9	24.	——	— 4
16.	——	— 6	25.	——	— 8
17.	——	— 8	26.	——	— 6
18.	——	— 5	27.	——	— 5
19.	——	— 10	28.	——	— 9
20.	——	— 11	29.	——	— 12
21.	——	— 12	30.	——	— 11

CASE II.—*When the Multiplier is a composite number.**

Multiply 436 by 32.

RULE WITH EXAMPLE.—The multiplier, viz. 32, is formed by the two factors 4 and 8; therefore, instead of multiplying by 32, you may multiply by 4, and obtain the product 1744. Multiply this product by the other factor, 8, and you obtain 13952, the product of the 436 multiplied by 32.

436
4
1744
8
13952

* A composite number is the product of two factors; thus, 16 is a composite number, because formed of the factors 2 and 8, or 4 and 4; 21 is formed of 3 and 7; 27 of 3 and 9; 36 of 4 and 9, or 6 and 6, or 3 and 12.

	$ c.			$ c.	
31.	4264.78	× 16	37.	3687.45	× 54
32.	7436.87	× 18	38.	2468.76	× 56
33.	9687.48	× 24	39.	7849.78	× 72
34.	6748.67	× 27	40.	2040.74	× 108
35.	6430.67	× 36	41.	4368.76	× 132
36.	4264.56	× 49	42.	4968.76	× 144

CASE III.—*When the Multiplier exceeds* 12.

Multiply 3426 by 342.

RULE WITH EXAMPLE.—Place the multiplier under the multiplicand, units under units, &c. Multiply by the figure in the lowest place of the multiplier, viz. 2. Then multiply by the next figure of the multiplier, viz. 4; thus, 4 times 6 make 24; but take notice that you are to place the 4 of the 24 directly under that figure of the multiplier by which you are multiplying. Proceed in the same manner with the figure 3 of the multiplier. Then add together the products obtained.

3426	
342	
6852	
13704	
10278	
1171692	

Multiply 6487 by 230

230

194610

12974

1492010

Multiply $64.87c. by .203

.203

19461

129740

$13.16861c.*

43.	Mult. 98.476	by 6.42	51.	Mult. 65839	by 958
44.	——	— 75.8	52.	——	— 627
45.	——	— 295	53.	——	— 3.69
46.	——	— .496	54.	——	— 426
47.	——	— 85.7	55.	——	— 704
48.	——	— 43.68	56.	——	— 8.743
49.	——	— 7.896	57.	——	— .6007
50.	——	— 36.54	58.	——	— 9864

*The 16-hundredths represent cents, the other figures are parts of a

59. Multiply sixty-four thousand eight hundred and fifty-two, by nine hundred and eighty-seven.

60. Multiply four hundred and fifty-eight thousand six hundred and ninety-four, by eight thousand and seventy-six.

61. Multiply nine hundred and eighty-six thousand seven hundred and forty, by four hundred and nine.

62. There are 8766 hours in the year; how many hours are there in 20 years?

63. A grocer sells goods to the amount of $382.40c. per week; how much does he sell during the year?

64. In a flock of 648 sheep, how many feet were there?

65. Suppose the page of a book to contain 49 lines, and each line 47 letters; how many letters does the whole page contain?

66. In 264 dozen of wine, how many bottles are there?

67. A gentleman dying gave orders in his will that his fortune should be equally divided among his five children; each received $648; how much money did he leave?

68. Suppose that there were in the parish 896 houses, and that each house in the parish contained 5 persons; what would be the population of that parish?

69. How many miles will a person travel in 34 years, supposing he travels 9 miles per day, and there are 365 days in the year?

70. There were in a garden 8 trees, and upon each tree there were 268 apples; how many apples were there upon all the trees?

71. There were 4768 geese plucked, and 17 quills got from each goose; how many quills were got from all?

72. There were 27 desks to be made for the school, and each desk required 29 nails; how many nails were required for all the desks?

73. In a school, there were 6 windows in the boys' room, and 4 in the girls' room; in each window there were 8 panes of glass; how many panes of glass were there in all?

74. I knew two boys; one of them was lazy and lay in bed till 9, the other was an active little fellow who rose every morning at 6; how many hours did the active boy gain in a year that the other lost?

75. How often does a clock strike in a year, at the rate of 156 times a day?

76. How many pins may a boy point in 6 days who works 8 hours a day, and points 16,000 pins in an hour?

SIMPLE DIVISION.

DIVISION is the method of finding how often one number is contained in another.

MENTAL EXERCISES.

1. How many pine-apples, at 8 cents each, can be obtained for 40 cents? for 56 cents?

2. What will 13 yards of silk cost, if 5 yards cost 45 dimes?

3. A man bought 4 barrels of flour for 20 dollars, and gave 3 of them for cider, at 3 dollars a barrel; how many barrels of cider did he get?

4. In how many days can 15 men earn as much as 3 men can in 25 days?

5. If 1 man can ride 1 mile for 4 cents, how far can 2 men ride for 80 cents?

CASE I.— *When the Divisor does not exceed* 12.

Divide 252 by 6.

RULE WITH EXAMPLE.—Put the numbers down according to the annexed example. Find how often the figure by which you are to divide—viz. 6—is contained in the first, or first and second figures: thus, 6 in 2, there are none, then 6 in 25; there are 4 sixes in 25, and 1 over. Put down the 4 under the 5. Suppose the 1 placed before the 2, which would make it 12. Say, 6 in 12. There are 2 sixes in 12. Put the 2 under the 2. The number 6 is called the *Divisor;* 252, the *Dividend;* and 42, the *Quotient.*

6)252
42

EXERCISES.

2)4628	2)6824	3)6039	4)8408
2314	3412	2013	2102
$ c.		$ c.	
* 2)476.58	3)76389	4)857.36	6)76590
$238.29	25463	$214.34	12765
(1)	$ (2) c.	(3)	$ (4) c.
4)27645	5)687.64	6)79687	7)806.20
$ (5) c.	(6)	$ (7) c.	(8)
8)764.26	9)28676	10)642.68	11)46267
(9)	$ (10) c.		(11)
12)76426872	8)426876.42		7)96402687

* When there are decimals, point off from the right of the quotient as many for decimals as the decimals in the dividend exceed those in the divisor. For instance, if the dividend has three and the divisor one, point off two, &c.

$ (12) c.	$ (13) c.	(14)
9)642687.62	12)468768.76	8)46876400
$ (15) c.	**$ (16) c.**	**(17)**
6)760020.41	9)43026.01	7)41200602

						$ c.	
18.	Divide 56472689	by	2	29.	Divide 749680.23	by	2
19.	——	—	3	30.	——	—	3
20.	——	—	4	31.	——	—	4
21.	——	—	5	32.	——	—	5
22.	——	—	6	33.	——	—	6
23.	——	—	7	34.	——	—	7
24.	——	—	8	35.	——	—	8
25.	——	—	9	36.	——	—	9
26.	——	—	10	37.	——	—	10
27.	——	—	11	38.	——	—	11
28.	——	—	12	39.	——	—	12

CASE II.—*When the Divisor exceeds* 12, *and is a composite number.*

Divide 6789 by 28.

RULE WITH EXAMPLE.—The two factors that produce 28 are 4 and 7; divide them by 4 and by 7, as in the example. The quotient found is 242, but with two remainders, viz. 3 and 1. To obtain the complete remainder, multiply the first divisor, viz. 4, by the last remainder, viz. 3, and to the product add the first remainder, viz. 1; thus, $4 \times 3 + 1 = 13$, the true remainder.

$$28 \begin{cases} 4)6789 \\ \hline 7)1697 \text{ remains } 1 \\ \hline 242 \text{ remains } 3 \end{cases}$$

40.	426478	÷	16	46.	368745	÷	54
41.	743687	÷	18	47.	246876	÷	56
42.	968748	÷	24	48.	784978	÷	72
43.	674867	÷	27	49.	204076	÷	108
44.	643067	÷	36	50.	436876	÷	132
45.	426456	÷	49	51.	496876	÷	144

CASE III.—*When the Divisor contains several figures.*

Divide 431769 by 528.

RULE WITH EXAMPLE.—Put down the sum in this form. Consider whether the divisor, viz. 528, is contained in the first three figures of the dividend, viz. 431; you see at once that it is not; mark off then four figures, viz. 4317. You are now to find how often 528 is contained in 4317; for this purpose find how often the first figure of the divisor, viz. 5, is contained in the first two figures of the dividend, viz. 43. It is contained 8 times; put the 8 on the opposite side of the dividend from the divisor. Multiply 528 by 8, and put the product under the 4317; subtract, and there remains 93; bring to this the next figure of the dividend, viz. 6. You are now to find how often the divisor, 528, is contained in your new dividend, 936; find, as you did before, how often the first figure of the divisor, 5, is contained in the first figure of the dividend, 9. It is contained once; put the 1 beside the 8; multiply 528 by 1, and place the product under the 936; subtract, and you obtain 408; bring to this the next figure of the dividend, 9. Find, as before, how often 528 is contained in 4089. Because 5 is contained 8 times in 40, you will be inclined to try 8. Do it, and you will find that you obtain the product 4224, but this is greater than the 4089 from which you have to subtract it; when this is the case, you must try a smaller figure: in this case take 7.

```
528)4317,69(817 quotient.
    4224
    ----
     936
     528
     ---
    4089
    3696
    ----
     393 remainder.
```

52.	Divide 74236 by 42	56.	Divide 74236 by 46
53.	—— 43	57.	—— 689
54.	—— 44	58.	—— 799
55.	—— 45	59.	—— 410

60.	Divide 87403 by	611	69.	842.786 ÷	78
61.	——	312	70.	976842 ÷	946
62.	——	584	71.	4201.076 ÷	4.38
63.	——	708	72.	6416879 ÷	648
64.	——	246	73.	286.4976 ÷	39.6
65.	——	357	74.	2876.407 ÷	410.7
66.	——	428	75.	6412930 ÷	7481
67.	——	502	76.	980.0147 ÷	30.76
68.	——	618	77.	4078948 ÷	4278

If the decimals in the dividend exceed those in the divisor, *point off* from the quotient *as many as the decimals in the dividend exceed those in the divisor.* That is, for instance, if the divisor has three and the dividend three, from the quotient point off NONE. If the divisor has four and the dividend two, add two to the dividend to make them equal, and point off NONE. If the divisor has two and the dividend five, point off THREE.

78.	4078948 ÷	.0008	82.	78.64126 ÷	7410
79.	7198641 ÷	.2864	83.	3002602 ÷	.8000
80.	364.1201 ÷	.1407	84.	402026.4 ÷	.0069
81.	248070.8 ÷	.2600	85.	9687600 ÷	.4300

86. Divide six millions seven hundred and ninety-four thousandths, by four hundred and eighty thousand six hundred and nine millionths.

87. What is the ninth of $6037.45?

88. A ship sailed in four weeks 1262 miles; how much is that per day?

89. If a vessel contains 648 gallons of water, how long will it take to discharge it all, at the rate of .18 of a gallon a minute?

90. The population of Ireland is about eight millions, and there are about 30,000 square miles of surface; how many persons to each mile?

91. The Earth is about 95 millions of miles distant from the Sun; how many days would a horse take in reaching the Sun, supposing he went at the rate of 45 miles per day?

92. The rays of light come from the Sun to the Earth

in $8\frac{1}{4}$ minutes, or 495 seconds; at what rate does light move per second, the distance from the Sun to the Earth being 95173000 miles?

93. The circumference of the Earth is about 25000 miles; how many days would a man take to walk round it at the rate of 27 miles per day?

CASE IV.—*When a Multiplier has a fraction.*

RULE WITH EXAMPLE.—Place the multiplier under the multiplicand, as usual, then multiply by the upper figure of the fraction and divide by the under. Proceed with the other part of the multiplier as if there was no fraction there, placing units under units, &c. Add the quotient in with the others when summing up.

68340
$5\frac{3}{4}$
4)205020
51255
341700
392955

94. Multiply 7346 by $3\frac{1}{2}$.
95. " 86214 " $6\frac{1}{3}$.
96. " 9567 " $34\frac{4}{7}$.
97. " 3278654 " $680\frac{3}{4}$.
98. " 7268 " $17\frac{5}{6}$.
99. " 2897 " $19\frac{8}{9}$.
100. " 462 " $325\frac{3}{5}$.
101. " 601834 " $65\frac{1}{11}$.
102. " 10837464 " $94\frac{3}{8}$.
103. " 9746 " $13\frac{1}{12}$.

CASE V.—*When a Divisor has a fraction.*

RULE WITH EXAMPLE.—Multiply the divisor by the under figure of the fraction, adding in the upper, and multiply the dividend also by the under figure; then divide by short or long division as the case may require.

$2\frac{3}{4}$) 67846
4) 4
11) 271384
$24671\frac{8}{11}$

104. Divide 8245 by $2\frac{3}{4}$.
105. " 678 " $1\frac{1}{2}$.

106. Divide 486213 by $7\frac{2}{7}$.
107. " 98464 " $10\frac{2}{11}$.
108. " 3825 " $4\frac{1}{3}$.
109. " 2424 " $1\frac{1}{3}$.
110. " 38465 " $2\frac{2}{3}$.
111. " 6794 " $13\frac{2}{21}$.
112. " 463820 " $25\frac{4}{7}$.
113. " 978654 " $134\frac{4}{31}$.

NEW BRUNSWICK CURRENCY.

ADDITION.

$563.52	$29.32	$0.32	$1.00
43.65	6.53	1.06	0.37
9.05	18.09	3.03	0.62
283.26	4.28	90.02	5.00
9.00	2.50	1.05	4.35
$908.48			

SUBTRACTION.

$8765.32	$432.53	$15.05	$7.19
387.62	187.50	8.39	1.65
8377.70			

MULTIPLICATION.

$768.54	$527.59	$687.35	$28.05
2	3	4	5
$1537.08	$	$	$

DIVISION.

9)$8406.45	3)$980.10	5)$27.65	6)$8654.04
934.05			

1. Add the following sums: \$1.05, \$0.55, \$2.63, \$4.05, \$7.85, \$60.30.

2. James owed John \$300.00; he has paid him \$175.55; what does he still owe him?

3. If 1 barrel flour cost \$6.25, what will 5 barrels cost? at the same rate, what will 25 barrels cost?

4. If \$972 is to be divided between 108 men, what does each man receive?

5. What is the sixth part of \$836.34?

6. What will eight barrels of potatoes cost at \$1.25 each?

7. What is the difference between \$60.00 and \$49.99?

8. How many dollars in 5534 cts., and how many cents over?

9. What will 235 grammars cost at 33 cts. apiece? Express the answer in dollars and cents.

REDUCTION.

Reduction is the bringing of one denomination to another without altering its value.

Case I.—*To bring from a higher to a lower.*

Rule with Example.—Multiply by as many of the lower as make one of the higher. Thus, to bring 2*l.* to shillings, multiply 2 by 20, because there are 20*s.* in a pound.

£2
20
—
40*s.*

Case II.—*To bring a lower to a higher.*

Rule with Example.—Divide by as many of the lower as make one of the higher. Thus, to bring 40 shillings to pounds, divide by 20, because there are 20 shillings in a pound.

s.
2,0)4,0
———
£2

Bring £4 9*s*. 6½*d*. to farthings.

Multiply the 4 by 20, and add the 9*s*. to the product; this will give the number of shillings, 89*s*. Multiply then by 12, adding 6 pence; this will give the number of pence, 1074*d*. Multiply by 4, and add the two farthings to the product; this will give the number of farthings in 4*l*. 9*s*. 6½*d*.

£	*s*.	*d*.
4	9	6½
20		
—		
89		
12		
—		
1074		
4		
—		
4298		

Bring 4298 farthings to pounds.

Divide the farthings by 4; this will give 1074 pence and 2 farthings. Divide this by 12, and 88 shillings and sixpence is obtained. Divide by 20, and the quotient is 4 pounds 9 shillings, in all £4 9*s*. 6½*d*.

4)4298
—
12)1074-½
———
2,0) 8,9 6
———
£4 9 6½

MENTAL EXERCISES.

1. How many shillings are there in £3 10*s*.? in £4 5*s*.? in £6 13*s*.?
2. How many pence are there in 1*s*. 8*d*.? in 2*s*. 6*d*.? in 15*s*.?
3. How many pounds are there in 75*s*.? in 163*s*.? in 194*s*.?
4. In four miles how many furlongs are there?
5. How many rods are there in one mile?
6. How many hours are there in a week?

EXERCISES.

STERLING MONEY.

1. How many farthings are there in 12*l*. 7*s*. 6½*d*.?
2. In 264*l*. 9*s*. 10*d*. how many pence?

3. Reduce 364*l.* 14*s.* 9½*d.* to farthings.
4. In 274*l.* 12*s.* 8½*d.* how many halfpence?
5. How many pence are there in 276 guineas?
6. In 298 crowns, how many farthings?
7. Reduce 3648 sixpences to farthings.
8. In 42768 farthings, how many pence?
9. How many pounds are there in 67890 shillings?
10. In 426876 farthings, how many pounds?
11. How many guineas are there in 36789 shillings?
12. In 68794 pence, how many crowns?
13. How many fourpences are there in 37689 shillings?
14. In 2470*l.* how many crowns?
15. How many pounds in 39076 half-crowns?
16. In 29685 twopences, how many shillings?
17. In 43687 crowns, how many threepences?
18. How many fivepences are there in 4796 crowns?
19. In 76971 halfpence, how many fourpences?
20. In 798302 pounds, how many sixpences?
21. How many crowns are there in 7968 guineas?
22. In 79201 half-guineas, how many seven-shilling pieces?

AVOIRDUPOIS WEIGHT.

23. In 7 cwt. 2 qrs. 14 lbs., how many pounds?
24. In 3 qrs. 13 lbs. 12 oz., how many ounces?
25. How many pounds are there in 1427 oz.?
26. Bought 24 bags of hops, each weighing 2 cwt. 2 qrs. 13 lbs.; how many pounds in the whole?
27. In 3 cwt. 2 qrs. 14 lbs. of sugar, how many parcels are there, each containing half a pound?

TROY WEIGHT.

28. In 24 lbs. of gold, how many pennyweights?

29. In 2468 grains of gold-dust, how many ounces?

30. In a silver snuff-box weighing 10 oz. 16 dwt., how many grains?

31. How many silver tablespoons, each weighing 4 oz. 16 dwt., can be made out of 2 lbs. 8 oz. 13 dwt. of silver?

32. What quantity of gold will it require to make twelve gold ornaments, each weighing 1 oz. 18 dwt. 12 gr.?

33. A gentleman sent a silver tankard to a silversmith, and ordered him to make it into spoons, each to weigh 2 oz. 12 dwt.; how many spoons did he make, the tankard weighing 4 lbs. 7 oz.?

APOTHECARIES' WEIGHT.

34. In 4 lbs. 8 oz. 4 drams, 2 scr., how many grains?

35. In 2487 grains, how many ounces?

36. In 7 ounces, 5 drams, 3 scruples, how many scruples?

37. A patient is required to take daily 2 drams, 2 scruples of bark; how long will 7 lbs. of bark last him?

LONG MEASURE.

38. In 76 miles, 6 furlongs, how many perches?

39. In 47968 inches, how many yards?

40. From Dublin to Liverpool is about 38 leagues; how many yards is it?

41. From Dublin to Cork is about 130 miles; how often does a coach-wheel turn round between the two places, the circumference of the wheel being 12 feet?

42. From Dublin to Belfast is about 90 miles; how often does a coach-wheel turn round between the two places, the circumference of the wheel being 12 feet?

CLOTH MEASURE.

43. In 246 yards, how many nails?

44. In 4786 nails, how many yards?

45. From a piece of linen containing 24 English ells, how many shirts can be made, each requiring $3\frac{1}{2}$ yards?

46. How many suits may be made from 26 yds. 2 qrs., each suit containing $3\frac{1}{2}$ yards?

MEASURE OF CAPACITY.

47. In 24 gallons, 2 quarts, 1 pint, how many pints?

48. In 4687 pints, how many gallons?

49. In 24 chald. 5 bushels, 3 pecks, how many pecks?

50. How many bushels are there in 4796 pecks?

51. In a hogshead of wine containing 63 gallons, how many gills are there?

TIME.

52. In 6 weeks, 3 days, 14 hours, how many hours are there?

53. In 74697 minutes, how many days?

54. How many minutes has a boy lived, who is 10 years and 6 weeks old?

55. A clock strikes 156 times during the day; how often does it strike in 6 years?

COMPOUND ADDITION.

THIS is the adding of numbers containing two or more distinct denominations.

RULE.—Place the numbers to be added so that figures of the same name may stand directly under each other. Begin at the right-hand column or lowest denomination. Add it up, and divide the amount by as many of the same as it takes to make one of the next higher. Set down the remainder, and add the quotient to the next higher, and so on till all are added.

£	s.	d.
42	14	6¼
26	12	4½
34	16	7
25	13	8¾
129	17	2½

cwt.	qrs.	lbs.
4	2	12
2	3	14
6	1	7
3	2	24
17	2	1

ac.	rd.	per.
32	3	16
16	2	21
76	1	13
24	2	27
150	1	37

(1)

£	s.	d.
43	16	7¾
65	13	4
84	12	2½
92	11	3
41	16	6¾

(2)

£	s.	d.
35	12	4
72	17	6¾
13	8	7½
16	14	8¼
72	12	4½

(3)

£	s.	d.
36	13	4½
12	8	6¼
11	19	10½
17	14	8¾
28	12	6¼

(4)

cwt.	qrs.	lbs.
7	3	16
8	1	19
4	2	27
8	1	13

(5)

per.	yd.	ft.
16	3	2
17	4	1
24	5	0
23	2	2

(6)

qrs.	lbs.	oz.
1	14	12
2	24	15
3	13	7
2	17	13

(7)

£	s.	d.
623	16	4¼
846	14	6
764	12	7½
276	11	4
876	10	5¾
798	4	10
473	16	11¼

(8)

£	s.	d.
264	16	6
146	17	8½
869	19	7¼
796	18	0
210	6	4
407	2	2¾
864	17	6½

(9)

£	s.	d.
560	16	9¼
216	14	4
378	12	8¾
924	17	1
623	9	4
146	16	7½
876	11	10¾

(10)

ac.	rd.	per.
46	3	27
12	2	16
61	0	34
46	3	17

(11)

fur.	per.	yd.
7	22	2
6	22	4
9	16	3
6	14	5

(12)

ac.	rd.	per.
37	2	12
41	3	21
62	1	17
47	2	34

(13)

	£	s.	d.
For paving yard....	4	7	0
—new-laying floor	2	5	6
1000 bricks.....	1	16	0
For mortar.....	0	14	6
— hair.....	0	2	6

(14)

	£	s.	d.
40 copy-books.....	1	4	0
100 slates.....	0	10	6
100 slate-pencils....	0	0	8
8 qrs. of paper..	0	9	4
500 quills.....	0	7	7

15. A merchant, the first year he was in business, sold goods to the amount of 476*l.* 18*s.* 7*d.*; the second year 678*l.* 14*s.* 6½*d.*; the third year 878*l.* 7*s.* 0¾*d.*; the fourth year 917*l.* 18*s.* 7*d.*; the fifth year 1312*l.* 19*s.* 8¾*d.*; what was the amount of goods sold during the five years?

16. A silversmith made three dozen spoons, weighing 5 lb. 9 oz. 8 dwt.; a teapot, weighing 3 lb. 2 oz. 16 dwt. 16 grs.; two pair silver candlesticks, weighing 4 lb. 6 oz. 17 dwt.; a dozen silver forks, weighing 1 lb. 8 oz. 19 dwt. 22 grs.; what was the weight of all the articles?

17. A person went to market and laid out on the purchase of tea 2*l.* 16*s.* 7*d.*; on coffee 2*l.* 7*s.* 8¾*d.*; on sugar 3*l.* 14*s.*; on beef 2*l.* 16*s.* 6*d.*; on mutton 37*s.*; on veal 9*s.* 7½*d.*; on various other articles 3*l.* 15*s.* 7¾*d.*; how much was laid out in all?

18. The bricklayers were engaged about a house 23 weeks, 4 days, and 8 hours; the carpenters 14 weeks, 6 days, and 9 hours; the painters 12 weeks, 5 days, 7 hours, and 34 minutes; the upholsterer 5 weeks, 10 hours, and 42 minutes; how long were these different workmen engaged about the house?

19. The expenses of building a house were as follows:—architect 198*l.*; bricklayer 4762*l.*; mason 2141*l.* 16*s.* 6*d.*; carpenter 2768*l.* 17*s.* 9*d.*; plumber 396*l.* 14*s.*; glazier 478*l.* 16*s.* 6*d.*; painter 421*l.* 18*s.* 11½*d.*; and paper-hanger 243*l.* 18*s.* 7*d.*; what was the amount?

20. A man rode 35 miles, 2 furlongs, 34 perches; walked 24 miles, 6 furlongs, 25 perches, 2 yards; then rode again 42 miles, 7 furlongs, 4 yards; then walked again 15 miles, 4 furlongs, 38 perches, 3 yards; what was the length of his journey?

21. I bought four fields; in the first there were 6 acres, 3 roods, 12 perches; in the second 7 acres, 2 roods; in the third 9 acres and 13 perches; in the fourth 5 acres, 2 roods, 36 perches. How much in all?

COMPOUND SUBTRACTION.

THIS is finding the difference between numbers having different denominations.

RULE.—Place the less number under the greater, having figures of the same name directly under each other. Begin at the right hand or lowest denomination, subtract the under from the upper, and write the remainder directly below.

If the under figure is greater than the figure above, add to the upper figure as many of the same as it takes to make one of the next higher, then subtract the lower figure and set down the remainder. Carry one to the next number of the subtrahend.

£	*s.*	*d.*
49	17	$4\frac{1}{2}$
17	14	$2\frac{1}{4}$
32	3	$2\frac{1}{4}$

ml.	*fur.*	*per.*
4	6	20
1	7	35
2	6	25

yrs.	*wks.*	*dys.*
43	4	2
24	6	5
18	49	4

(1)

£	*s.*	*d.*
78	14	$6\frac{1}{4}$
29	17	$8\frac{1}{4}$

(2)

£	*s.*	*d.*
47	16	$8\frac{1}{2}$
28	17	$6\frac{1}{4}$

(3)

£	*s.*	*d.*
86	17	4
27	19	$0\frac{3}{4}$

(4)

£	*s.*	*d.*
68	13	7
28	16	$10\frac{1}{4}$

(5)

£	*s.*	*d.*
94	0	0
24	17	$9\frac{1}{2}$

(6)

£	*s.*	*d.*
83	17	$9\frac{1}{2}$
47	0	$0\frac{3}{4}$

(7)

ac.	*rd.*	*per.*
42	1	25
17	2	35

(8)

dys.	*hrs.*	*min.*
47	12	10
17	20	40

(9)

per.	*yd.*	*ft.*
16	2	1
12	4	2

(10)

£	*s.*	*d.*
56	12	$0\frac{1}{2}$
17	12	$0\frac{3}{4}$

(11)

£	*s.*	*d.*
24	19	$8\frac{1}{2}$
7	12	9

(12)

£	*s.*	*d.*
48	12	8
17	19	$8\frac{1}{2}$

(13)

yrs.	*wks.*	*dys.*
32	3	4
16	7	6

(14)

fur.	*per.*	*yd.*
7	10	1
2	19	4

(15)

ac.	*rd.*	*per.*
36	0	20
13	2	30

(16)

cwt.	*qrs.*	*lbs.*
16	2	12
12	3	24

(17)

cwt.	*qrs.*	*lbs.*
17	1	10
10	2	27

(18)

qrs.	*lbs.*	*oz.*
19	22	12
11	26	14

19. A tobacconist received 16 cwt. 2 qrs. 25 lb. of tobacco, and sold 12 cwt. 3 qrs. 26 lb.; how much has he unsold?

20. Three dozen silver tablespoons weighed 5 lb. 9 oz. 8 dwt., while three dozen silver teaspoons weighed only 1 lb. 9 oz. 16 dwt. 18 grs.; what was the difference in weight?

21. A cow and calf were worth 16*l.* 7*s.* $10\frac{1}{2}$*d.*; but the calf alone was worth 2*l.* 6*s.* $7\frac{3}{4}$*d.*; can you tell me the value of the cow?

22. A traveller walked on Monday 32 miles, 5 furlongs; on Tuesday he walked 27 miles, 7 furlongs, 35 perches; how much did his journey of Monday exceed that of Tuesday?

23. A farmer had 576 bu. 1 pk. 2 qt. of wheat; he sold 139 bu. 2 pk. 3 qt. 1 pt.; how much remained unsold?

24. What is the difference in length of one web of cloth, measuring 36 yds. 3 qrs. 3 nls.; and two webs, each measuring 23 yds. 2 qrs. 2 nls.?

25. In a field containing 241 acres, 3 roods, 16 perches, 176 acres, 2 roods, 23 perches were sown with wheat; the remainder of the field was sown with barley; how much was sown with barley?

26. A vessel, with its cargo, was worth fifty-six thousand four hundred and thirty-nine pounds; the cargo was worth thirty-four thousand nine hundred and nine pounds, eight shillings and six pence; what was the value of the ship?

27. One cask contained 23 gallons, 3 quarts, 1 pint; another 37 gallons, 2 quarts, 3 gills; how much more did the one contain than the other?

28. Two vessels sailed for England; one of them was 9 weeks, 6 days, and 14 hours on her voyage; the other got to England in 7 weeks, 5 days, and 19 hours; how much less time did the one go in than the other?

COMPOUND MULTIPLICATION.

THIS is the multiplying of numbers containing two or more different denominations.

RULE.—When the multiplier does not exceed 12, beginning at the lowest, multiply each figure by the multiplier, and divide the product by as many of the same as it takes to make one of the next higher. Set down the remainder, and add the quotient to the product of the next higher, and so on till all are multiplied.

£	s.	d.	lbs.	oz.	dwt.	yds.	qrs.	nls.
57	16	8¾	18	6	14	24	2	3
		4			4			4
231	6	11	74	2	16	98	3	0

(1)

lbs.	*oz.*	*dwt.*
24	3	12
		8

(2)

yds.	*qrs.*	*nls.*
36	2	3
		9

(3)

cwt.	*qrs.*	*lbs.*
6	2	18
		7

(4)

£	*s.*	*d.*
78	16	$7\frac{3}{4}$
		$11\frac{1}{2}$

(5)

£	*s.*	*d.*
59	19	$7\frac{1}{2}$
		$12\frac{3}{4}$

(6)

£	*s.*	*d.*
67	16	$10\frac{1}{2}$
		9

7. A mail-coach travelled at the rate of 7 miles, 5 furlongs, 25 perches, per hour; how far would it go in twelve hours?

8. Eight men cut down a field of hay; each man cut 3 acres, 2 roods, 27 perches. How much was mown?

9. Sold eight silver teapots, each weighing 3 lb. 9 oz. 18 dwt. 13 grs.; how much did they all weigh?

10. A farmer bought 12 cows; they cost him 9*l.* 12*s.* 6*d.* each; how much did they all come to?

11. Bought 11 barrels of herrings at 1*l.* 8*s.* $7\frac{1}{2}$*d.* each; what did the whole cost?

CASE II.—*When the Multiplier exceeds* 12.

Multiply £4 6*s.* 3*d.* by 23.

RULE WITH EXAMPLE.—When the multiplier, viz. 23, is under a hundred, multiply the multiplicand, 4*l.* 6*s.* 3*d.*, by *one* ten, and the product, 43*l.* 2*s.* 6*d.*, by the number of tens, 2; then multiply the top line, viz. 4*l.* 6*s.* 3*d.*, by the number of units, 3; add this to the amount obtained by multiplying by the number of tens, 2, and the sum required is obtained, viz. 99*l.* 3*s.* 9*d.*

£	*s.*	*d.*	
4	6	3	× 3
		10	
43	2	6	
		2	
86	5	0	
12	18	9	
£99	3	9	

Multiply 4*l.* 6*s.* 3*d.* by 423. When the multiplier, 423, is a hundred, or above it, multiply the multiplicand, 4*l.* 6*s.* 3*d.*, twice by 10, and the product, 431*l.* 5*s.*, by the number of hundreds, 4; then multiply the product of the first 10, 43*l.* 2*s.* 6*d.*, by the number of tens, 2; and place it under the product of the 4, under 1725*l.* 0*s.* 0*d.*; multiply now the first line, 4*l.* 6*s.* 3*d.*, by the number of units, viz. 3; put the product obtained under the product of the tens, and add the products of the hundreds, the tens, and the units together for the answer.—For thousands, multiply by four tens, and proceed in the same manner.

£	s.	d.	
4	6	3	×3
		10	
43	2	6	×2
		10	
431	5	0	
		4	
1725	0	0	
86	5	0	
12	18	9	
1824	3	9	

12. Multiply £64 16*s.* 7½*d.* by 68.

13. Multiply 17 lbs. 7 oz. 14 dwts. by 478.

14. Multiply £476 15*s.* 8*d.* by 647.

15. Multiply 4 mls. 6 fur. 20 per. by 7426.

16. What is the weight of 36 hhds. of tobacco, each hhd. weighing 5 cwt. 3 qrs. 14 lbs. 13 oz.?

17. How much molasses is contained in 25 hhd., each hhd. having 61 gal. 1 qt. 1 pt.?

18. A farmer has 18 lots, and each lot contains 41 a. 2 r. 11 p.; how many acres does he own?

19. If a railroad-car goes 21 m. 2 fur. 10 r. per hour, how far will it go in 15 hours?

20. How much cloth will it take to make the clothes for a regiment of soldiers containing 1143 men, if each suit requires 7 yds. 3 qrs. 2 nls. 1 in.?

21. If a steamship in going round the world travel 211 m. 4 fur. 32 per. a day, how far will she go in 367 days?

22. In 27 barrels there was on an average in each, 29 gallons, 3 quarts, 1 pint; how much in all?

23. I can go to a certain town by the railway in nine hours, 25 minutes, and 30 seconds; it would take me, at least, five times as long to go by the stage-coach; how long would the coach take?

24. How much water will be contained in 96 hogsheads, each containing 62 gal. 1 qt. 1 pt. 1 gl.?

25. A gentleman spends, per day, 1*l.* 7*s.* 6*d.*; how much does he spend in a year?

26. If one spoon weigh 3 oz. 5 dwt. 15 grs., what is the weight of 120 spoons?

27. A person spent 12*s.* 6*d.* per day, and found that at the end of the year he had saved 25 guineas; what was his annual income?

28. A farmer bought 568 sheep; he paid for them 1*l.* 12*s.* 6*d.* each; how much did the whole flock cost him?

COMPOUND DIVISION.

COMPOUND DIVISION is when the dividend consists of several denominations.

RULE.—Divide the highest denomination by the quantity, and if any thing remains multiply it by as many of the next lower as it takes to make one of the same, adding in the given number of the next lower. Divide the number thus obtained by the divisor, as before; and so on. Proceed by long or short division, as the case may require.

£	s.	d.
2)74	16	8½
£37	8	4¼

£	s.	d.
6)8	12	7½
£1	8	9¼

£	s.	d.	
47)64	7	8½	(1
	47		
	17		
	20		
47)347			(7
	329		
	18		
	12		
47)224			(4
	188		
	36		
	4		
47)146			(3
	141		
	5 remain.		

yds.	qrs.	nls.
4)25	3	2
6	1	3¾

cwt.	qrs.	lbs.
3)19	3	8
6	2	12

(1)

cwt.	qrs.	lbs.
6)14	2	17

(2)

qrs.	lbs.	oz.
9)19	11	13

(3)

yds.	qrs.	nls.
7)64	2	3

(4)

yds.	qrs.	nls.
9)36	3	1

(5)

lbs.	oz.	dwt.
4)67	8	17

(6)

oz.	dwt.	grs.
7)43	16	22

(7)

dys.	hrs.	min.
8)35	17	6

8. Divide 19 cwt. 3 qrs. 8 lbs. by 3.

9. Divide 18 lbs. 6 oz. 14 dwts. by 17.

10. Divide 16 per. 2 yds. 1 ft. by 9.

11. Divide 64 yds. 2 qrs. 3 nls. by 42.

12. Divide 36 acr. 3 rd. 27 per. by 31.

13. A tradesman had in the savings-bank 96*l.* 16*s.* 6*d.*; this sum he had saved in 5 years; how much did he save on an average each year?

14. Ten men rented a house at 46*l.* 14*s.* 8*d.*; how much had each to pay?

15. A father left 426*l.* 16*s.* 6*d.* to be divided equally among his eight children; how much did each get?

16. Twelve persons subscribed 28*l.* 15*s.* 6*d.* per annum for the support of a school; how much did each subscribe?

17. A piece of cloth containing nine yards was bought for 4*l.* 16*s.* 8*d.*; how much was that per yard?

18. Ten sacks of potatoes weighed 19 cwt. 3 qrs. 13 lbs. 14 oz.; what was the weight of each sack?

19. How many parcels, each containing 4½ lbs., can be made out of 2 cwt. 2 qrs. 23 lbs.?

20. If 36 bags of cotton weighed 49 cwt. 3 qrs. 13 lbs., how much did one weigh?

21. A surveyor, who had 19 miles, 7 fur., 36 perches of road to keep in repair, appointed 12 men to the work; what length of road had each to attend to?

22. A man travelled in nine days 150 miles, 4 furlongs, 18 perches, 3 yards; how much did he travel per day on an average?

23. Bought sixty-five yards of cloth, for which I paid 72*l.* 14*s.* 4½*d.*; what did it cost per yard?

24. A rich man divided 168 bu. 1 pk. 6 qt. of corn among thirty-six poor men; how much did each receive?

25. If in 30 days a man travels 746 ml. 5 fur., travelling the same distance each day, what is the length of each day's journey?

26. A farmer rents a farm at 596*l.* 16*s.* 6*d.* per annum; he wishes to lay past as much every week as may pay the rent; how much must he save each week?

27. A gentleman had an estate of 3468 acres, for which he received per annum 879*l.* 16*s.* 8*d.*; how much was it let for per acre?

28. A tax-gatherer collected 747*l.* 15*s.* 9*d.* per month the first six months of the year, and 547*l.* 17*s.* 8*d.* per

month the last six months of the year; how much did he collect daily on an average for the whole year?

29. In a savings-bank in a village there was deposited 268*l.* 17*s.* 8*d.*, and there were 56 depositors, or people who had placed money in the bank; how much had each depositor on an average?

MIXED QUESTIONS ON THE COMPOUND RULES.

1. What is the weight of the sugar in 4 hogsheads, when each weighs 13 cwt. 3 qrs. 14 lbs.; the empty hogsheads weigh 1 qr. 10 lbs.?

2. What is the net weight of 9 chests of tea, each weighing 5 cwt. 2 qrs. 19 lbs.; empty chests weigh 18 lbs.?

3. How many hogsheads of sugar, each containing 13 cwt. 2 qrs. 14 lbs., may be put on board a ship of 324 tons burden?

4. St. Paul's bell, in London, weighs 5 tons 2 cwt. 1 qr. 22 lbs.; by how much does the great bell of Moscow exceed it, which weighs 198 tons 2 cwt. 1 qr.?

5. In 27 barrels there was on an average in each, 29 gallons, 3 quarts, 1 pint; how much in all?

6. If it take 5 yds. 2 qrs. 3 nls. to make a suit of clothes, how many suits can be made from 182 yards?

7. I have a field of corn, consisting of 123 rows, and each row contains 78 hills, and each hill has 4 ears of corn; now, if it take 8 ears of corn to make a quart, how many bushels does the field contain?

8. How many steps, 2 ft. 8 in., will a man take in walking 15 miles?

9. A man, on being asked his age, said he had spent the first 19 years of his life in England, the next 9 in America; during 27 following, 6 years, 11 months, 3 weeks, 6 days, were spent in France, 16 years, 4 months, 3 days in the United States, and the remainder in his native

J.W. LAWRENCE COLLECTION

country; how old was he, and in which land had he lived the longest?

10. A man has 3 farms; the first contains 100 ac. 3 ro. 15 rds.; the second, 161 ac. 2 ro. 28 rds.; the third, 360 ac. 3 ro. 5 rds. He gave his oldest son a farm of 112 ac. 3 ro. 30 rds.; his second, a farm of 316 ac. 1 ro. 18 rds.; his youngest, a farm of 168 ac. 3 ro. 13 rds.; and sold the remainder of his land at $1.35 a rod. To what did it amount?

11. A farmer has two meadows, one containing 9 a. 3 r. 37 p., the other contains 10 a. 2 r. 25 p.; also three pastures, the first containing 12 a. 1 r. 1 p., the second containing 13 a. 3 r., and the third 6 a. 1 r. 39 p.; by how many acres does the pasture exceed the meadow land?

12. Divide $462 among 5 men and 6 women, giving to each man thrice the share of a woman.

13. If 3 qrs. 16 lbs. of silk is sufficient for a thread of 100 miles in length, what length of a similar size will 5 oz. spin?

14. If one man consumes in a week 7 lbs. 12 oz. 3 drams of bread, how many men will consume 13 cwt. 2 qrs. 15 lbs. 6 oz. in the same time?

15. Bought 50 casks of molasses, each containing 58 gals. 3 qts., at 50 cts. per gal.; afterwards 215 gals. 2 qts. leaked out, and the remainder was sold at 64 cents per gal.; what was the result of the operation?

SIMPLE PROPORTION.

WHEN we have three numbers given, this rule teaches how to find a fourth number, which may have the same proportion to the third number that the second has to the first.

Thus, if the three given numbers be 1, 2, 3, it is required to find a fourth number which will have the same proportion to the 3 that the 2 has to 1. Now, the 2 is double the 1; therefore the required number must be double of the 3, that is, 6. To express proportion, the numbers are put down thus, 1 : 2 :: 3 : 6, and are read thus, 1 is to 2 as 3 is to 6.

CASE I.—*To find out a fourth proportional to three given numbers.*

Find a fourth proportional to the numbers 4, 8, 6.

RULE WITH EXAMPLE.—Place them thus, and multiply the second and third numbers together, and divide by the first; the quotient is 12, which bears the same proportion to 6 that 8 does to 4.

```
4 : 8 :: 6 :
       6
    ----
4) 48
   --
   12
```

To 3, 6, 12, find a fourth proportional. *Ans.* 24.
To 6, 8, 3, find a fourth proportional. *Ans.* 4.
To 3, 6, 8, find a fourth proportional. *Ans.* 16.
To 6, 12, 4, find a fourth proportional. *Ans.* 8.
To 10, 150, 68, find a fourth proportional. *Ans.* 1020.
Find a fourth proportional to 1020, 68, 150. *Ans.* 10.
Find a fourth proportional to 150, 10, 1020. *Ans.* 68.
Find a fourth proportional to 68, 1020, 10. *Ans.* 150.

Find a fourth proportional to the following numbers:—

To 2 tons, 17 tons, and 25*l.* *Ans.* 212*l.* 10*s.*
To 10 lbs., 150 lbs., and 5*s.* *Ans.* 75*s.*
To 9 yds., 36 yds., and 18*s.* *Ans.* 72*s.*
To 5 lbs., 1 lb., and 15*s.* *Ans.* 3*s.*
To 4 yds., 18 yds., and 2*s.* *Ans.* 9*s.*
To 1 cwt., 215 cwt., and 50*s.* *Ans.* 10750*s.*
To 5 tons, 50 tons, and 27*l.* *Ans.* 270*l.*

CASE II.—*When the two first terms are of different denominations, reduce them to the same.*

To 3 oz., 112 lbs., and 2*s*., find a fourth proportional.

RULE WITH EXAMPLE.—Multiply 112 lbs. by 16, to bring them to the same as the first term,—viz. to ounces. When this is done, the numbers stand thus,—3 oz., 1792 oz., 2*s*.

oz.	*lbs.*	*s.*
3 :	112 :	2
	16	
	672	
	112	
	1792	
	2	
	3)3584	
	1194,2	

Find the fourth proportional to the following numbers:—

To 2 qrs., 240 yds., 12*s*. *Ans.* 5760*s*.
To 5*s*., 80*l*., 1 yd. *Ans.* 320 yds.
To 5 cwt., 6000 lbs., 8*s*. *Ans.* 85*s*., 500 remains.
To 5*s*. 6*d*., 140*s*., 2 yds. *Ans.* 50 yds., 60 remains.
To 3*s*. 4*d*., 1*l*. 10*s*., 1 yd. *Ans.* 9 yds.

CASE III.—*When the third term is of different denominations, reduce it to the lowest.*

To 2 lbs., 112 lbs., and 5*s*. 6*d*., find a fourth proportional.

RULE WITH EXAMPLE.—Multiply the 5*s*. by 12, adding the 6*d*. It then stands thus,—2 lbs., 112 lbs., 66*d*. Proceed as formerly.

lbs.	*lbs.*	*s.*	*d.*
2 :	112 : :	5	6 :
	66	12	
	672	66	
	672		
	2)7392		
	3696 pence.		

Find the fourth proportional to the following numbers:—

To 2 tons, 14 tons, 28*l.* 10*s.* *Ans.* 3990*s.*
To 5 brls., 100 brls., 18*s.* 6*d.* *Ans.* 4440*d.*
To 4 lbs., 112 lbs., 5¼*d.* *Ans.* 588 farthings.

If 24 lbs. of butter cost £1 8*s.*, what is the price of 3 lbs.?

RULE WITH EXAMPLE.—In this question there are two things mentioned—butter and money. Is the answer to the question to be given in butter or money? You see at once it is to be given in money. Put down the money, 1*l.* 8*s.*, for the third term. Having done this, you have now to consider where you are to place the 24 lbs. and the 3 lbs. Read over the question, and you will see that the answer must be less than the third term; for 3 lbs. will not cost so much as 24 lbs. If, then, the answer is to be less, put the less number for the second term, and the greater for the first. In all questions let the third term be the same as the answer; and if the answer is to be greater than the third term, put the *greater* second; if it is to be less, put the *less* second.

lbs.	*lbs.*	£	*s.*
24 :	3 : :	1	8
		20	
		—	
		28	
		3	
		—	
		2)84	
24		—	
		12)42	
		—	
		3*s.*	6*d.*

1. If 2 lbs. of tea cost 9*s.*, what will 24 lbs. cost?

2. Bought 2 oz. tea for 10 cents; what is that per lb.?

3. For 5 pairs of gloves, a lady paid $4.45; what cost 11 pairs?

4. Bought 65 barrels of flour for $422.50; what is the price of one barrel?

5. If 11 tons of hay cost $212.50, what will 1 ton cost?

6. For 45 acres of land a farmer paid $500; what cost 150 acres?

7. When $60 are paid for 96 arithmetic-books, what will 87 dozen cost?

8. Gave $5.58 for 9 bushels of potatoes; what will 43 bushels cost?

9. Bought five tons of hay for eighty-five dollars; what would a single ton cost?

10. A merchant sold 509 chaldrons of coals at $5.50 per chaldron; what money was received for the whole?

11. A gentleman gave $450 for 300 square feet of land, that he wanted for building; what would an acre cost at that rate?

12. A bankrupt owes $4968, but he has only money sufficient to pay 35 cents for every dollar he owes; how much money has he to pay his debts?

13. If 24 yds. cost 3*l*. 14*s*. 7*d*., how much must I give for 1 yd. 3 qrs. 2 nls.?

14. What cost 5 hogsheads of sugar, each weighing 14 cwt. 2 qrs. 24 lbs., at 2*l*. 13*s*. 6*d*. per cwt.?

15. If for 7*s*. 8*d*. I can buy 9 lbs. of raisins, how much can I purchase for 56*l*. 16*s*.?

16. A grocer bought 6 cwt. 3 qrs. 26 lbs. of sugar, for which he paid 24*l*. 16*s*. 8*d*.; at what rate per pound must he sell it to gain 4*l*. 10*s*. 4*d*. on the whole?

17. A person reaches a certain place in 18 days by walking 8 hours a day; what number of days would he have taken had he walked 12 hours a day?

18. If 14 men could make a ditch in 18 days, in what time could 34 men do it?

19. A ship was provisioned for a crew of 40 for 3 months; how long would these provisions last, if the crew were reduced to 32 men?

20. If 8 horses can subsist on a certain quantity of hay for 2 months, how long would 12 horses subsist on the same quantity?

21. A field of corn was to be cut down by 40 men in 10 days; ten of the men, however, did not make their appearance; in what time would the field be cut down?

22. A pole 6 feet high throws a shadow of 5 feet 8

inches; what is the height of a spire which throws a shadow of 156 feet?

23. If 54 men can build a house in 90 days, how many men would be required to do it in 12 days?

24. Paid $136.50 for wood, at $3.25 per cord; how many cords did I buy?

25. If a bushel of turnips cost 28 cents, what will 59 bushels cost?

26. Sold 169 pine logs, for $1.30 each; what did the whole sell for?

27. I gave $60 for some refuse boards, at the rate of $1.10 for a thousand feet; how many feet were there in the pile?

28. A tailor purchased a bale of cloth containing 83 yds. for $415.45, and sells it by the yard at $5.86; how much does he make on the whole?

29. Bought in London 57 yards of broadcloth for 49 guineas; what did it cost per ell English?

30. If the penny loaf weighs 7 oz. when flour is $8 per barrel, how much should it weigh when flour is $7.50?

31. If a certain vessel has provisions sufficient to last a crew of 10 men 45 days, how long would the provisions last if the vessel were to ship 5 new hands?

MENTAL EXERCISES.

1. If 5 quintals of codfish cost $15, what would be the price of 20?

2. If 12 yards of cloth cost $48, what will 15 yards cost?

3. What is the price of three barrels of flour when two cost 13 dollars?

4. If 17 lb. of sugar cost $1.19, what is the price of 365 lb.?

5. If 2 cords of wood cost $11.50, what will 18 cords cost?

COMPOUND PROPORTION.

WHEN, in order to find a fourth proportional, several circumstances require to be considered, it is called Compound Proportion.

If 14 horses eat 56 bushels of oats in 16 days, how many bushels will be required for 20 horses for 24 days?

RULE WITH EXAMPLE.—Write down for the third term that number which is of the same kind with the answer required—56 bushels. Then take two numbers of the same kind—14 horses and 20 horses—and consider, as in Simple Proportion, whether, from the nature of the question, the greater or less is to be put in the first or second term. Here it is obvious that the greater must be in the second term, as 20 horses will eat more than 14 horses.

				bush.
horses	14	:	20	: : 56
days	16	:	24	
	224		480	
			56	
			2880	
			2400	
	224)26880(120 bus.			
	224			
	448			
	448			
	0			

Take the other two terms, and proceed in the same manner. After all the terms have been put down, multiply the two first terms, 14 and 16, together; do the same with the two second terms, 20 and 24, and proceed as in Simple Proportion.

CONTRACTION.—Let the question be the same as in the last example.

After the terms have been properly arranged, the operation may often be greatly shortened by using the following method: Draw a line, and place the first terms, 14 and 16, under it, and the second and third terms, 20, 24, and 56, above it; then divide any number above

$$\frac{\overset{10}{\cancel{20}} \times \overset{3}{\cancel{24}} \times \overset{4}{\cancel{56}}}{\underset{2}{\cancel{14}} \times \underset{2}{\cancel{16}}}$$

the line and any below by any number which will divide both without leaving a remainder. Thus, 14 below and 56 above may both be divided by 7; divide by it, and place the numbers obtained below and above the 14 and 56, drawing your pencil at the same time through the 14 and 56. Again, you see that 16 and 24 may be divided by 8; draw your pencil through them, and write the numbers above and below, then cancel the 20 and the 2; then the 8 and the other 2. Multiply all the numbers that remain above the line, and divide the product by the product of all the numbers under the line, if any, for the answer; thus, $10 \times 3 \times 4 = 120$. This is the answer, as there is nothing below the line by which to divide.

1. If 15 men build 37 roods of wall in 27 days, how many roods will 74 men build in 63 days?

2. If 8 men for 5 days' work get $40, how much ought 32 men to get for 24 days' work?

3. If 4 men can mow 20 acres of grass in 7 days, how many acres can 12 men mow in 28 days?

4. If 6 tailors can make 10 suits of clothes in 4 days, how many suits can 20 make in 7 days?

5. A wall, 28 feet in height, was built in 15 days by 68 men; how many men, working at the same rate, could build a wall 32 feet high in 8 days?

6. If 12 horses in 5 days draw 44 tons of stones from a quarry, how many horses would it require to draw 132 tons in 18 days?

7. A garrison of 1500 men has provisions for 12 weeks, at the rate of 20 ounces per day to each man; how many men will the same provisions maintain for 20 weeks, allowing each man only 8 oz. per day?

8. If 50 men can do a piece of work in 100 days, working 8 hours per day, in what time will 120 men do it, working 6 hours per day?

9. If 4 men receive $20 for 5 days' work, how much would 8 men receive for 15 days' work?

10. If 25 men can dig a trench 36 feet long, 12 feet broad,

in 9 days, in how many days would 15 men dig a trench of the same depth, but 48 feet long and only 8 feet broad?

11. If 20 girls in a factory can do as much work as 15 boys, and 60 boys as much as 25 men, how many girls would accomplish as much as 250 men?

12. If a pasture of 12 acres will feed 8 horses 4 months, how many acres will feed 12 horses for 6 months?

BILLS OF PARCELS.

A BILL is a written account of goods purchased, or work performed.

A BILL OF PARCELS is that which is delivered with the goods at the time of purchase.

BOOKSELLER'S BILL.

Mr. THOMAS ROBERTSON

1861. Bought of J. & A. McMILLAN.
June 3.

Ingram's Mathematics	$1.45
White's Universal History	1.75
Cruise of the Betsey	1.25
Worcester's Dictionary	7.50
Macaulay's History, 5 vols	5.50
	$

HOSIER'S BILL.

Mrs. YOUNG

1861. Bought of JOHN McDONALD.
May 4.

5 pairs of Worsted Stockings	@	62 cts.	℔ pair.
6 yards of Flannel	"	34 "	" yard.
4 pairs of Gloves	"	56 "	" pair.
8 pairs of Thread Stockings	"	48 "	" "
6 pairs of Cotton "	"	44 "	" "
			$

GROCER'S BILL.

Mrs. YOUNG

Bought of JOHN DICKSON.

1861.
July 16.

12 lbs. of Loaf Sugar,	@	17 cts.	℔ lb.
9 lbs. of Green Tea,	"	54 "	"
6 lbs. of Turkey Coffee,	"	26 "	"
8 lbs. of Hyson Tea,	"	60 "	"
16 lbs. of Brown Sugar,	"	9 "	"
14 lbs. of Rice,	"	5 "	"
15 lbs. of Currants,	"	17 "	"

$

BILLS OF BOOK DEBTS.

A BILL OF BOOK DEBTS is a statement of debts formerly contracted. The following is the manner in which it ought to be copied from the tradesman's books:—

WINE-MERCHANT'S BILL.

Mr. THOS. ROBINSON

To WM. ANDERSON.

1861.

May 24.	To 4 dozen	Port,	@	$9.00	℔ doz.
" 28.	— 3½ "	Sherry,	"	9.35	"
June 13.	— 3 "	Claret,	"	11.22	"
July 19.	— 4½ "	Burgundy,	"	12.50	"
" 24.	— 1 "	Champagne,	"	7.00	"
Sept. 19.	— 4 gals.	Brandy,	"	3.10	℔ gal.
" 27.	— 3 "	Hollands,	"	1.70	"

$

PRACTICE.

PRACTICE is a short method of doing questions in Simple Proportion, by the aid of fractional parts.

A less number is said to be the aliquot part of a greater, when the less number is contained in the greater any number of times without leaving any remainder: thus, 3 is an aliquot part of 9 or of 15, and 4 of 16 or of 20.

TABLE OF ALIQUOT PARTS.

Of a Ton. cwt.		*Of a Cwt.* qrs. lbs.		*Of a Quarter.* lb.	
10	is $\frac{1}{2}$	2 0	is $\frac{1}{2}$	14	is $\frac{1}{2}$
5	— $\frac{1}{4}$	1 0	— $\frac{1}{4}$	7	— $\frac{1}{4}$
4	— $\frac{1}{5}$	0 16	— $\frac{1}{7}$	4	— $\frac{1}{7}$
$2\frac{1}{2}$	— $\frac{1}{8}$	0 14	— $\frac{1}{8}$	$3\frac{1}{2}$	— $\frac{1}{8}$
2	— $\frac{1}{10}$	0 8	— $\frac{1}{14}$	2	— $\frac{1}{14}$
1	— $\frac{1}{20}$	0 7	— $\frac{1}{16}$	1	— $\frac{1}{28}$

RULE.—Multiply the *price* by the highest name in the quantity, and take parts for the rest of the quantity.

EXAMPLE. — Bought 29 cwt. 2 qrs. 14 lb. at $16.50 per cwt.; what did I pay? Here $16.50 is multiplied by the 29, which gives the price of the cwt. 2 qrs., being half a cwt., gives $8.25 for its price, when 14 lb., being the quarter of 2 qrs., gives $2.06 as its price = $\frac{1}{4}$ of $8.25.

2 qrs. = $\frac{1}{2}$) $16.50
29

14850
3300

478.50 price of cwt.
14 lb. = $\frac{1}{4}$) 8.25 " qrs.
2.06.25 " lb.

$488.81.25 pr. of whole.

1. 24 cwt. 2 qrs. 7 lb. @ $12.80 per cwt.
2. 14 " 1 " 8 " " 16.60 "
3. 7 " 3 " 6 " " 24.40 "

4.	16	cwt.	2	qrs.	18	lb.	@	$30.20	per cwt.
5.	27	"	1	"	16	"	"	48.48	"
6.	32	"	2	"	14	"	"	6.30	"
7.	35	"	1	"	8	"	"	22.72	"
8.	45	"	1	"	14	"	"	7.36	"
9.	48	"	2	"	4	"	"	18.24	"
10.	40	"	[illegible]	"	9	"	"	20.20	"

SIMPLE INTEREST.

INTEREST is money paid for the loan of money.

The Principal is the sum of money lent.

The Rate per cent. is the sum to be given for the loan of a hundred.

The Amount is the principal and interest added together.

Thus, if I get from a banker $100 at 5 per cent, I must pay him back at the end of the year the principal, viz. $100, and the interest, viz. $5. The principal and interest, viz. $105, is the amount.

NOTE.—Any of the following examples, or others similar, may be used for Mental Exercises.

CASE I.—*To find the interest of any sum for one or more years.*

What is the interest of $106 at 5 per cent. per annum, for three years?

RULE WITH EXAMPLE.—Multiply the principal, $100, by the rate, 5, and divide the product 530 by 100, which is done by simply pointing off the tens and units. The quotient, $5.30, is the interest for one year; this multiplied by the number of years, 3, will give the interest for the number of years, which in this instance is $15.90.

$106
5
5.30
3
15.90

1. What is the interest of $78 for 1 year @ 6 per cent.?
2. What is the interest of $675 for 2 years @ 5 per cent.?
3. What is the interest of $260 for 4 years @ 4 per cent.?
4. What is the interest of $480 for 2½ years @ 6 per cent.?
5. What is the interest of $575 for 10 years @ 5 per cent.?
6. What is the interest of $60 for 12¾ years @ 6 per cent.?
7. What is the interest of $84 for 7 years @ 3 per cent.?
8. What is the interest of $95 for 8 years @ 4½ per cent.?
9. What is the interest of $760 for 15 years @ 6 per cent.?
10. What is the interest of $1000 for 10 years @ 1½ per cent.?

CASE II.—*To find the interest for weeks and days.*

What is the interest of $400 for 10 weeks and 3 days at 4 per cent. per annum?

RULE WITH EXAMPLE.—By Case I., the interest of $400 for one year at 4 per cent. is $16. Multiply it by the number of days, which is 73, =10 weeks and 3 days, and divide by the number of days in a year. The quotient, $3.20, is the interest for 73 days.

```
$400
   4
------
16.00
  73
------
4800
11200
------
365)1168.00($3.20
   1095
------
    730
    730
------
      0
```

11. What is the interest of $426 for 6 weeks and 4 days at 5 per cent. per annum?

12. What is the interest of $764 for 9 weeks and 3 days at 4 per cent. per annum?

13. What is the interest of $376 for 240 days at $4\frac{1}{2}$ per cent. per annum?

14. What is the amount of $748 for 120 days at $3\frac{1}{2}$ per cent. per annum?

15. What is the interest of $860 for 6 years, 8 weeks, and 4 days at $2\frac{1}{2}$ per cent. per annum?

16. What is the amount of $978 for 3 years and 136 days at $4\frac{1}{4}$ per cent. per annum?

17. What is the interest of $7462 for 9 years and 6 weeks at $3\frac{1}{2}$ per cent. per annum?

18. What is the amount of $836 for 12 years and 93 days at $4\frac{3}{4}$ per cent. per annum?

19. What is the interest of $764 for 5 weeks and 6 days at $3\frac{1}{4}$ per cent. per annum?

20. What is the amount of $9864 for 10 years, 7 weeks, and 4 days at $4\frac{3}{8}$ per cent. per annum?

21. Required the interest of $460 for 2 years, 4 months, and a day, at 5 per cent. per annum.

22. Required the interest of $326 for 8 weeks and 5 days at 4 per cent. per annum.

23. What is the amount of $864 for 120 days at $4\frac{1}{2}$ per cent. per annum?

24. Required the amount of $246 for 3 years, 6 weeks, and 4 days at $2\frac{1}{2}$ per cent, per annum.

CASE III.—*To find the interest for months at* 6 *per cent.*

What is the interest of $368 for 8 months at 6 per cent.?

RULE WITH EXAMPLE.—Six per cent. for a year is $\frac{1}{2}$ per cent. for a month, and 4 for eight months. Hence the rule, Multiply by half the number of months, and divide by 100.

368	
4	
$14.72	

25. What is the interest of $687 for 10 months?
26. What is the interest of $61.18 for 15 months?
27. What is the interest of $11.39 for 19 months?
28. What is the interest of $1671.82 for 14 months?
29. What is the interest of $819.75 for 11 months?
30. What is the interest of $3671.25 for 13 months?
31. What is the interest of $9.98 for 23 months?
32. What is the interest of $167.18 for 50 months?

NOTE.—In New Brunswick the legal interest is 6 per cent.

COMPOUND INTEREST.

COMPOUND INTEREST is interest, not only for the use of the sum borrowed, but also for the use of the interest, if it be not paid at the end of a year.

Thus, if I borrow $100 at 5 per cent., I owe at the end of the year $105. If I wish to pay off the debt, I pay $105. If I wish merely to pay the interest, I pay $5, and still owe $100. If, however, I do neither, it is obvious that at the end of the second year I must pay interest, not upon $100, but upon $105.

What is the compound interest of $240 for 3 years at 5 per cent.?

RULE WITH EXAMPLE.—Find the interest upon the principal for 1 year at 5 per cent., viz. $12, and add it to the principal. At the beginning of the second year the principal is $252; find the interest upon this for 1 year at 5 per cent., add it, and so on for any number of years. $277.83 is what $240 *amounts* to in 3 years. The compound interest is found by taking the

240	1st year's prin.
add 12	1st year's int.
252	2d year's prin.
add 12.60	2d year's int.
264.60	3d year's prin.
add 13.23	3d year's int.
277.83	Amt. in 3 yrs.
subtract 240	Principal.
37.83	Comp. int. in 3 years.

original principal, $240, from the amount in 3 years, $277.83, and what remains, $37.83, is the compound interest on $240 for 3 years.

1. Required the compound interest on $420 for 3 years at 5 per cent.

2. Required the amount of $640 for 4 years at 3 per cent., compound interest.

3. What will $436 amount to in 3 years at 4½ per cent., compound interest?

4. What is the compound interest on $678.80 for 6 years at 3½ per cent. per annum?

5. What will $764 amount to in 4 years at 6 per cent., compound interest?

6. What is the compound interest on $786.10 for 6 years at 4½ per cent. per annum?

7. Required the amount of $15.50 in 10 years at 6 per cent., compound interest.

DISCOUNT.

DISCOUNT is an allowance made for the payment of money before it is due.

Thus, if a person gave me his note for $100, to be paid at the end of a year, and I wished money immediately, I might take it to a banker, who, if he was sure of getting the money at the end of the year, would give me $94, keeping $6 to himself for the interest of the money he had given me. The $6 is called discount, and the $94 is called the present worth of $100 a year hence at 6 per cent.

RULE.—Find the interest of the sum of the note or debt at the given rate and for the given time, which is called the discount, and subtract it from the sum for the present worth.

What is the present value of $250 due in two years at 6 per cent.?

EXAMPLE.—Here $15 is the interest of $250 for 1 year, and $30 for 2. Subtract the $30 from the $250, and $220 is the present value.

	$250	
	6	
	15.00	
	2	
	$30.00	$250
		30
		$220

1. What is the present value of $640 due 3 years hence at 6 per cent?

2. What is the discount on $736 due 9 months hence at 5 per cent.?

3. What is the discount on $370 due 100 days hence at 4 per cent.?

4. What is the present worth of $245.50 on March 26, when the note is payable on June 23, three days' grace being allowed, at legal interest?

5. What is the value on May 1 of a note for $300, which was drawn on January 1, payable in a year at 5 per cent., the three days' grace being allowed?

6. What is the discount on $381.15 due 4 months hence at 5 per cent.?

7. A merchant bought 450 quintals of fish at $3.50 cash, and sold them immediately for $4.00 on 6 months' credit, for which he received a note. If he should get this discounted at a bank, what will he gain on the fish?

☞ The rule given above is that which is always employed in actual practice. It gives the discount too large, and consequently the present value too small.

THE CORRECT RULE.—As the amount of $100 for the given time and at the rate is to the debt, so is $100 to the present worth of the note or debt.

Taking the previous example, 12 is the interest of $100 for 2 years at 6 per cent.: so we add the $12 to the $100 for the first term, take the amount of the note or debt for the second, and the $100, being the present value of $112, for the third, and work out the proportion.

112 : 250 : : 100
100

112) 25000

223.21

The answers to the exercises are given both ways to a cent.

COMMISSION, BROKERAGE, INSURANCE, BUYING AND SELLING STOCKS.

COMMISSION is an allowance given to an agent or factor for buying or selling goods, negotiating bills, &c.

BROKERAGE is an allowance to a broker for procuring sales, transfers of property, &c.

INSURANCE is an allowance, called premium, given to persons who engage to make good the loss of ships, merchandise, houses, &c. that may be lost or damaged by storms, fire, &c.

STOCK is the debt owing by government, or it is the capital of any trading company.

Any questions in these rules may be performed by the rules for Simple Interest.

1. What is 2 per cent. of $335?

2. What is 5 per cent. of $594?

3. A man received a legacy of $10,000, but he lost 25 per cent. of it in speculation; how much remained?

4. Bought 25 shares of the stock of the Bank of New Brunswick, at $100 each; but soon after I sold them at 11 per cent. premium; what was the gain?

5. What is the commission on the sale of a quantity of goods valued at $4820, at 2 per cent.?

6. An auctioneer sells goods to the amount of $789 at 2 per cent.; what is his commission?

7. My factor advises me that he has purchased on my account 97 bales of cloth at $25.50 per bale; what is his commission at $2\frac{1}{2}$ per cent.?

8. A broker in Montreal exchanged $46256 on the St. Stephen's Bank, at $\frac{1}{8}$ per cent.; what did he receive for his trouble?

9. What must be given for 75 shares of bank-stock, at 25 per cent. premium, the original shares being $100 each?

10. A stockholder in a railway sells his right of purchase on 5 shares of $100 each, at 12 per cent. advance; what is the premium?

11. Bought 84 shares in a certain joint-stock company, at 12 per cent. below par, and sold the same at $17\frac{1}{2}$ per cent. above par; what sum did I gain, the original shares being $175 each?

12. What is the premium of insurance on $868, at 12 per cent.?

13. What is the insurance upon a property valued at $17498, at $\frac{1}{4}$ per cent.?

14. A house, which was valued at $5904, was insured at $1\frac{3}{4}$ per cent.; what was the premium?

15. A bark and her freight, rated at $45,000, are insured at $3\frac{3}{4}$ per cent.; now, in the event of the vessel and cargo being destroyed, what will be the actual loss to the insurance company?

16. My agent in London has purchased goods for me to the amount of £4755, at 3 per cent.; what is the commission?

17. What is the purchase of $5000 railway-stock, at $76\frac{1}{2}$ per cent.?

18. What is the price of $28709 bank-stock, at 168 per cent.?

19. What is the expense incurred in insuring a ship and cargo, at 3.75 per cent., the ship being worth $9878 and the cargo worth $3497?

20. If a broker disposes of woollen goods to the amount of $6050, muslin to $5405, and hardware, $3515, what will his commission amount to, at $2\frac{1}{8}$ per cent.?

21. A broker negotiates a bill of exchange of $2500, at $\frac{1}{2}$ per cent. commission; what is his commission?

22. My agent at Savannah informs me that he has disposed of 500 barrels of herrings, at $7.50 per barrel, 88 barrels of apples, at $2.75 per barrel, and 56 cwt. of cheese, at $10.60 per cwt.; what is his commission, at $2\frac{1}{2}$ per cent.?

BARTER.

BARTER is the exchanging of goods of one kind for goods of another kind, either at the market value of each, or at prices mutually arranged by the parties who barter.

How many yards of cloth, at $2 per yard, ought I to get for 98 lbs. tea, at 50 cts. per lb.?

RULE WITH EXAMPLE.—Find the value of the goods given.

In this example, the value of the tea is found to be $49; you have, therefore, to consider how many yards of cloth you ought to receive for $49.00, the value of one yard being $2.00.

All the questions in this Rule may be solved by Simple Proportion.

lbs.
98
50
2)49.00
$24\frac{1}{2}$ yds.

1. How many pairs of boots, at $3.50 per pair, should be exchanged for 206 pairs of stockings, at 40 cts. per pair?

2. How much putty, at 10 cts. per lb., ought I to receive for 18 pairs of gloves, at $1.05 per pair?

3. How much coffee, at 20 cts. per lb., should I receive for a chest of tea, containing 55 lbs., at 50 cts. per lb.?

4. A wine-merchant bartered 94 gals. of wine, at $4.00 per gal., for Jamaica rum at $1.75 per gal. How much ought he to receive?

5. How much silk, at $3.50 per yard, should be exchanged for 90 barrels of apples, at $2.25 per bl.?

6. A tallow-chandler gave 100 boxes of candles, at $3.75 per box, for 22 cwt. 3 qrs. 16 lbs. tallow; what did the tallow cost per lb.?

7. How much iron, at 5 cts. per lb., ought a nailer to receive for 10,000 nails, at 9 cts. per hundred?

8. How much tobacco, at $25 per cwt., must be bartered for 6 cwt. 1 qr. 14 lbs. of snuff, at 90 cts per lb.?

PROFIT AND LOSS.

THIS Rule is used for the purpose of discovering what is lost or gained in the purchase or sale of goods.

CASE I.—*The prime cost and selling price being given, to find the entire gain or loss on any quantity of goods.*

Bought 9 yards of silk, at $2.50 per yard, and sold it for $3.15; what did I gain upon the whole?

RULE WITH EXAMPLE.—Subtract the cost price, $2.50, from the selling price, $3.15, and multiply the gain upon a yard, 65 cts., by the number of yards bought, 9. The product, $5.85, is the gain on the 9 yards.

$3.15
2.50
65
9
$5.85

1. Bought 256 yards ribbon, at 9 cts. per yard, and sold it for 11 cts.; what did I gain upon the whole?

2. Bought 106 logs, at $3.95 each, and sold them for $8.41; what did I gain upon the whole?

3. Bought 506 lbs. cheese, at 16 cts. per lb., and sold it at 19 cts.; what was the amount of profit?

4. Purchased 208 lbs. butter, at 24 cts. per lb., and sold it for 22½ cts.; what was the whole loss?

5. A fruit-dealer bought 12 chests of oranges for $35.00; whether did he lose or gain by selling them at $3.15?

CASE II.—*The prime cost and the selling price being given, to find the gain per cent.*

Bought velvet at $4.50 per yard, and sold for $5.05; what was the gain per cent.?

RULE WITH EXAMPLE.—Find the gain or loss by the former case; then say, as the cost price, $4.50, is to $100, so is the gain, 55 cts., to the gain or loss per cent.

$5.05
4.50

4.50 : 100 :: 55
100

4.50)5500.00

1222⅔

1. If a pound of sugar be bought for 9 cts. and sold for 11 cts., how much gain per cent.?

2. When a pound of tea is bought for $0.55 and sold for $0.62, what is the gain per cent.?

3. If a ham be bought for $3.87 and sold for $2.53, what is the loss per cent.?

4. When molasses is purchased for $0.30 per gallon and sold for $0.34, how much is the gain per cent.?

5. Bought a quantity of goods for $1005.00, but sold them for $9075.00; required the gain per cent.

PARTNERSHIP, OR COMPANY BUSINESS.

PARTNERSHIP is the connection of two or more persons in business transactions. Such a union is called a Company or Firm. The profits or losses (as the case may be) are shared by each person, in proportion to the capital each puts into the common fund or joint stock.

RULE WITH EXAMPLE.—As the whole stock, or fund, is to each partner's share of such stock, so is the whole profit or loss to his share of the profit or loss.

X, Y, and Z, whose stocks in trade are respectively \$300.00, \$450.00, and \$675.00, have to share a gain of \$650.00; what is the share of each partner?

X's stock = \$300
Y's do. = \$450
Z's do. = \$675

Whole stock = 1425

As 1425 : 300 : : 650 : \$136.84$\frac{12}{57}$ X's share of gain.
As 1425 : 450 : : 650 : \$205.26$\frac{18}{57}$ Y's do. do.
As 1425 : 675 : : 650 : \$307.89$\frac{27}{57}$ Z's do. do.

Proof \$ 650.00

1. Two merchants engage in business; A put into the business \$500.00, B \$2500.00; the gain was \$6500.00; what is the share of each?

2. A, B, C, and D purchase a ship; A pays for 6 shares, B for 5 shares, C for 3 shares, and D for 4 shares. They receive of net freight, for a voyage to Pernambuco and Rio Janeiro, \$355. How much of this sum ought each to receive?

3. James Williams, John Smeaton, and William Winstanley engage in business, under the style of Smeaton, Winstanley & Co. They gain the first year they are in business \$950.00. Their shares in the joint stock were

respectively $250.00, $450.00, and $725.00. What was the share of each of the amount gained?

4. E and F enter into partnership; E puts in $4000.00 and F $2000.00; what was each man's share of the $570 which they gained?

CASE II.—*Partnership with time.*

RULE.—Multiply each person's money by the time it continued in the business, and proceed as in CASE I.

EXAMPLE.—A and B enter into partnership; A had a capital of $400, which was employed 6 months, and B a capital of $450, which was employed 8 months. They gained $120. What was the share of each? *Ans.* A's $48, B's $72.

Capital.			$ $	
A 400 × 6 = 2400	As 6000 : 2400 ::	120 : 48		A's share.
B 450 × 8 = 3600	As 6000 : 3600 ::	120 : 72		B's share.
6000				

5. Charles Jones, Henry Adams, and John Stephens formed a company, under the name of H. Adams & Co., and commenced business, 1st June, on $2000.00 put in by Jones; the 1st August, Adams put in $3000.00, and 1st September Stephens put in $4000.00. At the end of that year they had gained $1500; what was each partner's share?

6. A, B, and C trade in company. A put in $700.00 for 5 months; B put in $800.00 for 6 months; and C put in $500.00 for 10 months. They gain $399.00; what is each trader's share of the gain?

7. H, I, J, and K transact business in company; H puts into the joint capital the sum of $325 for 3 months; I the sum of $450 for 4 months; J $575 for 5 months, and K $600 for 6 months; their profits were $4999; what was their share of the gain?

8. Four men hired a pasture for $50. A put in 5

horses for 4 weeks; B put in 6 horses for 8 weeks; C put in 12 oxen for 5 weeks, calling 3 oxen equal to 2 horses; and D put in 3 horses for 14 weeks. How much should each man pay?

EXCHANGE.

THE object of EXCHANGE is to find how much of the money of one country is equivalent to a given sum of the money of another. All the calculations in exchange are performed by Proportion.

RULE.—Place in the third term the rate of the kind of money required, the other rate in the first, and the sum of money whose value is required goes in the second.

NOTE.—The Decimal form of currency has been introduced into Canada, New Brunswick, Nova Scotia, and the United States.

The form of currency called sterling is still adhered to in Great Britain, New Foundland, Prince Edward's Island, &c.

What is the value of $50 of N.B. money in Nova Scotia, when the N.B. dollar is taken for $1.10?

EXAMPLE.—$1.10 being the N.S. rate, place it in the third, and, as the N.B. rate is $1.00, place it in the first; while $50, whose value is wanted, goes in the second.

	$		$
$1.00 :	50 : :		1.10
			50
			55.00

1. Change $75.50 N.B. into sterling at 4*s.* 2*d.* per dollar.

2. Bring $50 N.B. to its value in P.E. Island at 6*s.* 3*d.* per dollar.

3. Change $64.50 N.B. into Federal at $1.10 N.B. per dollar Federal.

4. What is the value in N.S. of $85.75 N.B. at 95 cts. per dollar N.S.?

5. How much Canadian money should I get in exchange for $580 New Brunswick money at $1.04 for the Canadian dollar?

6. Reduce £20 P.E. Island money to N.B. at 6*s*. 4*d*. per N.B. dollar.

7. Bring $50.25 Federal to N.B. money at 92 cts. for $1.00 N.B.

8. Change $20.50 N.S. to N.B. money at $1.05 per dollar N.B.

9. What is the value of $348 Canadian at 98 cts. per N.B. dollar?

10. Reduce £635 10*s*. sterling to N.B. money at 4*s*. 2*d*. per dollar.

11. How much Canadian money should I get in exchange for $75.25 New Brunswick money at $1.02 for the Canadian dollar?

12. Reduce $100 N.S. money to N.B. at $1.08 per dollar N.B.

13. Change $1000 Federal to N.B. at 90 cts. per $ N.B.

14. Bring £35 15*s*. P.E. Island money to New Brunswick at 6*s*. 4*d*. per $ N.B.

15. Change $65.75 Canadian to N.B. money at 95 cts. per $ N.B.

16. Reduce £80 15*s*. sterling to N.B. money at 4*s*. 4*d*. per dollar.

17. What is the value in Nova Scotian money of $100 N.B. at 92 cents per N.S. dollar?

18. Change $82 N.B. to Federal money at $1.05 per Federal dollar.

19. Bring $168.50 N.B. to P.E. Island currency at 6*s*. 4*d*. per dollar.

20. What is the value of $850 N.B. in sterling money at 4*s*. 7*d*. per dollar?

VULGAR FRACTIONS.

If one or more things of the same kind are divided into equal parts, and one or more of these parts are taken, we have a FRACTION. It is represented by two numbers, one above the line, and the other below it: thus, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$,—read one-half, two-thirds, three-fourths.

The number above the line is called the *numerator;* the number below the line is called the *denominator;* thus, in the fraction $\frac{4}{5}$, read four-fifths, the 4 is the numerator and the 5 is the denominator.

The denominator marks the number of equal parts into which the whole is divided; the numerator shows the number of those intended to be expressed by the fraction; thus, if I say that I have $\frac{2}{3}$ of an apple, I mean that the apple was divided into three equal parts, and that I have two of these parts.

A PROPER FRACTION is that which has its numerator *less* than its denominator, as $\frac{1}{2}$, $\frac{2}{3}$, $\frac{4}{7}$.

AN IMPROPER FRACTION is that which has its numerator *greater* than its denominator, as $\frac{3}{2}$, $\frac{7}{4}$, $\frac{8}{5}$.

A COMPOUND FRACTION is a fraction of a fraction, and is expressed by two or more fractions, as $\frac{2}{3}$ of $\frac{3}{4}$, or $\frac{1}{3}$ of $\frac{2}{5}$ of $\frac{4}{9}$.

A MIXED NUMBER is an integer with a fraction annexed, as $2\frac{1}{2}$, $4\frac{2}{3}$, $16\frac{4}{5}$.

Any integer may be made a fraction of by writing a 1 under it for a denominator; for example, 6 may be made a fraction of by writing it thus, $\frac{6}{1}$; or 10 thus, $\frac{10}{1}$. The value of a fraction is not altered by multiplying or dividing both the numerator and de-

nominator, provided both be multiplied or divided by the same number.

REDUCTION.

CASE I.—*To change an improper fraction into a whole or mixed number.*

RULE.—Divide the numerator by the denominator, and, if there be any remainder, write the denominator under it in the form of a fraction.

EXAMPLE.—Reduce the improper fraction, $\frac{1367}{5}$, to an integer or mixed number.

5)1367

$273\frac{2}{5}$ Ans.

1. Reduce $\frac{7463}{3}$ to its equivalent integer or mixed number.

2. Reduce $\frac{8463}{14}$ to its equivalent integer or mixed number.

3. Reduce $\frac{9786}{43}$ to its equivalent integer or mixed number.

4. Find the value of $\frac{64237}{693}$ as an integer or mixed number.

5. Find the value of $\frac{8363}{89}$ as an integer or mixed number.

Reduce the following fractions to integers or mixed numbers:

6. $\frac{8536}{43}$.	9. $\frac{742683}{7627}$.	12. $\frac{736201}{7036}$.
7. $\frac{7982}{680}$.	10. $\frac{968760}{2760}$.	13. $\frac{480010}{3084}$.
8. $\frac{3643}{2104}$.	11. $\frac{4922001}{487600}$.	14. $\frac{876246}{4968}$.

CASE II.—*To reduce a mixed number to an improper fraction.*

RULE.—Multiply the integer by the denominator of the fraction; add the numerator, and under the product place the denominator.

EXAMPLE.—Reduce the mixed number $46\frac{3}{5}$ to an improper fraction.

$$\begin{array}{r} 46\frac{3}{5} \\ 5 \\ \hline 230 + 3 = \frac{233}{5} \end{array}$$

Reduce the following mixed numbers to their equivalent improper fractions

15. $7\frac{1}{2}$.	20. $647\frac{2}{15}$.	25. $976\frac{24}{126}$.
16. $8\frac{2}{3}$.	21. $360\frac{10}{17}$.	26. $843\frac{31}{421}$.
17. $17\frac{4}{5}$.	22. $976\frac{21}{30}$.	27. $687\frac{28}{111}$.
18. $9\frac{7}{9}$.	23. $842\frac{17}{36}$.	28. $769\frac{111}{234}$.
19. $27\frac{4}{7}$.	24. $684\frac{19}{27}$.	29. $807\frac{101}{621}$.

CASE III.—*To reduce a compound fraction to a simple fraction.*

RULE.—Multiply together all the numerators for a numerator, and all the denominators for a denominator.

EXAMPLE.—Reduce the compound fraction $\frac{2}{3}$ of $\frac{6}{7}$ of 5 to a simple fraction.

$$\frac{2 \times 6 \times 5}{3 \times 7 \times 1} = \frac{30}{21} \text{ Ans.}$$

Reduce the following compound fractions to their equivalent simple ones:

30. $\frac{3}{6}$ of $\frac{2}{7}$ of $\frac{5}{7}$.	35. $\frac{17}{23}$ of $\frac{8}{9}$ of $\frac{3}{25}$ of $\frac{13}{19}$.
31. $\frac{7}{9}$ " $\frac{3}{11}$ " $\frac{8}{15}$.	36. $\frac{12}{37}$ " $\frac{1}{7}$ " $\frac{18}{33}$ " $19\frac{1}{8}$.
32. $\frac{5}{13}$ " $\frac{17}{3}$ " $\frac{19}{21}$.	37. $\frac{11}{21}$ " $\frac{17}{36}$ " $\frac{135}{78}$ " 24.
33. $\frac{4}{9}$ " $\frac{8}{11}$ " $\frac{11}{12}$.	38. $\frac{3}{7}$ " $\frac{9}{17}$ " $\frac{29}{78}$ " 32.
34. $\frac{7}{17}$ " $\frac{8}{19}$ " 7.	39. $\frac{7}{15}$ " $\frac{13}{19}$ " $\frac{21}{39}$ " $27\frac{2}{5}$.

CASE IV.—*To reduce a fraction to its lowest terms.*

RULE.—Divide the numerator and denominator by any number that will measure them; that is, that will divide them without a remainder. Do the same with the quotients as long as any number can be found to divide them.

Reduce $\frac{144}{240}$ to its lowest terms.

Divide the fractions and the quotients by the figures placed above them.

$$\frac{144}{240}\overset{(2)}{=}\frac{72}{120}\overset{(2)}{=}\frac{36}{60}\overset{(3)}{=}\frac{12}{20}\overset{(2)}{=}\frac{6}{10}\overset{(2)}{=}\frac{3}{5}$$ Ans.

Or,

If a number be wished for that may bring the fraction to its lowest terms at once, divide the greater term by the less, and the divisor by the remainder; and so on, dividing each divisor by the last remainder, till nothing remains. The last *divisor* is the number by which, if the numerator and denominator of the fraction be divided, the lowest term will be obtained.

Reduce $\frac{144}{240}$ to its lowest terms.

The denominator of the fraction being greater, it is divided by the numerator. The former divisor, 144, is now to be divided by the remainder, 96; the remainder, 48, is now to divide the former divisor, 96. The last divisor, 48, is the number by which, if the numerator and denominator be divided, the lowest term will be obtained; thus, $48)\frac{144}{240}=\frac{3}{5}$, as in former example.

144)240(1
144
—
96)144(1
96
—
48)96(2
96
—

Reduce the following numbers to the lowest terms:

40. $\frac{48}{272}$.
41. $\frac{46}{116}$.
42. $\frac{176}{484}$.
43. $\frac{48}{160}$.
44. $\frac{740}{8675}$.
45. $\frac{764}{5240}$.
46. $\frac{644}{1728}$.
47. $\frac{825}{1920}$.
48. $\frac{55}{9900}$.
49. $\frac{1245}{220}$.
50. $\frac{1344}{1536}$.
51. $\frac{1408}{1664}$.

CASE V.—*To reduce fractions to a common denominator.*

RULE.—Multiply each numerator by all the denomi-

nators, *except its own*, for a new numerator; and multiply all the denominators together for a new denominator.

Reduce $\frac{2}{3}$, $\frac{3}{5}$, and $\frac{4}{7}$ to a common denominator.

Here, the first numerator, 2, is multiplied by 5 and 7, the denominators of the other fractions. Mark that it is not multiplied by its own denominator, 3. The same is done to the other numerators. The answer then is $\frac{70}{105}$, $\frac{63}{105}$, $\frac{60}{105}$.

$$\left.\begin{array}{l} 2\times5\times7=70 \\ 3\times3\times7=63 \\ 4\times3\times5=60 \end{array}\right\}\text{numerators.}$$

$$3\times5\times7=105 \text{ com. denom.}$$

Or,

Find the least common multiple of the denominators. Divide it by the denominator of each fraction, and multiply both numerator and denominator by the quotient thus obtained.

The following is the usual method of finding the least common multiple. Write the numbers in the same line, and divide any two or more of them by any number greater than one that will divide them without a remainder, and write the quotients and the undivided numbers in a line below. Repeat the process so long as there are any two numbers that can be so divided. The continued product of the divisors and the numbers in the lowest line will be the least common multiple.

EXAMPLE.—Reduce $\frac{1}{6}$, $\frac{5}{12}$, and $\frac{3}{14}$ to their least common denominator. We divide 6 and 12 by 3, and write 14, as not being exactly divisible, in the lower line with the quotients. We then divide 2, 4, and 14 by 2, which gives 1, 2, and 7 for the quotients. The continued product of 7, 2, 2, and 3 gives 84, which is the least common multiple.

3)	6	12	14
2)	2	4	14
	1	2	7

Divide 84 by 6, 12, and 14, the denominators; 14, 7, and 6 are the quotients, and by which the numerators and denominators are to be multiplied.

84

$$\frac{1}{6}\times\frac{14}{14}=\frac{14}{84}$$

$$\frac{5}{12}\times\frac{7}{7}=\frac{35}{84}$$

$$\frac{3}{14}\times\frac{6}{6}=\frac{18}{84}$$

Reduce the following fractions to others having a common denominator.

As the answers are given in the lowest terms, it will be preferable to use the second method, and always have the least common denominator.

52. $\frac{3}{4}$, $\frac{2}{3}$, and $\frac{4}{7}$.
53. $\frac{5}{9}$, $\frac{7}{8}$, and $\frac{6}{5}$.
54. $\frac{9}{11}$, $\frac{7}{13}$, and $\frac{12}{19}$.
55. $\frac{13}{16}$, $\frac{11}{23}$, and $\frac{18}{27}$.
56. $\frac{17}{24}$, $\frac{19}{26}$, $\frac{15}{42}$, and $\frac{13}{17}$.
57. $\frac{21}{47}$, $\frac{18}{39}$, $\frac{41}{59}$, and $\frac{27}{78}$.
58. $\frac{71}{81}$, $\frac{39}{261}$, $\frac{419}{701}$, and $\frac{75}{813}$.
59. $\frac{313}{401}$, $\frac{710}{3026}$, $\frac{762}{980}$, and $\frac{83}{721}$.
60. $\frac{1}{8}$, $\frac{8}{12}$, $\frac{4}{48}$, and $\frac{5}{24}$.
61. $\frac{3}{21}$, $\frac{5}{49}$, and $\frac{6}{42}$.
62. $\frac{4}{15}$, $\frac{1}{25}$, and $\frac{7}{30}$.
63. $\frac{3}{86}$, $\frac{9}{42}$, and $\frac{19}{21}$.
64. $\frac{3}{14}$, $\frac{1}{13}$, and $\frac{4}{17}$.
65. $\frac{7}{22}$, $\frac{6}{50}$, and $\frac{3}{44}$.

ADDITION.

Rule.--Reduce compound fractions to simple fractions, and mixed numbers to improper fractions. Having done this, bring them to a common denominator. Add all the numerators together, and place, under the result, the common denominator. If the answer be an improper fraction, bring it to a mixed number.

Add together the following fractions, $\frac{2}{3}$, $\frac{3}{5}$, and $4\frac{1}{2}$.

Here the mixed number $4\frac{1}{2}$ is first brought to the improper fraction $\frac{9}{2}$, and then all the fractions are brought to a common denominator.

$$\begin{array}{rcl} & & 30 \\ \frac{2}{3} \times \frac{10}{10} & = & \frac{20}{30} \\ \frac{3}{5} \times \frac{6}{6} & = & \frac{18}{30} \\ \frac{9}{2} \times \frac{15}{15} & = & \frac{135}{30} \\ & & \hline \\ & & \frac{173}{30} = 5\frac{23}{30} \end{array}$$

Add together the following fractions and mixed numbers.

1. $\frac{2}{3} + \frac{3}{5} + \frac{4}{9}$.
2. $\frac{3}{7} + \frac{9}{11} + \frac{12}{13}$.
3. $\frac{4}{7} + \frac{11}{16} + \frac{18}{23}$.
4. $\frac{7}{9} + \frac{13}{17} + \frac{14}{19} + \frac{23}{121}$.
5. $\frac{8}{13} + \frac{11}{23} + \frac{9}{17} + \frac{14}{39}$.
6. $\frac{21}{42} + \frac{41}{53} + \frac{71}{89} + \frac{82}{23}$.
7. $\frac{2}{5}$ of $\frac{6}{7} + \frac{2}{13} + \frac{2}{3}$ of $\frac{7}{8}$.
8. $\frac{4}{7} + \frac{9}{13}$ of $\frac{12}{19} + \frac{4}{9}$ of $5\frac{1}{2}$.
9. $\frac{13}{28}$ of $7 + \frac{2}{3}$ of $9 + \frac{3}{7}$ of 14.
10. $\frac{21}{23} + \frac{11}{15}$ of $2\frac{2}{3} + \frac{2}{9}$ of $6\frac{3}{8}$.
11. $\frac{17}{19}$ of $\frac{23}{49}$ of $17\frac{4}{9} + \frac{4}{7}$ of 12.
12. $\frac{13}{27} + \frac{19}{23}$ of $9\frac{2}{3} + \frac{11}{35}$ of $8\frac{4}{7}$.

SUBTRACTION.

RULE.—Reduce the fractions to common denominators, as in addition. Find the difference of the numerators, under which write the common denominator.

From $\frac{12}{15}$ take $\frac{4}{7}$.

Here the fractions are first brought to a common denominator, then the 60 taken from the 84, and the common denominator written under the difference.

$\frac{12}{15} \times \frac{7}{7} = \frac{84}{105}$
$\frac{4}{7} \times \frac{15}{15} = \frac{60}{105}$
$3)\frac{24}{105} = \frac{8}{35}$

What is the difference between the following fractions?

1. $\frac{3}{4} - \frac{4}{7}$.
2. $\frac{8}{9} - \frac{6}{11}$.
3. $\frac{7}{15} - \frac{4}{13}$.
4. $\frac{9}{13} - \frac{8}{19}$.
5. $4\frac{1}{2} - \frac{9}{16}$.
6. $5\frac{4}{7} - \frac{27}{8}$.
7. $3\frac{2}{5} - 2\frac{1}{3}$.
8. $9\frac{1}{10} - 6\frac{4}{7}$.
9. $\frac{9}{11} - \frac{1}{18}$ of 4.
10. $\frac{11}{54} - \frac{3}{28}$ of $\frac{5}{6}$.
11. $169 - 14\frac{3}{7}$.
12. $76\frac{1}{4} - \frac{2}{3}$ of 19.

MULTIPLICATION.

RULE.—Reduce the mixed numbers to improper fractions, and compound fractions to simple ones; after this has been done, multiply all the numerators together for the numerator of the product, and all the denominators together for its denominator.

Multiply $6\frac{2}{3}$ by $\frac{2}{3}$ of $\frac{7}{8}$.

Here the mixed number $6\frac{2}{3}$ is converted into the improper fraction $\frac{20}{3}$, and the compound fraction $\frac{2}{3}$ of $\frac{7}{8}$ into the simple fraction $\frac{14}{24}$. The numerators and denominators being multiplied, produce the improper fraction $\frac{280}{72}$, which being reduced to a mixed number gives $3\frac{64}{72} = 3\frac{8}{9}$.

$6\frac{2}{3} = \frac{20}{3}$ and $\frac{2}{3}$ of $\frac{7}{8} = \frac{14}{24}$
then $\frac{20}{3} \times \frac{14}{24} = \frac{280}{72} = 3\frac{64}{72}$ *Ans.*

Multiply together the following fractions.

1. $\frac{3}{4} \times \frac{5}{8}$.
2. $\frac{7}{9} \times \frac{8}{11}$.
3. $\frac{9}{11} \times \frac{11}{12}$.
4. $\frac{4}{18} \times \frac{4}{27}$.
5. $8\frac{3}{4} \times \frac{5}{12}$.
6. $7 \times \frac{5}{13}$.
7. $5\frac{3}{8} \times 11\frac{1}{4}$.
8. $3\frac{5}{8} \times 4\frac{5}{6}$.
9. $8\frac{2}{3} \times \frac{2}{3}$ of $\frac{7}{8}$.
10. $16 \times \frac{4}{7}$ of $\frac{8}{13}$.
11. $17\frac{2}{5} \times \frac{17}{19}$ of $7\frac{4}{9}$.
12. $24\frac{7}{13} \times \frac{13}{16}$ of $9\frac{1}{9}$.

DIVISION.

RULE.—Prepare the fractions as in multiplication; then invert the divisor and proceed as in multiplication.

Divide $\frac{4}{7}$ by $\frac{3}{5}$. $\frac{4}{7} \div \frac{3}{5}$ inverted thus, $\frac{4}{7} \times \frac{5}{3} = \frac{20}{21}$

1. Divide $\frac{1}{5}$ by $\frac{11}{12}$.
2. $\frac{21}{80}$ $\frac{3}{10}$.
3. $\frac{15}{16}$ $\frac{4}{5}$.
4. $\frac{8}{35}$ $\frac{3}{8}$.
5. $\frac{12}{37}$ $\frac{18}{43}$.
6. $\frac{16}{351}$ $\frac{4}{27}$.
7. Divide $5\frac{5}{7}$ by $\frac{5}{7}$.
8. $3\frac{31}{48}$ $\frac{5}{12}$.
9. $3\frac{1}{6}$ $9\frac{1}{2}$.
10. $9\frac{1}{6}$ $\frac{1}{2}$ of 7.
11. $116\frac{4}{15}$ $\frac{1}{3}$ of $5\frac{1}{2}$.
12. $\frac{2}{3}$ of $\frac{3}{4}$ $\frac{1}{2}$ of $\frac{2}{3}$.

REDUCTION, CONTINUED.

CASE VI.—*To reduce fractions from one denomination to another.*

RULE.—If from a lower name to a higher, multiply the *denominator*, as in reduction of integers. If from a higher name to a lower, multiply the *numerator*, as in reduction of integers.

Reduce $\frac{2}{3}$ of a farthing to the fraction of a pound.

Here the denominator is multiplied, as it is to be brought to a higher name.

$$\frac{2}{3} \times 4 \times 12 \times 20 = \frac{2}{2880} = \frac{1}{1440}$$

Reduce $\frac{3}{5}$ of a pound to the fraction of a penny.

Here the numerator is multiplied, as it is to be brought to a lower name.

$$\frac{3}{5} \times 20 \times 12 = \frac{720}{5} = \frac{144}{1}$$

1. Reduce $\frac{3}{7}$ of a farthing to the fraction of a pound.
2. Reduce $\frac{4}{7}$ of a pound to the fraction of a penny.
3. Reduce $\frac{4}{5}$ of a shilling to the fraction of a guinea.
4. Reduce $\frac{4}{7}$ of a shilling to the fraction of a farthing.
5. Reduce $\frac{3}{10}$ of a day to the fraction of a week.
6. Reduce $\frac{7}{9}$ of a week to the fraction of an hour.
7. Reduce $\frac{4}{5}$ of a nail to the fraction of a yard.
8. Reduce $\frac{7}{8}$ of a cwt. to the fraction of a dram.
9. Reduce $\frac{4}{5}$ of a yard to the fraction of a mile.

CASE VII.—*To express any given quantity as a fraction of another quantity, considered as an integer.*

RULE.—Reduce both quantities to one denomination; then make the reduced integer the denominator, and the other quantity the numerator.

What part of £1 is 13*s.* 4*d.*?

Here both quantities, the £1 and the 13*s.* 4*d.*, are reduced to pence; the pence in the integer, 240, is made the denominator, and the pence in the other quantity is made the numerator; the fraction $\frac{160}{240}$ of a pound is, when brought to its lowest terms, equal to $\frac{2}{3}$ of a pound.

£	*s.*	*d.*
1		
20	13	4
—	12	
20	—	
12	160	
—		
240		

then $\frac{160}{240} = \frac{2}{3}$ *Ans.*

10. Reduce 14*s.* 6*d.* to the fraction of a pound.
11. Reduce 17*s.* 4*d.* to the fraction of a pound.

12. Reduce 5*s.* $8\frac{1}{4}$*d.* to the fraction of a pound.

13. Reduce 17*s.* 9*d.* to the fraction of a penny.

14. Reduce 6*s.* $7\frac{3}{4}$*d.* to the fraction of a farthing.

15. Reduce 7 hours 21 minutes to the fraction of a day.

16. Reduce 7 lbs. 3 drams to the fraction of a cwt.

17. Reduce 8 cwt. 2 qrs. 14 lbs. to the fraction of an ounce.

18. Reduce 3 lbs. 9 oz. to the fraction of a dwt.

19. Reduce 16 hours 13 minutes to the fraction of a day.

CASE VIII.—*To find the value of a fraction.*

RULE.—Reduce the numerator to the next inferior name, and divide by the denominator; reduce the remainder, if any, to the next lower name, and divide again, and so on to the lowest name.

What is the value of $\frac{7}{8}$ of a pound sterling?

Here the numerator, 7, is multiplied by 20, to bring it to the next inferior name, 140*s.* The 140*s.* are divided by 8, which gives 17*s.* and 4 of a remainder; the 4 is multiplied by 12, to bring it to the next inferior name, 48*d.*; it is then divided by 8, which gives 6 without any remainder. The answer, then, is 17*s.* 6*d.*, which is $\frac{7}{8}$ of a pound.

```
   7
  20
 ----
8)140
 ----
  17   4
      12
      --
    8)48
      --
       6
```

20. What is the value of $\frac{6}{7}$ of a pound?

21. What is the value of $\frac{5}{6}$ of a shilling?

22. What is the value of $\frac{9}{11}$ of a day?

23. What is the value of $\frac{14}{23}$ of a guinea?

24. What is the value of $\frac{4}{9}$ of a yard, long measure?

25. What is the value of $\frac{13}{16}$ of a lb. troy?

26. What is the value of $\frac{13}{16}$ of a lb. avoirdupois?

27. What is the value of $\frac{23}{27}$ of a cwt.?

28. What is the value of $\frac{17}{24}$ of a mile?

PROMISCUOUS EXERCISES.

If the fractions be of different denominations, it will be necessary to bring them to the same name before they are added or subtracted.

1. To $\frac{3}{7}$ of a pound add $\frac{4}{5}$ of a shilling.

2. From $\frac{3}{5}$ of a pound take $\frac{6}{9}$ of a shilling.

3. From $\frac{4}{11}$ of a shilling take $\frac{3}{5}$ of $\frac{2}{3}$ of a penny.

4. What is the value of $\frac{5}{8}$ yard of cloth at £$1\frac{5}{16}$ per yard?

5. What is the value of $\frac{5}{7}$ oz. of silver at £$3\frac{1}{7}$ per lb.?

6. If $8\frac{5}{7}$ yards of cloth cost $49\frac{3}{5}$s., what is the price per yard?

7. What is the price per yard, when 3 pieces of cloth, each $12\frac{3}{7}$ yards, cost £$46\frac{5}{9}$?

8. What is the difference between $\frac{2}{3}$ of a league and $\frac{5}{8}$ of a mile?

9. What is the sum of $\frac{4}{5}$ of a cwt., $7\frac{1}{3}$ lbs., and $4\frac{3}{5}$ oz.?

10. From $\frac{7}{8}$ of a guinea take $\frac{3}{4}$ of a pound.

11. How much is 8 times $\frac{15}{16}$ of a yard?

12. How much is $\frac{9}{16}$ of $\frac{2}{3}$ of a pound sterling?

13. A yard of ribbon cost 17*d.*; what is the price of $\frac{1}{2}$ of $\frac{1}{4}$ of a yard?

14. If $\frac{3}{7}$ of a yard cost £$\frac{4}{15}$, what ought to be paid for $6\frac{2}{3}$ yards?

15. If $2\frac{1}{2}$ yards of flannel cost $3\frac{1}{3}$s., what is the price of $4\frac{3}{4}$ yards?

16. If $\frac{3}{16}$ of a ship cost £273$\frac{1}{3}$, what is $\frac{5}{12}$ of her worth?

17. If $\frac{5}{8}$ of a cwt. cost £4$\frac{7}{9}$, what will 4$\frac{1}{2}$ lbs. cost?

18. If 1 lb. of coffee cost 2$\frac{3}{4}$*s.*, how many pounds can I have for 38$\frac{1}{2}$*s.*?

19. If 7$\frac{5}{8}$ yards cost £7 18*s.* 4*d.*, how much did 49$\frac{3}{11}$ yards come to?

20. What cost 17$\frac{19}{112}$ quintals of fish at $4.75 per quintal?

21. What cost $\frac{7}{8}$ of a cord of wood at $5.75 a cord?

DECIMALS.

A DECIMAL FRACTION is a fraction whose denominator is 10, 100, 1000, &c., or a unit with as many ciphers annexed to it as there are places in the equivalent decimal. Thus, $\frac{5}{10}$, $\frac{25}{100}$, $\frac{325}{1000}$, are decimal fractions, and are equivalent to .5, .25, .325, which are *decimals*, a point being placed at the left-hand side of the latter, to distinguish them from *integers*. In reading these decimals, the first is called 5-tenths, the second 25-hundredths, and the third 325-thousandths.

When there are not so many figures in the numerator as there are places in the equivalent decimal, as many ciphers as are necessary must be prefixed:—thus, $\frac{3}{100} = .03$, and $\frac{3}{1000} = .003$.

Ciphers on the left hand of a decimal *decrease* its value tenfold: thus, .5 is 5-tenths, .05 is 5-hundredths, and .005 is 5-thousandths. Ciphers on the right do not alter the value; for .5, .50, .500, are the same as $\frac{5}{10}$, $\frac{50}{100}$, $\frac{500}{1000}$, and these are of equal value.

ADDITION.

RULE.—Place the numbers to be added so that the decimal points be directly under each other, and add as in Simple Addition. Insert the point in the answer directly under the other points.

Add together the following numbers:

(1)	(2)	(3)
2.13	43.27	820.71
.426	9.042	2.006
21.2	712.417	84.243
7.63	41.007	217.072
640.072	.962	9.341

4. Add 4.231, 72.32, 920.74, .9374, 376.05.
5. Add 723.312, 91.0006, 2.0251, 3724.7, .00007.
6. Add 37.214, .736, 7213.04, 123.476, 21.6743.
7. Add 800.273, 498.0009, .296, .0071, 4260.008.
8. Add 320.492, .23687, 970.0083, 9.086, 41.762.

SUBTRACTION.

RULE.—Place the numbers as in addition; subtract as in Simple Numbers, and insert the point under the other points.

1. From 72.378 take 4.861
2. From 9.007 take .962
3. From 41.217 take 7.0968
4. From 298.012 take .9999
5. From 840.001 take 170.98
6. From 279.712 take 97.0076
7. From 72.0076 take 1.973
8. From 900.005 take 89.1171
9. From 243.21 take .964213
10. From 462.0068 take 134.791

MULTIPLICATION.

RULE.—Arrange the factors and multiply as in integers. Reckon the number of decimals in both factors, and point

off as many from the right of the product. When the number of figures in the product is not so great as the number of decimal places in both factors, as many ciphers as may be necessary to make up the deficiency must be placed at the left of the product.

Multiply 7.4 by .35

7.4
.35

370
222

2.590

In the above example there are three decimal places in the multiplicand and multiplier; therefore three figures are pointed off from the right of the product.

Multiply .045 by .03

.045
.03

.00135

In the above example there are five decimal places in the factors, and only three figures in the product; therefore two ciphers are placed at the left of the product to make the number of decimal places in the product equal to that in the factors.

1.	Multiply	.27	by	.27
2.	——	4.21	—	3.41
3.	——	97.04	—	80.03
4.	——	.4102	—	.1004
5.	——	.7	—	.806
6.*	——	.879	—	10
7.	——	2300.7	—	48.003
8.	——	704.23	—	.0007
9.	——	.786	—	100
10.	——	4.862	—	.75
11.	——	200.03	—	.002
12.	——	.00076	—	1000

* In order to multiply a decimal by 10, remove the point one to the *right;* if by 100, remove it two places; and so on.

DIVISION.

RULE.—Divide as in integers. Point off as many decimal places in the quotient as the dividend has more than the divisor: if necessary, place ciphers to the left of the quotient.

If the divisor has more figures than the dividend, add ciphers to the right of the dividend.

When there is a remainder, the quotient may be carried to any degree of exactness, by annexing ciphers to the remainder.

Divide 4.7614 by 3.8.

3.8)4.7614 (1.253.

In this case the decimals in the dividend exceed those in the divisor by three; three figures are therefore marked off in the quotient.

Divide .7644 by 42.

42).7644(.0182

In this case the decimals in the dividend exceed those in the divisor by four; a cipher is therefore prefixed in the quotient, to make four decimal places.

1.	Divide	6.74	by	2.34
2.	——	.496	—	.278
3.	——	7.6	—	.734
4.	——	7.23	—	4.06
5.	——	.024	—	.001
6.*	——	29.6	—	10
7.	——	724.1	—	38.07
8.	——	82.03	—	9.0002
9.	——	7.624	—	2.001
10.	——	.5213	—	.24121
11.	——	31	—	.124689
12.	——	3468.9	—	1000

* To divide by 10, 100, &c., remove the decimal place of the dividend as many places to the *left* as there are ciphers.

REDUCTION.

CASE I.—*To reduce a vulgar fraction to a decimal.*

RULE.—Divide the numerator by the denominator; annexing as many ciphers to the numerator as may be necessary. Point off as many decimal places in the quotient as there were ciphers annexed to the numerator.

Reduce $\frac{1}{2}$ to a decimal.	Reduce $\frac{3}{4}$ to a decimal.
2)10	4)300
.5 *Ans.*	.75 *Ans.*

1. Reduce $\frac{5}{8}$ to a decimal.
2. —— $\frac{1}{4}$
3. —— $\frac{7}{8}$
4. —— $\frac{1}{8}$
5. —— $\frac{5}{6}$
6. —— $\frac{1}{6}$
7. Reduce $\frac{9}{16}$ to a decimal.
8. —— $\frac{1}{75}$
9. —— $\frac{18}{75}$
10. —— $\frac{8}{11}$
11. —— $\frac{275}{3542}$
12. —— $\frac{1}{1875}$

CASE II.—*To reduce a decimal to a vulgar fraction.*

RULE.—Make the given decimal the numerator, and place under it, for a denominator, a unit, with as many ciphers as there are places in the decimal.

Reduce .5 to a vulgar fraction.	Reduce .078 to a vulgar fraction.
$\frac{5}{10}$ *Ans.*	$\frac{78}{1000}$ *Ans.*

1. Reduce .25 to a vulgar fraction.
2. —— .625
3. —— .875
4. —— .005
5. —— .01
6. —— .001
7. —— .41
8. —— .021
9. —— .007
10. —— .019

CASE III.—*To reduce numbers of a lower denomination to the decimal of a higher.*

RULE.—Write the given numbers, if more than one, directly under each other, beginning with the lowest, and divide by as many of the lower as make one of the higher, annexing ciphers if necessary.

Reduce 12*s.* 3*d.* to the decimal of a pound.

12) 3.00

20)12.250

.6125 *Ans.*

Here the shillings and pence are placed under each other, beginning with the lower, and each divided by as many of the lower as make one of the higher.

Reduce 16*s.* 6¾*d.* to the decimal of a pound.

4) 3.00

12) 6.7500

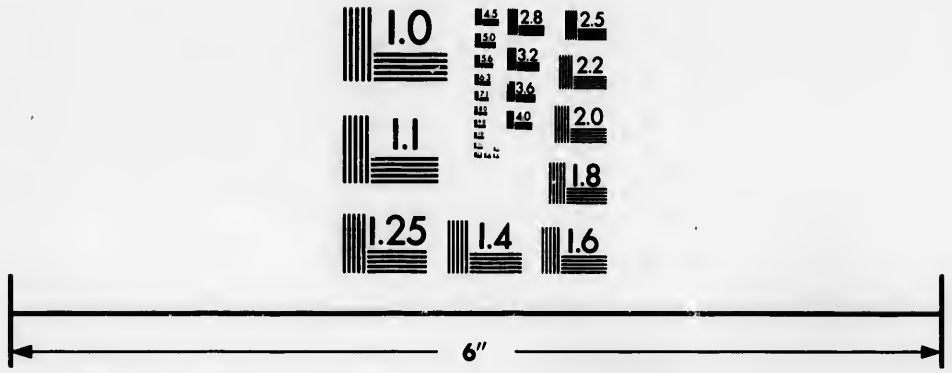
20)16.56250

.828125 *Ans.*

Here the farthings, pence, and shillings are placed under each other, beginning with the lowest; each is then divided by as many of the lower as make one of the higher.

1. Reduce 19*s.* 5½*d.* to the decimal of a pound.
2. Reduce 15*s.* 9¾*d.* to the decimal of a pound.
3. Reduce 13*s.* 4*d.* to the decimal of a pound.
4. Reduce 9*d.* to the decimal of a pound.
5. Reduce 3 cwt. 2 qrs. 8 lbs. to the decimal of a cwt.
6. Reduce 4 feet 8 inches to the decimal of a yard.
7. Reduce 26 min. 34 sec. to the decimal of a week.
8. Reduce 5 furlongs 3 poles to the decimal of a mile.
9. Reduce 4¾*d.* to the decimal of a guinea.
10. Reduce 5 dwt. 12 grs. to the decimal of an ounce.
11. Reduce 2 roods 12 perches to the decimal of an acre.

IMAGE EVALUATION TEST TARGET (MT-3)



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12. Reduce 17 yards, 1 foot, 6 inches, to the decimal of a mile.

CASE IV.—*To find the value of a decimal.*

RULE.—Multiply the decimal by as many of the next lower denomination as make one of the given denomination. Point off from the product as many decimal places as are in the given decimal. Proceed thus to the lowest denomination. The figures on the left of the points are the value of the decimal.

What is the value of .427 of a pound?

.427
20
8.540
12
6.480
4
1.920

Ans. 8*s.* 6¼*d.*

What is the value of .243 of a day?

.243
24
5.832
60
49.920
60
55.200

Ans. 5 hrs. 49 min. 55 sec.

1. What is the value of £.7634?
2. What is the value of £.3412?
3. What is the value of £.0076?
4. What is the value of .764 cwt.?
5. What is the value of .936 lbs. avoirdupois?
6. What is the value of .007 ton?
7. What is the value of .732 shilling?
8. What is the value of .9218 day?
9. What is the value of .496 yard?
10. What is the value of .0796 mile?
11. What is the value of .732 lb. troy?

12. What is the value of .987 oz. avoirdupois?
13. What is the value of .987 oz. troy?
14. What is the value of .779 lbs. avoirdupois?

INVOLUTION.

WHEN a number is multiplied by itself, the product is called a power, and the number multiplied, the root.

Thus, $2 \times 2 = 4$: here 4 is the square or second power of the root 2. Again, $2 \times 2 \times 2 = 8$: here 8 is the cube or third power of the root 2. Again, $2 \times 2 \times 2 \times 2 = 16$: here 16 is the fourth power of the root 2.

1. Find the second power of 8.
2. Required the third power of 18.
3. Raise 82 to the fourth power.
4. Involve 19 to the fifth power.
5. Involve 33 to the sixth power.
6. What is the seventh power of 5?
7. What is the twelfth power of 7?
8. Involve 8 to its eighth power.

EVOLUTION.

EVOLUTION is the method of finding the roots of numbers.

EXTRACTION OF THE SECOND OR SQUARE ROOT.

To extract the square root of any given number is to find a number which, when multiplied by itself, will produce the given number.

What is the square root of 106929?

RULE WITH EXAMPLE.—Divide the given number into periods of two figures each, by placing a point over the unit figure, and over every alternate figure towards the left. Find the square root, 3, of the first period, 10, and place it in the quotient. Subtract the square of it, 9, from the first period, and to the remainder annex the next period, 69, for a dividend. Double 3, the root already found, for a divisor, and supposing the unit figure, 9, omitted, find how often it, viz. 6, is contained in the dividend. It is contained 2 times; place the 2 then *both* in the quotient and the divisor. Multiply the divisor, 62, by the 2, and subtract the product, 124, from the dividend. Bring down another period, and proceed thus till all the periods are brought down.

```
     1̇06̇92̇9(327
      9
     ---
62)   169
      124
     ----
647)  4529
      4529
     ----
```

If there be a remainder after all the periods are used, periods of ciphers may be annexed; when the result will be decimals. Should there be decimals in the given number, still the pointing is to begin from the unit's place of the *integers*, and a point to be placed over every alternate figure both right and left.

The square root of a fraction is found by extracting the square root of the numerator for a new numerator, and the square root of the denominator for a new denominator: if, however, this cannot be done, let the fraction be reduced to a decimal, and the root extracted as before.

1. What is the square root of 30976?
2. What is the square root of 1234321?
3. What is the square root of 2052.09?
4. What is the square root of 4795.25731?
5. What is the square root of 24674.1264?
6. What is the square root of $\frac{49}{144}$?
7. What is the square root of $\frac{196}{1369}$?
8. What is the square root of $60\frac{1}{16}$?

EXTRACTION OF THE THIRD OR CUBE ROOT.

To extract the cube root of any given number is to find a number which, when multiplied twice by itself, will produce the given number.

Find the cube root of 12812904.

RULE WITH EXAMPLE. — Divide the given number into periods of three places, beginning at the place of units. Place the cube root of the first period, 2, in the quotient, and subtract its cube, 8, from the first period, and bring down the next period for a dividend, which makes 4812. To find a divisor,

		12812904(234
		8
		4812
$2\times2=4\times300=$	1200	
$2\times3=6\times30=$	180	
$3\times3=$	9	
	1389 $\times3=$	4167
		645904
$23^2\times300=$	158700	
$23\times4\times30=$	2760	
$4^2=$	16	
	161476 $\times4=$	645904
		0

multiply the square of the figure placed in the quotient by 300, = 1200; find how often this is contained in the dividend, viz. 3 times; place the 3 in the quotient for the second figure of the root. Multiply the part of the root formerly found, viz. 2, by the last figure placed in the root, viz. 3, and the product by 30, = 180; add this and the square of the last figure placed in the root to the divisor, viz. 1200; multiply the sum of these, 1389, by the last figure placed in the root, 3, and subtract the product, 4167, from the dividend, 4812; bring down another period for a new dividend, and proceed in the same manner.

In order to extract the cube root of a vulgar fraction, reduce it to a decimal, and then extract the root.

In mixed numbers, reduce the fractional part to a decimal.

Find the cube root of the following numbers:—

1. Of	373248.	6. Of	52734.375.
2. —	54872.	7. —	7834.8748.
3. —	389017.	8. —	.053157376.
4. —	1092727.	9. —	$\frac{4}{7}$.
5. —	84604519.	10. —	$7\frac{1}{5}$.

DUODECIMAL MULTIPLICATION.

This rule is made use of by artificers in measuring their work. The dimensions are taken in feet, inches, and parts. The foot is divided into 12 parts called inches; the inch into 12 parts called seconds; the second into 12 parts called thirds; and the third into 12 parts called fourths. Three seconds are marked thus, 3″; thirds thus, 3‴; and fourths thus, 3⁗.

Multiply 7 feet $6\frac{3}{4}$ inches by 2 feet $5\frac{1}{4}$ inches.

Rule with Example.—Place the multiplier under the multiplicand, feet under feet, inches under inches, &c. Multiply the multiplicand, beginning at the lowest term, 9, by the highest term in the multiplier, 2, carrying by 12; then multiply by the next lower term in the multiplier, viz. 5 inches, taking care, however, to put the product one place towards the right hand. Do the same with the next lower term, and so on. Add the different products together.

ft.	*in.*	″		
7	6	9*		
2	5	3		
15	1	6		
3	1	9	9	
	1	10	8	3
18	5	2″	5‴	3⁗

* Instead of $\frac{3}{4}$ inches, 9″ are put down, because they are equivalent. The same is done with the $\frac{1}{4}$ inch.

1. Multiply 7 feet 9 inches, by 5 feet 6 inches.
2. Multiply 9 feet 5 inches $8''$, by 4 feet 8 inches $6''$.
3. Multiply 12 feet 8 inches $7''$, by 8 feet 4 inches $9''$.
4. Multiply 46 feet 11 inches $8''$, by 12 feet $7''$.
5. Multiply 87 feet $9\frac{1}{2}$ inches, by 11 feet $10\frac{1}{4}$ inches.
6. Multiply 678 feet $7\frac{3}{4}$ inches, by 24 feet $10\frac{1}{2}$ inches.

To find the superficial content, multiply the length by the breadth.

7. Find the content of a board 8 feet 4 inches long, and 8 feet 4 inches broad.
8. Find the area of a table 10 feet 9 inches long, and 6 feet 4 inches broad.
9. What is the price of a marble slab, the length of which is 6 feet 4 inches, the breadth 3 feet 2 inches, at 7*s.* per foot?
10. Required the area of a square, the side of it being 23 feet 9 inches.
11. A grave-stone was charged at $1.04 per foot; what was the price of it, the length of it being 7 feet 2 inches, the breadth 3 feet 6 inches?
12. How much will it cost to plank a court-yard at 17cts. per foot, the length of it being 26 feet 9 inches, the breadth 12 feet 4 inches?

To find the solid content, multiply the length, breadth, and thickness together.

13. What is the solid content of a block of marble 9 feet 2 inches long, 5 feet 8 inches broad, and 2 feet 3 inches thick?
14. Required the solid content of a box $6\frac{1}{2}$ feet long, $4\frac{3}{4}$ feet broad, and $3\frac{1}{4}$ feet deep.
15. A log of mahogany is 72 feet $7\frac{1}{2}$ inches long, 5 feet $6\frac{1}{4}$ inches broad, and 8 feet $6\frac{1}{3}$ inches thick. Required its solid content.
16. What would it cost to have a cellar dug 18 feet 4 inches long, 12 feet 9 inches broad, and 9 feet 6 inches deep, at 18 cts. per solid yard?
17. Required the solid content of a log of beech 27 feet 6 inches long, 2 feet 5 inches broad, and 1 foot 2 inches thick.
18. What is the value of a block of granite 8 feet 9 inches long, 3 feet 7 inches broad, and 4 feet 2 inches thick, at $1.50 the solid foot?

ANSWERS.

NUMERATION.

1. One—Two—Three—Four—Five—Six—Seven—Eight—Nine—Naught.

2. Ten—Eleven—Fourteen—Sixteen—Nineteen—Twenty—Forty-two—Eighteen—Seventeen.

3. Two hundred—Four hundred and twenty—Six hundred and seven—Nine hundred and eighty-six—Four hundred and seventy-three—Two hundred and forty-seven—Three hundred and sixty-four.

4. Nine hundred and twelve—Eight hundred and seventy-four—Seven hundred and eighty-three—Six hundred and fifty—Two hundred and two—Six hundred and four—Five hundred and ten.

5. Four thousand—Two thousand seven hundred—Eight thousand six hundred and one—Seven thousand and thirty-six—Two thousand one hundred and one—One thousand and sixty.

6. One thousand and ten—Seven thousand and thirty—Four thousand six hundred—Nine thousand one hundred and eleven—Four thousand and seventy-six—Five thousand eight hundred and seventy.

7. Twenty-six thousand and twelve—Seventy thousand one hundred and one—Forty-two thousand one hundred—Thirty-six thousand one hundred—Ninety thousand two hundred and one.

8. Seven hundred thousand—Seven hundred and one thousand and twenty—Nine thousand two hundred and

sixty-four and two hundred and seventy thousandths —One hundred and four and two hundred and six thousandths.

9. Nine millions—Nine thousand seven hundred and sixty-four and two hundred and sixty-eight thousandths—Eight millions two hundred and two thousand one hundred—Five thousand and twenty-three and sixty-seven thousandths.

10. Two millions six hundred thousand and sixty—Four millions one hundred and one thousand and ten—Two millions four thousand—Fourteen thousand twenty-one and four hundred and ninety thousandths.

11. Forty millions—Two thousand nine hundred and sixty and two hundred and sixty-eight thousandths seven hundred millionths—Five thousand and two and six hundred and one thousandths seven hundred millionths—One hundred and sixty-seven and two thousandths.

12. Nine thousand four hundred and twelve and six hundred and eighty-seven thousandths and six hundred and seventy millionths—Two hundred and sixty-seven thousand six hundred and two and six hundred and seven thousandths—Four hundred and one million four hundred and sixty-seven thousand six hundred and eighty.

13. Two thousand nine hundred and sixty and two hundred and sixty-eight thousandths seven hundred and sixty millionths—Seven hundred and ten millions twenty thousand and ten—Two hundred and seventy millions six hundred and three thousand and fifty.

14. Fourteen thousand and twenty-three and six hundred and seven thousandths four hundred millionths—Three billions four hundred and sixty millions seven hundred and sixty thousand and ten—Four thousand and twenty-three and six hundred and one thousandths four hundred and ninety-seven millionths.

15. Seven hundred and four thousand two hundred and sixty and three hundred and seventy-one thousandths and four hundred millionths—Five millions seventy-nine thousand six hundred and seven and nine hundred and six thousandths—One billion seven hundred and four millions seventy thousand six hundred.

16. Eighty-one billions four hundred and sixty-two millions three hundred and six thousand and twelve—Four millions six hundred thousand seven hundred and sixty-eight and seven hundred and sixty-eight thousandths and one hundred millionths—Ninety-four billions eighty-six millions four hundred and twenty-one thousand three hundred and sixty.

17. Fourteen billions twenty-three millions six hundred and forty-one thousand two hundred and one—Twenty billions eight hundred and sixty millions two thousand and one—Four hundred thousand and twenty and two thousandths and twenty millionths.

18. Nine hundred and seven thousand and sixty and two hundred and six thousandths two hundred and four millionths—Two hundred and forty thousand and twenty-six and one hundred thousandths two hundred and one millionths—Five hundred and ninety billions nine hundred and sixty millions one hundred and twenty-six thousand and twenty.

NOTATION.

1.] 6—7—9—8—5—10—12—14—16—18—20—19.

2.] 74—26—31—49—58—62—76—77—97—84—55—99.

3.] 100—104—244—691—750—909—999—802.

4.] 4000—4200—5352—6705—7050—9002—8080—6707.

5.] 10000—15560—19019—26595—38038—40040—56.325—163.5.

6.] 400000—400040—600707—980000—256975—3891.25
14782.04—458215.673.

7.] 6000000—5498000—8040402—7498765—10010010—
20240606—53053053—87300010.005—
14014014.014014.

SIMPLE ADDITION.

MENTAL EXERCISES.

1.	22 cents.
2.	21 dollars.
3.	18
4.	85
5.	13

SLATE EXERCISES.

1.	$1186.37c.
2.	1248
3.	$1348.74c.
4.	1465
5.	2250.979
6.	2072
7.	2348.190
8.	2856.000
9.	$977.63c.
10.	1635
11.	$1518.30c.
12.	1056
13.	84957
14.	21868.6246
15.	18068
16.	$10914.44c.
17.	30154
18.	18001
19.	20169
20.	14372
21.	411093
22.	351626.939
23.	278540.63
24.	248663
25.	105
26.	293
27.	408
28.	1475
29.	15388
30.	4258c.
31.	$24731
32.	1824286
33.	7861214
34.	536146c.
35.	75675
36.	311013
37.	$660.11
38.	2246
39.	72
40.	230

41.	$2471.40	45.	162
42.	$10525	46.	$2625
43.	5681	47.	415
44.	68891	48.	336

SIMPLE SUBTRACTION.

MENTAL EXERCISES.

1.	9
2.	91
3.	8
4.	7
5.	29

SLATE EXERCISES.

1.	184
2.	$475.87
3.	342
4.	$455.52
5.	536
6.	$375.18
7.	463
8.	$531.08
9.	96
10.	$89.88
11.	16175
12.	18948
13.	25972
14.	70747
15.	36919.427
16.	78878
17.	40252.79
18.	38999
19.	22984
20.	$15289.09
21.	78359
22.	25292.15
23.	462121935
24.	435195169
25.	73922070
26.	612663991.767
27.	722995412.135
28.	91310918.832
29.	313841778927
30.	769808830048
31.	704026138872
32.	424575325955
33.	417801945959
34.	416879998308
35.	457555
36.	1205995
37.	3599244
38.	57955
39.	$8072
40.	171

41.	369	51.	2880
42.	172	52.	875884
43.	94	53.	140 millions.
44.	106	54.	2542904
45.	135	55.	5320 ft.
46.	799	56.	85 yrs.
47.	1386517	57.	412 yrs.
48.	83	58.	1819 and 23
49.	130	59.	77
50.	740		

MIXED QUESTIONS IN ADDITION AND SUBTRACTION.

1.	83	5.	415
2.	2720	6.	221
3.	1557	7.	19789
4.	162	8.	£287

SIMPLE MULTIPLICATION.

MENTAL EXERCISES.

1.	63 cents.	5.	66278.296
2.	89 dollars.	6.	672613.16
3.	84	7.	389807.501
4.	60 and 180	8.	748790
		9.	$502558.76
		10.	$1162249.44

SLATE EXERCISES.

1.	$17104.68	11.	$574877.79
2.	$134574.52	12.	568668
3.	$432268.20	13.	350184
4.	$225804.18	14.	612822
		15.	787914

16.	525276
17.	262638
18.	437730
19.	875460
20.	963006
21.	1050552
22.	$1966.54
23.	$6882.89
24.	$3933.08
25.	$7866.16
26.	$5899.62
27.	$4916.35
28.	$8849.43
29.	$11799.24
30.	$10815.97
31.	$68236.48
32.	$133863.66
33.	$232499.52
34.	$182214.09
35.	$231504.12
36.	$208963.44
37.	$199122.30
38.	$188250.56
39.	$565184.16
40.	$220399.92
41.	$576676.32
42.	$715501.44
43.	632.21592
44.	7464.4808
45.	29050.420
46.	48.844096
47.	8439.3932
48.	4301.43168
49.	777.566496
50.	3598.31304
51.	63073762
52.	41281053
53.	242945.91
54.	28047414
55.	46350656
56.	575630.377
57.	39549.4873
58.	649435896
59.	64008924
60.	3704412744
61.	408576660
62.	175320
63.	$19884.80
64.	2592
65.	2303
66.	3168
67.	$3240
68.	4480
69.	111690
70.	2144
71.	81056
72.	783
73.	80
74.	1095
75.	56940
76.	768000

SIMPLE DIVISION.

MENTAL EXERCISES.

1. 5 and 7
2. $11.70
3. 5
4. 5
5. 10

SLATE EXERCISES.

1. 6911¼
2. $137.52⅞
3. 18281⅛
4. $115.17⅐
5. $95.53⅜
6. $3186⅔
7. $64.26 8/10
8. 4206 1/11
9. 6368906
10. $53359.55⅔
11. 13771812⅜
12. $71409.73⅝
13. 39064.06 4/12
14. 5859550
15. 126670.06⅚
16. $4780.66⅞
17. 58858003⅞
18. 282363441/2
19. 188242293/3
20. 141181721/4
21. 112945375/5
22. 94121145/6
23. 8067527
24. 70590861/8
25. 62747432/5
26. 5647268 2/10
27. 5133880 9/11
28. 4706057 5/12
29. $374840.11½
30. $249893.41
31. $187420.052/4
32. $149936.043/5
33. $124946.703/6
34. $107097.174/7
35. $93710.027/8
36. $83297.803/9
37. $74968.02 3/10
38. $68152.74 9/11
39. $62473.35 3/12
40. 26654—14
41. 41315—17
42. 40364—12
43. 24995—2
44. 17862—35
45. 8703—9
46. 6828—33
47. 4408—28
48. 10902—34
49. 1889—64
50. 3309—88
51. 3450—76
52. 1767—22

53. 1726—18
54. 1687—8
55. 1649—31
56. 1618—38
57. 107—513
58. 92—728
59. 181—26
60. 143—30
61. 280—43
62. 149—387
63. 123—319
64. 355—73
65. 244—295
66. 204—91
67. 174—55
68. 141—265
69. 10.804—74
70. 1032—570
71. 959.1—218
72. 9902—383
73. 7.234—312
74. 7.00—1507
75. 857—1713
76. 31.86—11
77. 953—2014
78. 5098685000
79. 25134919—1984
80. 2587—1292
81. 954118—1200
82. .01061—2110
83. 3753252—4000
84. 58264695—45
85. 22529302—1400
86. 12-240000786692
87. $670.82—7
88. 45—2
89. 3600 minutes.
90. 266—20000
91. 2111111—5
92. 192268—340
93. 925—25
94. 25711
95. 546022
96. $3293781\frac{1}{7}$
97. $22319437102\frac{1}{4}$
98. $129612\frac{1}{6}$
99. $57618\frac{1}{6}$
100. $150427\frac{1}{3}$
101. $39173922\frac{2}{11}$
102. 1022785665
103. $127510\frac{2}{12}$
104. $2998\frac{2}{11}$
105. 452
106. 61881—36
107. 9670—64
108. 882—9
109. 2154—6
110. 1424—3
111. 518—224
112. 18138—38
113. 7296—1506

NEW BRUNSWICK CURRENCY.

1. $76.43
2. $124.45
3. $31.25 / $156.25
4. $9.00
5. $139.39
6. $10.00
7. $10.01
8. 55 dollars and 34 cents.
9. $77.55

REDUCTION.

MENTAL EXERCISES.

1. 70*s.* 85*s.* and 133*s.*
2. 20*d.* 30*d.* and 180*d.*
3. £3 15*s.*, £8 3*s.*, and £9 14*s.*
4. 32 furlongs.
5. 320 rods.
6. 168 hours.

SLATE EXERCISES.

1. 11882 farthings.
2. 63478 pence.
3. 350150 farthings.
4. 131825 halfpence.
5. 69552 pence.
6. 71520 farthings.
7. 87552 farthings.
8. 10692 pence.
9. £3394 10*s.*
10. £444 13*s.* 3*d.*
11. 1751*gs.* 18*s.*
12. 1146*cr.* 2*s.* 10*d.*
13. 113067 fourpences.
14. 9880 crowns.
15. £4884 10*s.*
16. 4947*s.* 6*d.*
17. 873740 threepences.
18. 57552 fivepences.
19. 9621 fourpences 1½*d.*
20. 31932080 sixpences.
21. 33465*cr.* 3*s.*
22. 118801½ seven shillings.

AVOIRDUPOIS WEIGHT.

23. 854 lb.
24. 1564 oz.
25. 89 lb. 3 oz.
26. 7032 lb.
27. 812 parcels.

TROY WEIGHT.

28. 5760 dwt.
29. 5 oz. 2 dwt. 20 gr.

30. 5184 gr.
31. 6 spoons—77
32. 1 lb. 11 oz. 2 dwt.
33. 21 spoons—8.

APOTHECARIES' WEIGHT.

34. 27160 grains.
35. 5 oz. 1 dr. 1 scr. 7 gr.
36. 186 scruples.
37. 252 days.

LONG MEASURE.

38. 24560 perches.
39. 1332 yds. 1 ft. 4 in.
40. 200640 yards.
41. 57200 times.
42. 39600 times.

CLOTH MEASURE.

43. 3936 nails.
44. 299 yds. 2 nls.
45. 8 shirts—8.
46. 7 suits—8.

MEASURES OF CAPACITY.

47. 197 pints.
48. 585 gal. 3 qts. 1 pt.
49. 3479 pecks.
50. 1199 bushels.
51. 2016 gills.

TIME.

52. 1094 hours.
53. 51 dys. 20 hrs. 57 min.
54. 5316480 minutes.
55. 341640 times.

COMPOUND ADDITION.

1. £328 10*s.* 0*d.*
2. £241 5*s.* 7*d.*
3. £107 9*s.* 0¼*d.*
4. 29 cwt. 1 qr. 19 lb.
5. 82 per. 4 yds. 2 ft.
6. 10 qrs. 14 lb. 15 oz.
7. £4660 7*s.* 0¾*d.*
8. £3560 17*s.* 11*d.*
9. £3727 18*s.* 9¼*d.*
10. 167 ac. 2 rd. 14 per.
11. 29 fur. 36 per. 3 yds.

12. 189 ac. 2 rd. 4 per.
13. £9 5*s*. 6*d*.
14. £2 12*s*. 1*d*.
15. £4264 18*s*. 6*d*.
16. 15 lb. 4 oz. 1 dwt. 14 gr.
17. £17 17*s*. 1*d*.
18. 56 wks. 2 ds. 11 hrs. 16 min.
19. £11912 2*s*. 3½*d*.
20. 118 miles 5 fur. 18 per. 3½ yds.
21. 29 ac. 0 rd. 21 per.

COMPOUND SUBTRACTION.

1. £48 16*s*. 9¾*d*.
2. £18 19*s*. 2¼*d*.
3. £58 18*s*. 3¼*d*.
4. £39 16*s*. 8¾*d*.
5. £69 2*s*. 2½*d*.
6. £36 17*s*. 8¾*d*.
7. 24 ac. 2 rd. 30 per.
8. 29 days 15 hrs. 30 min.
9. 3 per. 2½ yd. 2 ft.
10. £38 19*s*. 11¾*d*.
11. £17 6*s*. 11½*d*.
12. £30 12*s*. 11½*d*.
13. 15 yrs. 47 wks. 5 days.
14. 4 fur. 30 per. 2½ yds.
15. 22 ac. 1 rd. 30 per.
16. 3 cwt. 2 qr. 16 lb.
17. 6 cwt. 2 qr. 11 lb.
18. 7 qrs. 23 lb. 14 oz.
19. 3 cwt. 2 qrs. 27 lb.

20. 8 lb. 11 oz. 11 dwt. 6 gr.
21. £14 1*s.* 2¾*d.*
22. 4 miles 5 fur. 5 per.
23. 436 bush. 2 pk. 6 qt. 1 pt.
24. 10 yd. 1 qr. 1 nl.
25. 65 ac. 0 rd. 33 per.
26. £21529 11*s.* 6*d.*
27. 13 gal. 2 qts. 1 pt. 3 gills.
28. 2 wks. 0 days. 19 hrs.

COMPOUND MULTIPLICATION.

1. 194 lb. 4 oz. 16 dwt.
2. 330 yd. 0 qr. 3 nl.
3. 46 cwt. 2 qr. 14 lb.
4. £906 11*s.* 5*d.*—½.
5. £764 15*s.* 2½*d.*—¾
6. £610 11*s.* 8¼*d.*
7. 92 miles 3 fur. 20 per.
8. 29 ac. 1 rd. 16 per.
9. 30 lb. 7 oz. 8 dwt. 8 gr.
10. £115 10*s.*
11. £15 14*s.* 10½*d.*
12. £4408 10*s.* 6*d.*
13. 3432 lb. 8 oz. 12 dwt.
14. £308485 4*s.* 4*d.*
15. 35737 miles 5 fur.
16. 211 cwt. 3 qrs. 1 lb. 4 oz.
17. 1534 gal. 1 qt. 1 pt.
18. 748 ac. 38 per.
19. 319 m. 1 fur. 30 per.

20. 9032 yd. 3 qr. 2 nl.
21. 77657 m. 1 fur. 24 per.
22. 806 gals. 2 qts. 1 pt.
23. 47 hrs. 7 min. 30 sec.
24. 5991 gals.
25. £501 17*s.* 6*d.*
26. 393 oz. 15 dwt.
27. £254 7*s.* 6*d.*
28. £923 0*s.* 0*d.*

COMPOUND DIVISION.

1. 2 cwt. 1 qr. $21\frac{1}{2}$ lb.
2. 2 qrs. 4 lb. $6\frac{7}{9}$ oz.
3. 9 yds. 0 qr. $3\frac{8}{7}$ nls.
4. 4 yds. 0 qr. $1\frac{4}{9}$ nls.
5. 16 lb. 11 oz. $4\frac{1}{4}$ dwt.
6. 6 oz. 5 dwt. $6\frac{4}{7}$ gr.
7. 4 days 11 hrs. $8\frac{3}{8}$ min.
8. 6 cwt. 2 qrs. 12 lb.
9. 1 lb. 1 oz. 2 dwt.
10. 1 per. 4 yd. 0 ft. 10 in.
11. 1 yd. 2 qr. $0\frac{7}{42}$ nl.
12. 1 ac. 0 rd. $30\frac{17}{31}$ per.
13. £19 7*s.* $3\frac{1}{2}d.$—$\frac{2}{5}$
14. £4 13*s.* $5\frac{1}{2}d.$—$\frac{4}{10}$
15. £53 7*s.* $0\frac{3}{4}d.$
16. £2 7*s.* $11\frac{1}{2}d.$
17. 10*s.* $8\frac{3}{4}d.$—$\frac{5}{9}$
18. 1 cwt. 3 qrs. 26 lb. $9\frac{4}{10}$ oz.
19. $67\frac{3}{5}$ parcels.

20. 1 cwt. 1 qr. $15\frac{5}{36}$ lb.
21. 1 mile 5 fur. 13 per.
22. 16 miles 5 fur. 33 per. 0 yd. 2 ft. 10 in.
23. £1 2*s*. $4\frac{1}{2}d$.
24. 4 bush. 2 pk. $5\frac{24}{36}$ qt.
25. 24 miles 7 fur. 4 rods.
26. £11 9*s*. $6\frac{1}{2}d$.—16
27. 5*s*. $0\frac{3}{4}d$.—1916
28. £21 5*s*. $11\frac{1}{2}d$.—202
29. £4 16*s*. $0\frac{1}{2}d$.—24

MIXED QUESTIONS ON THE COMPOUND RULES.

1. 54 cwt. 0 qr. 16 lb.
2. 49 cwt. 2 qrs. 9 lb.
3. 475 hogsheads—910.
4. 192 tons 19 cwt. 3 qrs. 6 lb.
5. 806 gals. 2 qts. 1 pt.
6. 32 suits.
7. 149 bush. 3 pk. 5 qt.
8. 29700 steps.
9. 55 years of age, and lived longest in England.
10. $5436.45
11. 11 ac. 3 rd. 18 per.
12. { $22 woman's share. $66 man's share.
13. 2 fur. 20 rods.
14. 196 men—1556
15. He gains $273.33

SIMPLE PROPORTION.

1. 108*s.*
2. 80 cts.
3. $9.79
4. $6.50
5. $19.31 $\frac{9}{11}$
6. 1666.66\frac{2}{3}$
7. $652.50
8. $26.66
9. $17
10. $2799.50
11. $65340
12. $1738.80
13. 5*s.* 9$\frac{3}{4}$*d.*—264
14. £196 16*s.* 0$\frac{3}{4}$*d.*—48.
15. 1333 lb. 9 oz.—4
16. 9*d.*—6
17. 12 days.
18. 7 days 9 hrs.—30
19. 8$\frac{3}{4}$ months.
20. 1$\frac{1}{3}$ months.
21. 13$\frac{1}{3}$ days.
22. 165 feet 2 in.—8
23. 405 men.
24. 42 cords.
25. $16.52
26. $219.70
27. 54545 $\frac{5}{11}$ feet.
28. $70.98
29. £1 2*s.* 6$\frac{3}{4}$*d.*—36
30. 7 $\frac{7}{15}$ oz.
31. 30 days.

MENTAL EXERCISES.

1. $60
2. $60
3. $19.50
4. $25.55
5. $103.50

COMPOUND PROPORTION.

1. 425 roods—369
2. $768
3. 240 acres.
4. 58$\frac{1}{3}$ suits.
5. 145 men—160
6. 10 horses.
7. 2250 men.
8. 55$\frac{5}{9}$ days.
9. $120.
10. 13$\frac{1}{3}$ days.
11. 800 girls.
12. 27 acres.

BILLS OF PARCELS.

Bookseller's Bill..... $17.45
Hosier's Bill..... $13.86
Grocer's Bill..... $17.95

BILL OF BOOK DEBTS.

Wine-Merchant's Bill..... $183.13½

PRACTICE.

1.	$314.40	6.	$205.53¾
2.	$237.73+	7.	$802.50⅞
3.	$190.40+	8.	$333.96
4.	$503.15+	9.	$885.29+
5.	$1328.00+	10.	$824.77+

SIMPLE INTEREST.

1.	$4.68	12.	$5.52—216
2.	$67.50	13.	$11.12—200
3.	$41.60	14.	$756.60—260
4.	$72.00	15.	$132.53—155
5.	$287.50	16.	$1118.17+
6.	$45.90	17.	$2380.58—89
7.	$17.64	18.	$486.63—288
8.	$34.20	19.	$2.78—233
9.	$684.00	20.	$4378.16—125
10.	$150.00	21.	$53.72+
11.	$2.68—160	22.	$2.17—339

23.	$876.78—90	28.	$116.99+
24.	$265.22—185	29.	$45.08+
25.	$81.85	30.	$238.68+
26.	$4.58+	31.	$1.14+
27.	$1.08+	32.	$41.79½

COMPOUND INTEREST.

1.	$70.20¼	5.	$964.53
2.	$720.32	6.	$237.60
3.	$497.54	7.	$27.75
4.	$155.61		

DISCOUNT.

	COMMON.	CORRECT.
1.	$524.80	$542.37
2.	$27.00	$26.61
3.	$4.05—175	$3.99
4.	$241.79	$241.84
5.	$289.81	$290.92
6.	$6.35¼	$6.23
7.	$171.00	

COMMISSION, BROKERAGE, ETC.

1.	$6.70	6.	$15.78
2.	$29.70	7.	$61.83¾
3.	$7500	8.	$57.82
4.	$275	9.	$9375
5.	$96.40	10.	$60

11.	$4836.50	17.	$3825
12.	$104.16	18.	$48231.12
13.	$699.92	19.	$501.56¼
14.	$103.32	20.	$318.11⅓
15.	$48312.50	21.	$12.50
16.	£142 13*s.*	22.	$114.64

BARTER.

1. 23 pairs, and $1.90 to boot.
2. 189 lb.
3. 137½ lb.
4. 214 gals.—150
5. 57 yd.—3[illegible]0
6. 14 cents—1604
7. 1 cwt. 2 qrs. 12 lb.
8. 25 cwt. 2 qrs. 22 lb.—2020

PROFIT AND LOSS.

CASE I.		CASE II.	
1.	$5.12	1.	22⅔
2.	$472.76	2.	12$\frac{40}{55}$
3.	$15.18	3.	$34.62—206
4.	$3.12	4.	13⅓
5.	He gained $2.80	5.	802—990

PARTNERSHIP OR COMPANY BUSINESS.

1. A's $1083.33\frac{1}{3}$
   B's $5416.66\frac{2}{3}$

2. A's 118.33$\frac{1}{3}$
   B's 98.61$\frac{1}{3}$
   C's 59.16$\frac{2}{3}$
   D's 78.88$\frac{8}{9}$

3. James Williams's share 166.66\frac{2}{3}$
   John Smeaton's " 300.00
   W. Winstanley's " 483.33$\frac{1}{3}$

4. E's share $380
   F's " 190

5. Charles Jones's share 466.66\frac{30}{45}$
   Henry Adams's " 500
   John Stephens's " 533.33$\frac{15}{45}$

6. A's share $105
   B's " 144
   C's " 150

7. H's share 526.92\frac{6}{37}$
   I's " 972.77$\frac{31}{37}$
   J's " 1553.74$\frac{13}{37}$
   K's " 1945.55$\frac{25}{37}$

8. A's share $ 6.45$\frac{25}{155}$
   B's " 15.48$\frac{60}{155}$
   C's " 14.51$\frac{95}{155}$
   D's " 13.54$\frac{130}{155}$

EXCHANGE.

1.	£15 14*s.* 7*d.*	11.	$73.77—46
2.	£15 12*s.* 6*d.*	12.	$92.59—28
3.	$58.63—70	13.	$1111.11—10
4.	$90.26—30	14.	$112.89—36
5.	$557.69—24	15.	$69.21—5
6.	$63.15—60	16.	$372.69—12
7.	$54.61—88	17.	$108.69—52
8.	$19.52—40	18.	$78.09—55
9.	$355.10—20	19.	£53 7*s.* 2*d.*
10.	$3050.40	20.	£194 15*s.* 10*d.*

VULGAR FRACTIONS.

1.	$2487\frac{2}{3}$	17.	$\frac{89}{5}$
2.	$604\frac{1}{2}$	18.	$\frac{88}{9}$
3.	$227\frac{25}{43}$	19.	$\frac{193}{7}$
4.	$92\frac{21}{698}$	20.	$\frac{9707}{15}$
5.	$93\frac{86}{89}$	21.	$\frac{6130}{17}$
6.	$199\frac{29}{43}$	22.	$\frac{29301}{30}$
7.	$11\frac{502}{680}$	23.	$\frac{80329}{36}$
8.	$1\frac{15539}{2104}$	24.	$\frac{18487}{27}$
9.	$964\frac{731}{7687}$	25.	$\frac{123000}{126}$
10.	351	26.	$\frac{3549934}{421}$
11.	$1\frac{4401}{487600}$	27.	$\frac{76285}{111}$
12.	$104\frac{4457}{7036}$	28.	$\frac{180057}{234}$
13.	$130\frac{1090}{3684}$	29.	$\frac{501248}{621}$
14.	$176\frac{1878}{4963}$	30.	$\frac{80}{294}$
15.	$\frac{15}{2}$	31.	$\frac{168}{1485}$
16.	$\frac{26}{3}$	32.	$\frac{1615}{819}$

33. $\frac{352}{1188}$

34. $\frac{392}{323}$

35. $\frac{5304}{98325}$

36. $\frac{33048}{68370}$

37. $\frac{605880}{58965}$

38. $\frac{25056}{9282}$

39. $\frac{261807}{55575}$

40. $\frac{3}{17}$

41. $\frac{23}{55}$

42. $\frac{4}{11}$

43. $\frac{3}{10}$

44. $\frac{148}{1735}$

45. $\frac{191}{1310}$

46. $\frac{161}{432}$

47. $\frac{55}{128}$

48. $\frac{1}{180}$

49. $\frac{249}{44}$

50. $\frac{7}{8}$

51. $\frac{11}{13}$

52. $\frac{63}{84}$ $\frac{56}{84}$ $\frac{48}{84}$

53. $\frac{40}{72}$ $\frac{63}{72}$ $\frac{48}{72}$

54. $\frac{2223}{2717}$ $\frac{1463}{2717}$ $\frac{1716}{2717}$

55. $\frac{2691}{3312}$ $\frac{1584}{3312}$ $\frac{2208}{3312}$

56. $\frac{262299}{37128}$ $\frac{27132}{37128}$ $\frac{13260}{37128}$ $\frac{28392}{37128}$

57. $\frac{9664}{216294}$ $\frac{29828}{216294}$ $\frac{145304}{216294}$ $\frac{74871}{216294}$

58. $\frac{3911502891}{4462418879}$ $\frac{666798321}{4462418879}$ $\frac{2609973390}{4462418879}$ $\frac{411662225}{4462418879}$

59. $\frac{478020548860}{612416102220}$ $\frac{143693813700}{612416102220}$ $\frac{476184765518}{612416102220}$ $\frac{70500005060}{612416102220}$

60. $\frac{3}{24}$ $\frac{6}{24}$ $\frac{2}{24}$ $\frac{5}{24}$

61. $\frac{7}{49}$ $\frac{5}{49}$ $\frac{7}{49}$

62. $\frac{40}{150}$ $\frac{6}{150}$ $\frac{35}{150}$

63. $\frac{28}{126}$ $\frac{27}{126}$ $\frac{114}{126}$

64. $\frac{363}{3094}$ $\frac{238}{3094}$ $\frac{728}{3094}$

65. $\frac{350}{1100}$ $\frac{132}{1100}$ $\frac{75}{1100}$

ADDITION.

1. $1\frac{32}{45}$

2. $2\frac{170}{1001}$

3. $2\frac{107}{2576}$

4. $2\frac{2651113}{3317477}$

5. $1\frac{114975}{152485}$

6. $3\frac{126945}{4556622}$

7. $1\frac{437}{5460}$

8. $3\frac{7051}{15561}$

9. $13\frac{1}{4}$

10. $4\frac{21087}{3105}$

11. $14\frac{15537}{83779}$

12. $11\frac{24475}{152145}$

SUBTRACTION.

1.	$\frac{5}{28}$	5.	$3\frac{15}{16}$	9.	$\frac{73}{143}$
2.	$\frac{34}{99}$	6.	$2\frac{11}{56}$	10.	$\frac{173}{1512}$
3.	$\frac{81}{195}$	7.	$1\frac{11}{40}$	11.	$154\frac{4}{7}$
4.	$\frac{93}{247}$	8.	$2\frac{37}{70}$	12.	$63\frac{7}{12}$

MULTIPLICATION.

1.	$\frac{15}{32}$	5.	$3\frac{31}{48}$	9.	$5\frac{1}{18}$
2.	$\frac{56}{99}$	6.	$2\frac{9}{13}$	10.	$5\frac{57}{91}$
3.	$\frac{3}{4}$	7.	$60\frac{15}{32}$	11.	$115\frac{256}{285}$
4.	$\frac{8}{243}$	8.	$17\frac{25}{48}$	12.	$181\frac{611}{936}$

DIVISION.

1.	$3\frac{8}{55}$	5.	$\frac{86}{111}$	9.	$\frac{1}{3}$
2.	$\frac{7}{8}$	6.	$\frac{4}{13}$	10.	$2\frac{13}{21}$
3.	$1\frac{11}{64}$	7.	8	11.	$63\frac{23}{55}$
4.	$2\frac{18}{35}$	8.	$8\frac{3}{4}$	12.	$1\frac{1}{2}$

REDUCTION, CONTINUED.

1.	$\frac{3}{6720}$£.	11.	$\frac{13}{15}$£.
2.	$\frac{960}{7}d.$	12.	$\frac{91}{320}$£.
3.	$\frac{4}{105}$ guinea.	13.	$2\frac{13}{1}d.$
4.	$\frac{192}{7}$ farthing.	14.	$\frac{319}{1}$ farthing.
5.	$\frac{3}{70}$ week.	15.	$\frac{49}{160}$ day.
6.	$\frac{392}{3}$ hour.	16	$\frac{1795}{28672}$ cwt.
7.	$\frac{1}{20}$ yard.	17.	$\frac{15456}{1}$ oz.
8.	$\frac{25088}{1}$ dram.	18.	$\frac{900}{1}$ dwt.
9.	$\frac{1}{2200}$ mile.	19.	$\frac{973}{1440}$ day.
10.	$\frac{29}{40}$£.	20.	$17s.\ 1\frac{1}{2}d.—\frac{6}{7}$

21.	10*d.*	25.	9 oz. 15 dwt.
22.	19h. 38 min. $10\frac{10}{11}$ sec.	26.	13 oz.
23.	12*s.* $9\frac{1}{4}d.$—$\frac{13}{23}$	27.	3 qr. 11 lb. 6 oz. $8\frac{8}{27}$ dr.
24.	1 ft. 4 in.	28.	5 fur. 26 per. 3 yd. 2 ft.

PROMISCUOUS EXERCISES.

1.	9*s.* $4\frac{1}{4}d.$—$\frac{29}{35}$	12.	2*s.* 6*d.*
2.	12*s.* 8*d.*	13.	$2\frac{1}{8}d.$
3.	$3\frac{3}{4}d.$—$\frac{47}{55}$	14.	£4 2*s.* $11\frac{5}{9}d.$
4.	11*s.* $8\frac{1}{2}d.$—$\frac{1}{2}$	15.	6*s.* 4*d.*
5.	4*s.* $3\frac{1}{4\frac{1}{9}}d.$	16.	£227 12*s.* 1*d.*
6.	5*s.* $8\frac{1}{4}d.$—$\frac{63}{305}$	17.	6*s.* $1\frac{1}{2}d.$—$\frac{6}{7}$
7.	£1 4*s.* $11\frac{1}{2}d.$—$\frac{526}{783}$	18.	14 lb.
8.	1 mile 3 fur.	19.	£51 3*s.* 1*d.*—$\frac{533}{671}$
9.	$1558\frac{22}{45}$ oz.	20.	$\$81.55\frac{65}{112}$
10.	3*s.* $4\frac{1}{2}d.$	21.	$\$5.03\frac{1}{8}$
11.	7 yd. 2 qrs.		

DECIMAL FRACTIONS.

ADDITION.

1.	671.458	5.	4541.03777
2.	806.698	6.	7396.1403
3.	1133.372	7.	5558.5850
4.	1374.2784	8.	1341.58517

SUBTRACTION.

1.	67.517	6.	182.7044
2.	8.045	7.	70.0346
3.	34.1202	8.	810.8879
4.	297.0121	9.	242.245787
5.	669.021	10.	327.2158

MULTIPLICATION.

1.	.0729	7.	110440.5021
2.	14.3561	8.	.492961
3.	7766.1112	9.	78.6
4.	.04118408	10.	3.6465
5.	.5642	11.	.40006
6.	8.790	12.	.76

DIVISION.

1.	2.8803+	7.	19.0202+
2.	1.784+	8.	9.114+
3.	10.354+	9.	3.81009+
4.	1.7807+	10.	2.161+
5.	24	11.	248.618+
6.	2.96	12.	3.4689

REDUCTION.

CASE I.

1.	.625
2.	.25
3.	.875
4.	.333+
5.	.833+
6.	.166+
7.	.5625
8.	.0133+
9.	.2133+
10.	.7272+
11.	.0715+
12.	.00053+

CASE II.

1.	$\frac{1}{4}$
2.	$\frac{5}{8}$
3.	$\frac{3}{8}$
4.	$\frac{1}{200}$
5.	$\frac{1}{100}$
6.	$\frac{1}{1000}$
7.	$\frac{41}{100}$
8.	$\frac{21}{1000}$
9.	$\frac{7}{1000}$
10.	$\frac{19}{1000}$

CASE III.

1. £.9729+
2. £.790625
3. £.6666+
4. £.0375
5. cwt. 3.57142+
6. yd. 1.4166+
7. weeks .00263+
8. mile .63437+
9. guin. .018849+
10. oz. .275
11. acre .575
12. mile .009943+

CASE IV.

1. 15*s.* 3*d.*—$\frac{27}{125}$
2. 6*s.* 9$\frac{3}{4}$*d.*—$\frac{69}{125}$
3. 1$\frac{3}{4}$*d.*—$\frac{37}{125}$
4. 3 qrs. 1 lb. 9 oz. 1 dr.—$\frac{51}{125}$
5. 14 oz. 15 dr.—$\frac{77}{125}$
6. 15 lb. 10 oz. 14 dr.—$\frac{2}{25}$
7. 8$\frac{3}{4}$*d.*—$\frac{17}{125}$
8. 22 hrs. 7 min. 23 sec.—$\frac{13}{25}$
9. 1 qr. 3 nl. 2 in.—$\frac{53}{500}$
10. 25 per. 2 yd. 1 ft. 9 in.—$\frac{57}{125}$
11. 8 oz. 15 dwt. 16 gr.—$\frac{8}{25}$
12. 15 drams—$\frac{99}{125}$
13. 19 dwt. 17 gr.—$\frac{19}{25}$
14. 12 oz. 7 drams—$\frac{53}{125}$

INVOLUTION.

1. 64
2. 2197
3. 1048576
4. 2476099
5. 1291467969
6. 78125
7. 13841287201
8. 16777216

EVOLUTION.

SQUARE ROOT.

1.	176	5.	157.08
2.	1111	6.	$\frac{7}{12}$
3.	45.3	7.	$\frac{14}{37}$
4.	69.247+	8.	$7\frac{3}{4}$

CUBE ROOT.

1.	72	6.	37.5
2.	38	7.	19.86+
3.	73	8.	.376
4.	103	9.	.829+
5.	439	10.	1.93+

DUODECIMAL MULTIPLICATION.

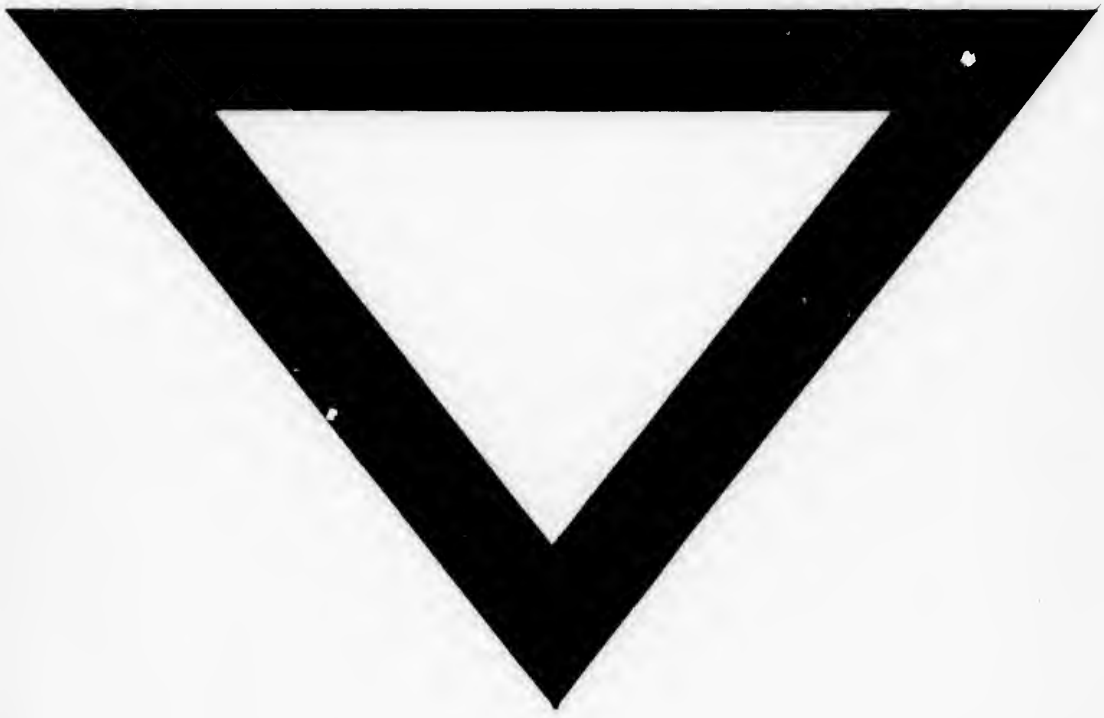
	ft.	in.	″	‴	⁗
1.	42	7	6	0	0
2.	44	5	2	7	6
3.	106	9	0	9	3
4.	565	11	4	9	8
5.	1040	8	4	4	6
6.	16881	3	9	4	6
7.	27	9	4	0	0
8.	68	1	0	0	0
9.	£7 0*s.* 4½*d.*—$\frac{2}{3}$				

10. 564 ft. 0 in. 9″
11. \$26.08$\frac{2}{3}$
12. \$56.08$\frac{7}{12}$
13. 116 ft. 10 in. 6″
14. 100 ft. 4 in. 1″ 6‴
15. 3419 ft. 2 in. 7″ 2‴ 10⁗ 6⁗⁗
16. \$10.65+
17. 77 ft. 6 in. 5″
18. \$195.96+

THE END.

ON.

7.08
$\frac{7}{12}$
$\frac{14}{37}$
$7\frac{3}{4}$

5
6+
3
9+
3+

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