

HANDBOOK
TO
ELEMENTARY
ARITHMETIC
PARTS I AND II

79826

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HANDBOOK
TO
ELEMENTARY ARITHMETIC

PARTS I AND II

FOR PUBLIC SCHOOLS



PRICE \$1.00

W. J. GAGE & COMPANY, LIMITED
TORONTO

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PREFACE

In presenting the answers to the Elementary Arithmetic, Parts I and II, together with hints for the solution of the more difficult problems, the authors desire to make the following observations:—

Great importance should be given to the oral arithmetic; in fact, no written work should be given to the pupil or attempted by the pupil until the principles necessary for the complete mastering of the subject have been thoroughly grasped through oral exercises involving the use of simple numbers. For this purpose the oral exercises of the text should be largely supplemented by the teacher. Emphasis should be laid upon actual business practices and the understanding of business terms. Often the difficulty in the solution of the problem disappears when these things are known.

Precision in the use of language necessary to the accurate expression of thought cannot receive too much attention either in oral or written work. This will promote not only keener discernment and mental development, but will also tend to secure accuracy in the final result. The habit of accepting inaccurate work upon the pretext that the *result does not matter* cannot be too strongly deprecated.

Second in importance to accuracy is *neatness* in the performance of all written work. Neatness will lessen the number of mechanical errors as well as lead to accuracy in reasoning. No written work in any subject will be accepted by the efficient teacher that does not closely approximate to the pupil's best production. To secure this will require vigilance and persistence on the part of the teacher, but the results will fully justify the effort put forth.

PREFACE

There are several thousand problems in the text from which a judicious selection should be made for a first course. This will leave new material for review. The ideal review in Arithmetic, any more than in any other subject, does not mean simply a *repetition* of what has been previously learned, but rather a *new* view of ground formerly traversed—either looked at from a different standpoint or freshened by the introduction of new material. There is but little vitality in solving the same old problems in the same old way.

All pupils in the same grade are not on the same level either in attainment or ability, and thus, if habits of indolence or mischief are not to be encouraged, exercises supplementary to the minimum required of all pupils should be provided for the more capable. Many problems of the text which are too difficult for the ordinary public school pupil will be valuable for this purpose, and if so used may tend to avert "arrested development" on the part of the rapid worker or the more brilliant in the class.

The necessity of keeping this book in small compass has in many cases caused a conciseness of statement beyond what is desirable in ordinary solution. A few errors were discovered in the first edition of the Arithmetic. These have been corrected in the second edition and the answers in the handbook are based on this edition. It is possible that in spite of the care exercised there may still appear some errors which have escaped notice. Information in regard to these will be gratefully received.

THE AUTHORS.

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HANDBOOK

TO

ELEMENTARY ARITHMETIC

PARTS I AND II

FOR PUBLIC SCHOOLS

PART I

Exercise 7. Page 13

1. 16, 12, 18, 25, 28, 31, 30, 27.
2. 46, 39, 42, 48, 356, 409, 453.
3. 248, 314, 339, 316, 294, 318.
4. 68, 58, 50, 56, 577, 584, 652.
5. 68, 71, 75, 68, 760, 761, 673.
6. 88, 83, 80, 80, 701, 720, 788.
7. Sum of lines, 67, 65, 64, 68, 51, 58, 61, 52, 65, 66.
Sum of columns, 64, 65, 58, 59, 69, 59, 58, 59, 64, 62.
Sum of columns, 617. Sum of lines, 617.
8. 72 trees.
9. 12 qts.
10. 120 sheets.
11. \$420.
12. \$3.85.
13. 72 in.
14. 66 ft.
15. \$1.62.

Exercise 8. Page 16

1. 25, 23, 15, 41, 22, 62, 43.
2. 84, 63, 70, 34, 23, 16, 52.
3. 29, 37, 46, 16, 34, 32, 51.
4. 19, 38, 56, 46, 38, 11, 56.
5. 30, 34, 45, 68.
6. 56, 29, 29, 19.
7. 19, 29, 49, 39.
8. 56, 9, 35, 37.
9. 44 and 12; 81 and 49; 111 and 37;
124 and 46; 127 and 29; 140 and 46; 161 and 9.
10. 104 and 46; 124 and 26; 119 and 15; 64 and 26; 90 and
54; 99 and 27; 73 and 35.
11. 18c.
12. 4 bouquets.
13. 6 ft.

Exercises 9-14—Oral

Exercise 15. Page 27

1. XIX, XXIV, XLIX, LXXXIV, XCIX.
2. CLXXXVII, CCVIII, DCCLXXXI, CMLXII, CMXCIX.
3. MCCC I, MCCCXC, MDCLXXXIV, MCCCCXV,
MDCCCLXXVIII. 4. 44, 69, 94, 71.
5. 99, 129, 177. 6. 555, 1604, 1819, 1090.
7. 1290, 1009, 1490, 1900. 8. X, V, I.
9. C, L, V, I.

Exercise 16. Page 27

1. 100 times. 2. 9999, 1000. 3. 090, 900.
4. 26000, 10000, 89910, 399999, 40689, 20399.
5. 40000, 5000, 200, 60, 9; 3000000, 100000, 70000, 6000, 7.
7 hundreds and 4 tens; 16 hundreds and 8 tens; 100 hundreds.
6. 1914 = MCMXIV, 1915 = MCMXV, 1916 = MCMXVI,
1917 = MCMXVII, 1918 = MCMXVIII, 1919 = MCMXIX,
1920 = MCMXX, etc.
7. The answer for this question will vary from year to year.
The most reliable figures will be obtained from the Dominion
Census Bureau, Ottawa, Ontario.

Exercise 17. Page 30

1. 47 horses. 2. 98 boys. 3. 39 girls. 4. 978.
5. 956. 6. 898. 7. 889. 8. 879.
9. 979. 10. 697. 11. 798. 12. 998.
13. 898. 14. 879. 15. 889. 16. 8589.
17. 9879. 18. 8989. 19. 9989. 20. 98878.
21. 87988. 22. 88998. 23. 79988.

Exercise 18. Page 31

1. 79c. 2. 88 trees. 3. 589 ac.
4. \$796. 5. 989 mi. 6. 969 yd.
7. 878 bales. 8. \$8989.

Exercise 19. Page 33

- | | | | |
|-----------------|--------------|--------------|---------------|
| 1. 113 dollars. | 2. 78 cents. | 3. 152 boys. | 4. 145 girls. |
| 5. 146. | 6. 247. | 7. 162. | 8. 161. |
| 9. 217. | 10. 213. | 11. 255. | 12. 205. |
| 13. 150. | 14. 418. | 15. 306. | 16. 255. |
| 17. 2704. | 18. 1656. | 19. 1951. | 20. 1976. |
| 21. 1842. | 22. 2141. | 23. 23878. | 24. 18294. |
| 25. 16954. | 26. 14978. | 27. 15114. | 28. 16046. |
| 29. 36924. | 30. 38487. | 31. 41400. | 32. 34826. |
| 33. 30477. | 34. 38548. | 35. 276124. | 36. 245389. |
| 37. 185498. | 38. 400123. | | |

Exercise 20. Page 34

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|--------------|---------------|--------------|
| 1. \$535.14. | 2. \$7798.32. | 3. \$101990. |
|--------------|---------------|--------------|

Exercise 21. Page 35

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|----------------|-------------|------------|------------|
| 1. 24692. | 2. 25879. | 3. 27265. | 4. 24447. |
| 5. 23378. | 6. 238390. | 7. 246818. | 8. 94903. |
| 9. 76931. | 10. 104974. | 11. 47991. | 12. 12521. |
| 13. \$4464.94. | | | |

Exercise 22. Page 35

Horizontal lines—\$1099.28; \$999.03; \$1317.43; \$966.84; \$1015.23; \$1128.17.

Vertical lines—\$1731.98; \$1426.17; \$1294.68; \$1172.96; \$900.19. Total—\$6525.98.

Exercise 23. Page 36

- | | | |
|-------------|-------------|----------------|
| 1. \$222. | 2. 1660 ac. | 3. 120 da. |
| 4. 1061 mi. | 5. 936 lb. | 6. 7428 bu. |
| 7. 3441 ac. | 8. \$633. | 9. 2104 pages. |
| 10. \$2237. | | |

Exercise 24. Page 37

- | | | |
|-------------|--------------|-------------------|
| 1. \$31080. | 2. 26728 mi. | 3. \$231,611,417. |
| 4. 1407 mi. | 5. 2065 mi. | |

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Exercise 25. Page 40

1. 313.	2. 241.	3. 251.	4. 402.
5. 644.	6. 464.	7. 143.	8. 305.
9. 344.	10. 304.	11. 733.	12. 530.
13. 4442.	14. 5022.	15. 2223.	16. 2001.
17. 2530.	18. 4422.	19. 5512.	20. 2734.
21. 5024.	22. 6257.	23. 1361.	24. 4623.
25. 423.	26. 60224.	27. 36275.	28. 31216.
29. 5082.	30. 43264.	31. 36425.	32. 35137.
33. 66243.	34. 75331.	35. 61161.	36. 364.
37. 233.	38. 228.	39. 2533.	40. 1243.
41. 6216.			

Exercise 26. Page 41

1. 43 girls.	2. 44 cents.	3. \$16.	4. 34 runs.
5. 44.	6. \$43.	7. \$33.	8. \$2112.

Exercise 27. Page 43

1. 4944.	2. 2857.	3. 5339.	4. 1299.
5. 1359.	6. 5247.	7. 2279.	8. 5263.
9. 3784.	10. 5682.	11. 4469.	12. 1789.
13. 11844.	14. 19528.	15. 52888.	16. 35499.
17. 49289.	18. 25012.	19. 21236.	20. 61076.
21. 32130.	22. 78224.	23. 54546.	24. 57754.
25. 43266.	26. 51837.	27. 47978.	28. 41094.
29. 32113.	30. 11523.		

Exercise 28. Page 44

1. 642396, 576917.	2. 623141, 764544.	3. 475078, 1.
4. 709909, 616161.	5. 3428, 4249, 5144.	6. 3683, 1966, 2736.
7. 3998, 3466, 1613.	8. 1145, 5406, 2246.	9. \$8.
10. 77 yd.	11. \$560.	12. 1826.
13. 3251.	14. \$3.44.	

Exercise 29. Page 44

- | | |
|-------------------------------|----------------------------|
| 1. 520. | 2. 6258. |
| 3. 4216. | 4. 16220. |
| 5. 8240. | 6. $11478 - 7110 = 4368$. |
| 7. $1971 + 127 = 2098$. | 8. $3936 + 507 = 4443$. |
| 9. $999001 - 1487 = 997514$. | 10. $5383 - 2992 = 2391$. |

Exercise 30. Page 45

- | | |
|------------------------------|-------------------------------|
| 1. $1328 - 1151 = 177$. | 2. $1621 - 882 = 739$. |
| 3. $3274 - 1463 = 1811$. | 4. $1744 - 1053 = 691$. |
| 5. $4382 - 2120 = 2262$. | 6. $1922 - 1402 = 520$. |
| 7. $5514 - 3335 = 2179$. | 8. $101021 - 78695 = 22326$. |
| 9. $93138 - 15273 = 77865$. | 10. $12210 - 8612 = 3598$. |

Exercise 31. Page 46

- | | |
|--|----------------|
| 1. \$357. | 2. Loss \$632. |
| 3. $11438 - 904 = 10534$. | |
| 4. First, \$352; Second, \$419; Third, \$325; Fourth, \$104. | |
| 5. $2325 - 1369 = 956$. | 6. 814 ft. |

Exercise 32. Page 46

- | | |
|---|-------------------------------------|
| 1. $78360 - 35951 = 42409$. | 2. 227 ac. |
| 3. Red, 84; Black, 47; Blue, 76; Green, 38. Total 245. | |
| 4. Gladstone was 10 years older than Victoria when he died.
He lived 7 years longer than Victoria. | |
| 5. (a) 39951, (b) 313863, (c) 353814. | |
| 6. $202750 - 168498 = 34252$. | 7. $\$17500 - \$17461 = \$39$ gain. |

Exercise 33. Page 47

- | | | |
|---|------------|---------------|
| 1. 53c. | 2. 984. | 3. 2608c. |
| 4. 17th from the bottom, 29th from the top. | | |
| 5. 589 nuts. | 6. \$28. | 7. 33c. gain. |
| 8. \$1269. | 9. \$1864. | 10. \$1.25. |
| 11. 3 boys. | | |

Exercise 34. Page 52

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|--------------|-----------------|----------------|
| 1. 14864 | 2. 16864. | 3. 216936. |
| 4. 368492. | 5. 195 boys. | 6. 282c. |
| 7. 959 cows. | 8. 1488 apples. | 9. 2106 girls. |
| 10. 1890. | 11. 3360. | 12. 3070. |
| 13. 23526. | 14. 47901. | 15. 43710. |
| 16. 78112. | 17. 53838. | 18. 70340. |
| 19. 72028. | 20. 661672. | 21. 153132. |
| 22. 630855. | 23. 352794. | 24. 646857. |
| 25. 53936. | 26. 54360. | 27. 432481. |

Exercise 35. Page 52

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|-------------------------------------|------------------------|------------|
| 1. \$162.80. | 2. \$1854.30. | 3. \$2709. |
| 4. \$15215. | 5. 336 sheep ; \$2352. | |
| 6. 94 lb.; \$26.10; \$7.52; \$6.58. | | |

Exercise 36. Page 54

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|---------------|---------------|--------------|--------------|
| 1. 11950. | 2. 40992. | 3. 118377. | 4. 66738. |
| 5. 482544. | 6. 340488. | 7. 189945. | 8. 240896. |
| 9. 134010. | 10. 62550. | 11. 183576. | 12. 1348560. |
| 13. 98560 yd. | 14. 68520 ft. | 15. \$83.52. | 16. 459 da. |
| 17. \$3000. | 18. \$8505. | 19. \$19845. | |

Exercise 37. Page 56

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|----------------|----------------|----------------|----------------|
| 1. 472440. | 2. 300720. | 3. 236196. | 4. 562650. |
| 5. 724885. | 6. 6608822. | 7. 6586169. | 8. 6509916. |
| 9. 1194872. | 10. 4127874. | 11. 9781440. | 12. 11961586. |
| 13. 14821755. | 14. 25581580. | 15. 23120856. | 16. 81362385. |
| 17. 29455710. | 18. 31259060. | 19. 70021632. | 20. 14069499. |
| 21. 41316048. | 22. 26514000. | 23. 42741832. | 24. 16765686. |
| 25. 66093951. | 26. 217702278. | 27. 163588743. | 28. 307551216. |
| 29. 276010344. | 30. 114297351. | 31. 348112465. | 32. 283036032. |

Exercise 38. Page 57

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|--------------|---------------|----------------|----------------|
| 1. 127405. | 2. 6317608. | 3. 1960452. | 4. 6825456. |
| 5. 63366216. | 6. 56127072. | 7. 6749472. | 8. 8214206. |
| 9. 25996104. | 10. 80071992. | 11. 738110274. | 12. 344892582. |

Exercise 39. Page 57

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|------------|----------------|---------------|----------------|
| 1. 283800. | 2. 592900. | 3. 60744600. | 4. 11887500. |
| 5. 243000. | 6. 258000. | 7. 11214000. | 8. 4096000. |
| 9. 422500. | 10. 627000000. | 11. 64610000. | 12. 488000000. |

Exercise 40. Page 58

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|-------------------|------------------|---------------|
| 1. 454560 sheets. | 2. 195559 yd. | 3. \$6125. |
| 4. 1653 yd. | 5. 3915648 lb. | 6. \$1228275. |
| 7. 263952 apples. | 8. 915750 pages. | 9. 61275 yd. |

Exercise 41. Page 58

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|-----------------|-----------------|------------------|
| 1. \$1246420. | 2. \$3926000. | 3. \$7080320. |
| 4. 262800 bbl. | 5. \$277107850. | 6. 372480 hills. |
| 7. 89784 yd. | 8. 7344 mi. | 9. \$631.80. |
| 10. 1323000 lb. | | |

Exercise 42. Page 59

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|--|---------------------------------|
| 1. 785664. | 2. $693875 - 258420 = 435455$. |
| 3. $398692 + 113484 = 502176$. | 4. $389037 - 86271 = 302766$. |
| 5. 172081. | 6. 46189. |
| 7. $990991 \times 1640 = 1625225240$. | 8. $502254 - 423654 = 78600$. |
| 9. 67419143. | 10. $272 \times 300 = 81600$. |

Exercise 43. Page 60

- | | |
|---|---------------------------------|
| 1. $\$2960 - \$2352 = \$608$. | |
| 2. $164700 \text{ men} - 1936 \text{ men} = 162764 \text{ men}$. | |
| 3. 530229 gal. | 4. $\$4773 - \$2000 = \$2773$. |

5. $36652c. - 24000c. = 12652c.$ 6. House, \$7455; Farm, \$9940.
 7. Horses, \$2532.
 8. A's, 706800 letters; B's, 1126125 letters.

Exercises 44, 45 — Oral

Exercise 46. Page 66

1. 228.	2. 368.	3. 274.	4. 187.
5. 269.	6. 245.	7. 272.	8. 174.
9. 138.	10. 246.	11. 223.	12. 171.
13. 182.	14. 255.	15. 275.	16. 128.
17. 156.	18. 183.	19. 144.	20. 206.
21. 184.	22. 204.	23. 243.	24. 152.
25. 109.	26. 123.	27. 147.	28. 129.
29. 177.	30. 168.	31. 163.	32. 187.
33. 156.	34. 153.	35. 176.	36. 139.
37. 108.	38. 109.	39. 129.	40. 144.
41. 246.	42. 556.	43. 419.	44. 609.
45. 1223.	46. 367.	47. 676.	48. 1208.
49. 1337.	50. 1410.	51. 907.	52. 457.
53. 947.	54. 3669.	55. 13879.	56. 988.
57. 442.	58. 285.	59. 7032.	60. 7484.

Exercise 47. Page 68

1. 59 oranges.	2. 173 da.	3. 918 lb.
4. 231 yd.	5. 96 rd.	6. 91c.
7. 15 bu.	8. 123.	9. 6052 bu.

Exercise 48. Page 68

1. 432 bbl.	2. 1256 lb.	3. \$6226.
4. \$11.20.	5. \$8.	6. $13\frac{1}{2}$ apples.
7. $130\frac{3}{4}$ lb.	8. \$125.20.	9. $52\frac{1}{4}$ wk.

\$9940.

Exercise 49. Page 71

1.	24	times and 20 remainder.	19.	6205	times and 162 remainder.
2.	8	" 39	"	20. 6200	" 160 "
3.	18	" 33	"	21. 3746	" 0 "
4.	74	" 53	"	22. 2025	" 372 "
5.	39	" 50	"	23. 4998	" 432 "
6.	588	" 51	"	24. 9710	" 140 "
7.	531	" 45	"	25. 43210	" 0 "
8.	945	" 27	"	26. 4671	" 0 "
9.	554	" 66	"	27. 3180	" 0 "
10.	49	" 49	"	28. 3615	" 0 "
11.	231	" 231	"	29. 1142	" 0 "
12.	498	" 153	"	30. 7277	" 9467 "
13.	375	" 375	"	31. 25596	" 11496 "
14.	2259	" 1	"	32. 50444	" 0 "
15.	5050	" 99	"	33. 100300001	times and 0 re- [mainder.
16.	2831	" 0			
17.	23137	" 136	"	34. 10000200	times and 36 re- [mainder.
18.	30653	" 17	"	35. 1003.	

Exercise 50. Page 73

1.	1734	times and 9 remainder.	7.	349	times and 17 remainder.
2.	1366	" 44	"	8. 696	" 26 "
3.	1549	" 61	"	9. 1082	" 6 "
4.	307	" 38	"	10. 4236	" 57 "
5.	246925	" 21	"	11. 2570	" 0 "
6.	149147	" 13	"	12. 5599	" 89 "

Exercise 51. Page 73

1.	43 da.	2.	38 da.	3.	1090 ft.
4.	\$32.	5.	129 yr.	6.	\$123.
7.	\$46.	8.	545 lb.	9.	$343\frac{5}{7}$ mi.
10.	2075 bbl.				

Exercise 52. Page 75

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|-------------------------------------|-------------------------------|
| 1. 24 times and 5 remainder. | 7. 2 times and 386 remainder. |
| 2. 127 " " 22 " 8. 5 " " 3500 " | |
| 3. 12 " " 242 " 9. 30 " " 9751 " | |
| 4. 326 " " 61 " 10. 153 " " 5521 " | |
| 5. 804 " " 9 " 11. 673 " " 1773 " | |
| 6. 1183 " " 38 " 12. 632 " " 6279 " | |

Exercise 53. Page 75

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|------------|-----------|------------|-----------|
| 1. 108 yd. | 2. 65 hr. | 3. 123 lb. | 4. 30 lb. |
| 5. 42 bu. | 6. \$235. | 7. 237 bu. | 8. 43 bu. |

Exercise 54. Page 77

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|----------|---|
| 1. 4. | 2. Dividend - (Divisor \times Quotient). |
| 3. 89. | 4. (Divisor \times Quotient) + Remainder. |
| 5. 6. | 6. (Dividend - Remainder) \div Divisor. |
| 7. 12. | 8. (Dividend - Remainder) \div Quotient. |
| 9. 9265. | 10. $(97 \times 203) + 96 = 19787$. |

Exercise 55. Page 78

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|------------|--|------------|
| 1. 271. | 2. 555. | 3. 222221. |
| 4. 632819. | 5. $(383 \times 587) - 313 = 224508$. | |
| 6. 37874. | 7. 414348. | 8. 16546. |
| 9. 9576. | | |

Exercise 56. Page 78

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|-------------------------|-----------------------|
| 1. 38 mo. = 3 yr. 2 mo. | 2. 367 ac. |
| 3. \$2310. | 4. \$3380. |
| 6. \$44. | 7. $65\frac{2}{3}$ c. |
| 9. 24 mo. = 2 yr. | 8. 1650 bbl. |

Exercise 57. Page 79

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|----------|------------|------------|
| 1. 80c. | 2. \$2.40. | 3. 54c. |
| 4. \$56. | 5. \$96. | 6. \$100. |
| 7. 40c. | 8. \$12. | 9. \$6880. |

Exercise 58. Page 80

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|------------|-----------|-----------|-----------|
| 1. 9 da. | 2. 15 da. | 3. 12 da. | 4. 32 da. |
| 5. 361 da. | 6. 50 da. | 7. 90 da. | 8. 48 da. |

Exercise 59. Page 81

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|-------------|-------------|-------------|
| 1. 28 men. | 2. 105 men. | 3. 21 men. |
| 4. 108 men. | 5. 25 men. | 6. 114 men. |
| 7. 56 men. | 8. 72 men. | 9. 150 men. |

Exercise 60—Oral

Exercise 61. Page 86

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|---|-------------------------------------|------------------------------------|
| 1. 92 <i>d</i> . | 2. 1104 far. | 3. £29. 15 <i>s</i> . 5 <i>d</i> . |
| 4. £309 5 <i>s</i> . | 5. 2406 <i>d</i> . | 6. 560 <i>d</i> . |
| 7. £4. 1 <i>s</i> . 5 <i>d</i> . 2 far. | 8. £29. 16 <i>s</i> . 11 <i>d</i> . | 9. 183839 far. |
| 10. 3209 far. | 11. \$28.83½. | 12. \$18.43¼. |

Exercise 62. Page 88

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|-------------------------------|------------------------|-----------------------|
| 1. 65296 oz. | 2. 86 oz. | 3. 13cwt. 52lb. 13oz. |
| 4. 30 lb. 10 oz. 6 dr. | 5. 516608 dr. | 6. 168005 oz. |
| 7. 2 ton. 7 cwt. 74 lb. 1 oz. | | 8. 4933 oz. |
| 9. 25 ton. 16 cwt. 49 lbs. | | 10. 26 stone. 1 lb. |
| 11. 43136 dr. | 12. 3cwt. 90lb. 10 oz. | |

Exercise 63. Page 90

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|--------------------------|------------------------|------------------|
| 1. 685 rd. | 2. 3036 in. | 3. 73 ft. |
| 4. 70 in. = 5 ft. 10 in. | 5. 217 yd. 2 ft. 9 in. | 6. 14 mi. 82 rd. |
| 7. 13464 in. | 8. 9 ch. 46 ft. 9 in. | 9. 5238 in |

Exercise 64. Page 94

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|-------------------------------------|-------------------|------------------------|
| 1. 10368 sq. in. | 2. 13104 sq. in. | 3. 124 sq. ft. |
| 4. 28 sq. yd. 3 sq. ft. 127 sq. in. | | 5. 840 sq. rd. |
| 6. 49 ac. 5 sq. rd. | 7. 1120 sq. rd. | 8. 300 sq. ch. |
| 9. 87120 sq. ft. | 10. 22129 sq. in. | 11. 47 ac. 125 sq. rd. |
| 12. 51200 sq. rd | | |

Exercise 65. Page 95

1. Square; 160 ac.
2. 480 ac.; 4 mi. of fence; cost \$384.
3. \$160.
4. \$5520.
5. 1 mi.
6. \$334080.
7. \$1604160.
8. 2 mi.; 4 mi.
9. (1) 3 mi. 66 ft. or 3 mi. 4 rd.
(2) 7 mi. 66 yd. = 7 mi. 12 rd.
(3) The distance to the centre of the road allowance midway between the north and the south sides of sections 23 and 24 = $6\frac{1}{2}$ mi. 99 yd. = 6 mi. 979 yd. = 6 mi. 178 rd.
(4) The distance will be $6\frac{1}{2}$ mi. 99 yd. = 6 mi. 178 rd.

Exercise 66. Page 98

1. 60 cords 9 cu. ft.
2. 4 cu. ft. 1557 cu. in.
3. 135424 cu. in.
4. 610 cord ft. 4 cu. ft.
5. 813888 cu. in.
6. 3552 cu. ft.
7. 13 cu. yd. 18 cu. ft. 52 cu. in.
8. 45 cords 8 cu. ft.
9. 3712 cu. ft. 260 cu. in.
10. 186624 cu. in.

Exercise 67. Page 100

1. 120 bu. 2 qt.
2. 678 pt.
3. 2311 pt.
4. 336 gal. 3 qt. 1 pt.
5. 556 pk.
6. 61 bu. 25 lb.
7. 96 gal. 8 lb. or $96\frac{8}{10}$ gal.
8. 80 standard gal.
9. 157 bu. 10 lb.
10. 72 bu.

Exercise 68. Page 101

1. 62100 sec.
2. 230400 sec.
3. 10 hr. 14 min. 1 sec.
4. 2 da. 13 hr. 18 min.
5. 1814400 sec.
6. 8784 hr.
7. 2 wk. 3 da. 17 hr.
8. 38 da. 13 hr. 55 min.
9. 608400 sec.
10. 1 da. 22 hr. 47 min. 36 sec.

Exercise 69. Page 102

1. 1740 sec.
2. 34099 sec.
3. $12^{\circ} 48'$.
4. $21^{\circ} 21' 35''$.
5. 19038 sec.
6. 2714400 sec.
7. 1299660 sec.
8. 1641648 sec.

Exercise 70. Page 103

- | | | |
|---|----------------------------------|----------------|
| 1. 29 bbl. 84 lb. | 2. 1608 sheets. | 3. 5292 units. |
| 4. 34 bbl. 47 lb. | 5. 125 doz. | 6. 69 score. |
| 7. 4 great gross, 5 gross, 4 doz., 4 units. | 8. 683 lb. | |
| 9. 1148 lb. | 10. 16 reams 7 quires 21 sheets. | |

Exercise 71. Page 103

- | | | |
|-----------------|----------------------|-----------------------|
| 1. 672 hr. | 2. 2640 yd. | 3. 317520 sq. in. |
| 4. 1168 qt. | 5. 848 cu. ft. | 6. 33 wk. 3 da. 4 hr. |
| 7. 33481 far. | 8. 439552 dr. | 9. 2855520 in. |
| 10. 172200 sec. | 11. 240 lb. heavier. | |

Exercise 72. Page 104

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|----------------------------|---------------------------------|------------------|
| 1. 26112 oz. | 2. \$4.08. | 3. \$4.05. |
| 4. \$3045. | 5. 39 mi. 510 yd. | 6. 2678400 sec. |
| 7. 8600 yd. | 8. \$13.65. | 9. 92 bu. 28 lb. |
| 10. 141 bu. 16 lb. | 11. 23 tons 5 cwt. 62 lb. 8 oz. | |
| 12. 1666 sq. yd. 6 sq. ft. | 13. \$595. | |
| 14. 17190 ft. | 15. \$195. | |

Exercise 73. Page 105

- | | |
|-----------------------------------|--------------------------------------|
| 1. 73 cwt. 70 lb. 9 oz. | 2. 16 yd. 1 ft. 6 in. |
| 3. £34. 14s. 8d. | 4. 43 bu. 1 pk. 1 pt. |
| 5. 16 yd. 2 ft. 3 in. | 6. 6 wk. 3 da. 6 hr. 50 min. 33 sec. |
| 7. 13 yd. 8 in. | 8. 101 mi. 1261 yd. |
| 9. 1395 cords 124 cu. ft. | 10. 458 bu. 49 lb. |
| 11. 99 ac. 4488 sq. yd. 6 sq. ft. | |

Exercise 74. Page 107

- | | |
|-------------------------------|-------------------------------------|
| 1. 19 mi. 1758 yd. 2 ft. | 2. 58 ac. 4834 sq. yd. 5 sq. ft. |
| 3. 5 mi. 1759 yd. 1 ft. 8 in. | 4. £27. 17s. 4d. |
| 5. 13 oz. 11 dr. | 6. 142 bu. 2 pk. 1 gal. 1 qt. |
| 7. 31 gal. 2 qt. 1 pt. | 8. 12 sq. yd. 3 sq. ft. 132 sq. in. |
| 9. 1 cwt. 85 lb. | 10. 72 mi. 254 rd. |

Exercise 75. Page 108

- | | |
|---------------------------------|--------------------------|
| 1. 4 ac. 4054 sq. yd. 4 sq. ft. | 2. 1 hr. 35 min. 45 sec. |
| 3. $62^{\circ} 49' 4''$. | 4. 9 ac. 3534 sq. yd. |
| 5. 1 hr. 41 min. = 6060 sec. | 6. 1 bu. 1 pk. 1 gal. |
| 7. 4 tons 1323 lb. | 8. 8 yd. 2 ft. 3 in. |
| 9. 114 cords 11 cu. ft. | 10. 500 gal. |
| 11. 97 mi. 842 yd. 2 ft. 6 in. | 12. 865 cords 6 cord ft. |

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Exercise 76. Page 111

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|-------------------------------|----------------------------------|
| 1. 90 cwt. 82 lb. 13 oz. | 2. 75 da. 23 hr. 34 min. 40 sec. |
| 3. £600 9s. $6\frac{3}{4}$ d. | 4. 249 tons 5 cwt. 25 lb. |
| 5. 150 ac. 115 sq. rd. | 6. 23058 gal. |
| 7. 88 mi. 120 rd. | 8. £54 18s. $0\frac{1}{2}$ d. |
| 9. 662 mi. 1024 yd. | |

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Exercise 77. Page 111

- | | |
|--------------------------------|------------------------------|
| 1. 2739 bu. 1 pk. 1 gal. 1 qt. | 2. 55 min. 15 sec. |
| 3. 402 cords 92 cu. ft. | 4. 17 min. 58 sec. |
| 5. 2215 mi. 1228 yd. | 6. 12 tons 12 cwt. 70 lb. |
| 7. 54 bu. | 8. 87 mi. |
| 9. 455 bu. | 10. 1532 tons 16 cwt. 25 lb. |
| 11. 468 yd. 8 in. | 12. 23 tons 3 cwt. 82 lb. |
| 13. 12 mi. 1466 yd. 2 ft. | 14. 6 ac. 1960 sq. yd. |

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Exercise 78. Page 114

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|---|------------------------------------|
| 1. £15 9s. 7d. | 2. 16 tons 2 cwt. 38 lb. |
| 3. 1 gal. 2 qt. | 4. 2 cu. yd. 6 cu. ft. 960 cu. in. |
| 5. 9 mi. 1322 yd. 11 in. | |
| 6. 25 wk. 3 da. 18 hr. 55 min. 18 sec. | |
| 7. 13 lb. 11 oz. 6 dwt. 15 gr. and 35 gr. remainder. | |
| 8. 27 cu. yd. 4 cu. ft. 246 cu. in. and 34 cu. in. remainder. | |
| 9. 7 tons 1614 lb. 5 oz. | |

9.
11.

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Exercise 79. Page 115

1. 8.
2. 10 times and 18 qt. remainder.
3. 11 times and 489 oz. remainder (avoirdupois).
4. 5 times and 355 qt. remainder.
5. 2 bu. 3 pk. $3\frac{3}{4}$ qt.
6. 25 jars.
7. 5 wk.
8. 17 coats and 2 yd. 9 in. left.
9. 42240 times.

Exercise 80. Page 115

1. 37 vessels.
2. $10249\frac{7}{17}$ times.
3. 4 mi. 328 yd.
4. $28\frac{1}{3}\frac{2}{3}$ seconds.
5. 166 hr. 40 min.
6. 8 hr.
7. 42 doz. and 3.
8. 216 tons. 2 cwt. 98 lb.
9. 27 mi. 480 yd.
10. \$96.
11. Wheat, \$48.24; timothy seed, \$48.75; rye, \$18.72; oats, \$25.55. Total, \$141.26.

Exercise 81. Page 121. See Model Receipt.

Exercise 82. Page 121

1. \$32.20.
2. \$13.76.
3. \$3.85.
4. \$27.76.
5. \$47.02.
6. Wheat, \$187.61; oats, \$171.00; corn, \$34.20; peas, \$143.50; barley, \$253.23. Total, \$789.54.
7. \$14.24.
8. Boots, \$121.50; gaiters, \$312; overshoes, \$114.66; slippers, \$17.10; heavy boots, \$206.25. Total, \$771.51.
9. \$18.78.
10. \$25.41 - \$22.10 = \$3.31.
11. \$44.25 - \$34.07 = \$10.18.

Exercise 83. Page 123

1. $34\frac{1}{4}$.
2. $32\frac{3}{4}$.
3. $493\frac{1}{2}$.
4. $54\frac{2}{5}$.
5. 44.
6. 8 lb. 7 oz.
7. 110; 10.
8. \$457.
9. Average per load, 55 bu. 24 lb.; average per acre, 22 bu. $9\frac{3}{4}$ lb.
10. 456; 465; 564; 546; 654; 645. Total, 3330. Average, 555.

Exercise 84. Page 124

1. 65 lb. 3 oz.
2. 135 mi. 215 rd.
3. $67\frac{5}{8}$ c.
4. $\$2.06\frac{1}{4}$.
5. Lost 30c.
6. 40c.
7. Wheat worth 78c. sold at 76c.; loss = 2c. per bushel.
 " " 72c. " 76c.; gain = 4c. "
 To neither gain nor lose he must sell 4 bu. at 78c. to
 2 bu. at 72c., or 200 bu. at 78c. to 100 bu. at 72c.
8. $25\frac{1}{4}$ lb.
9. $\$10.20$.
10. 482 pages.
11. 27 mi. 547 yd.

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Exercise 85. Page 126

1. $\$3.50$ and $\$3.75$.
2. 52 and 61.
3. 268 and 375.
4. 57 lb. 5 oz. and 64 lb. 12 oz.
5. 112 ac. $2452\frac{1}{2}$ sq. yd. and 113 ac. $2684\frac{1}{2}$ sq. yd.
6. A, 45c.; B, 83c.; C, 79c.
7. A, 16 marbles; B, 23 marbles; C, 33 marbles.
8. First, 540 pages; second, 284 pages; third, 176 pages.
9. 478 and 521.
10. Length, 144 yd.; width, 117 yd.

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4.
7.

Exercise 86. Page 127

1. 30 and 120.
2. A, $\$120$; B, $\$80$.
3. $\$700$ and $\$560$.
4. A, $\$125$; B, $\$150$; C, $\$225$.
5. A, 7c.; B, 14c.; C, 42c.
6. A, 25c.; B, 90c.
7. A, $\$25$; B, $\$54$; C, $\$78$.
8. There will be 2 five-cent pieces and 3 ten-cent pieces for every 1 twenty-five-cent piece; i. e., for one division $10c. + 30c. + 25c. = 65c.$ will be required.
 No. of divisions = $\$3.90 \div 65c. = 6$.
 " five-cent pieces = $2 \times 6 = 12$; value 60c.
 " ten-cent " = $3 \times 6 = 18$; " $\$1.80$.
 " twenty-five-cent pieces = $1 \times 6 = 6$; value, $\$1.50$.
9. Wheat, 54 bu.; barley, 135 bu.
10. Green, 138; blue, 112; red, 100.
11. A, 30 cords 60 cu. ft.; B, 40 cords 35 cu. ft.; C, 41 cords 33 cu. ft.
12. A, $\$50.75$; B, $\$70.25$; C, $\$80.65$; D, $\$90.25$.

Exercise 87. Page 128 — Oral

Exercise 88. Page 128

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|---|---|
| 1. 96 sq. ft. | 2. 91 sq. ft. |
| 3. 525 sq. ft. | 4. 18 sq. yd. 6 sq. ft. |
| 5. 351 sq. yd. 3 sq. ft. | 6. 470 sq. ft. |
| 7. Walls and ceiling, \$14.43 $\frac{1}{2}$. | 8. 4 ac. 20 sq. rd. |
| 9. 1404 bricks. | 10. 5 sq. ft. 142 $\frac{1}{2}$ sq. in. |

Exercise 89. Page 129

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|-----------------------|-----------|----------------|
| 1. 10 ft. 6 in. | 2. 3 ft. | 3. 2 ft. 8 in. |
| 4. 71 yd. 2 ft. 4 in. | 5. 16 ft. | 6. 15 ft. |
| 7. 12 ft. | 8. 15 in. | 9. 63 ft. |

Exercise 90. Page 130

3. (i) If carpet run lengthwise, No. strips = 10 ; No. yd. = 90.
 " " crosswise " " = 12 ; " = 84.
 (ii) " " lengthwise " " = 6 ; " = 30.
 " " crosswise " " = 7 ; " = 28.
 (iii) " " lengthwise " " = 8 ; " = 64.
 " " crosswise " " = 11 ; " = 66.
 (iv) " " lengthwise " " = 12 ; " = 144.
 " " crosswise " " = 16 ; " = 138 $\frac{2}{3}$.
4. Carpet running lengthwise, No. yd. = 40 ; cost = \$48.
 5. " " " " = 64 ; " = \$57.60.
 6. " " " " = 29 $\frac{1}{8}$; " = \$29.16 $\frac{3}{8}$.
7. (i) 5 strips ; (ii) 7 strips. 8. 8 strips.
 9. 8 strips. 10. \$42.75.
11. Carpet running lengthwise, No. strips = 8.
 No. yds. of carpet = $\frac{57.60}{1.20} = 48$. Length of each strip = 6 yd.
 Length of room = 18 ft.
12. \$9.47 $\frac{2}{3}$.

Exercise 91. Page 132

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|--|-------------------------------|
| 1. 32 sq. yd. | 2. 150 sq. yd. 6 sq. ft. |
| 3. \$37.80. | 4. 12 ft. $6\frac{6}{11}$ in. |
| 5. Walls, 824 sq. ft.; walls and ceiling, 1292 sq. ft. | |
| 6. \$44. | 7. \$5. |
| 8. 240 ft. | 9. \$29.40. |

Exercise 92. Page 133

- 47 strips = 141 yd.
- Walls and ceiling, 829 sq. ft. 135 sq. in.
- 112 yd. 4. \$14.
- 348 yd.; 44 single rolls.
- 107 strips; 81 rolls; cost, \$20.25.
- Double rolls, \$1.20; single rolls, \$1.50.
- $147\frac{1}{2}$ yd.

Exercise 93. Page 135

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|-------------------|------------------------------|-------------------|
| 1. 10 board ft. | 2. $13\frac{1}{2}$ board ft. | 3. 40 board ft. |
| 4. 24 board ft. | 5. 624 board ft. | 6. 2400 board ft. |
| 7. 2232 board ft. | 8. 25920 board ft. | 9. 3000 board ft. |
| 10. \$720. | 11. \$160. | 12. \$396. |

Exercise 94. Page 136

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|-------------------|-------------------|-------------------|
| 1. 2592 shingles. | 2. 3888 shingles. | 3. 5760 shingles. |
| 4. 9600 shingles. | 5. 18 M. | 6. 20 ft. 10 in. |
| 7. 12 ft. 6 in. | 8. \$105.30. | 9. \$40. |
| 10. \$28.80. | | |

Exercise 95. Page 137

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|----------------------------|--|
| 1. 240 cu. ft. | 2. 93 cu. ft. 576 cu. in. |
| 3. 187 cu. ft. 864 cu. in. | 4. 35 cu. ft. |
| 5. 20250 bricks. | 6. \$116.14 $\frac{2}{7}$ or \$116.15. |
| 7. 9 ft. | 8. $4\frac{1}{2}$ ft. |
| 9. $31\frac{1}{4}$ cords. | 10. 166 cu. ft. 432 cu. in. |

Exercise 96. Page 138

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|--------------------------------|----------------|-------------|
| 1. 18 sheep. | 2. 70c. | 3. \$5.15. |
| 4. 100 shares. | 5. 16 times. | 6. \$3.75. |
| 7. \$122. | 8. \$93.84. | 9. 50 tons. |
| 10. \$1.10. | 11. \$1191.75. | 12. 1760. |
| 13. 476 yd.; 30c. gain per yd. | | 14. 400 bu. |
| 15. 1560 pairs. | | |

Exercise 97. Page 142

- 880, 4144, 1000 and 1296 are divisible by 2, 4 and 8;
1356 and 4044 are divisible by 2 and 4;
5214 and 125474 are divisible by 2.
- 5125, 4300, 41250 and 3225 are divisible by 5.
- 1236, 4344, 203640 are divisible by 3 and 6.
1239 is divisible by 3.

Exercise 98. Page 143

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|--------------------------|--------------------------------|----------------------|
| 1. 2, 2, 2, 2, 3. | 2. 2, 2, 2, 3, 3. | 3. 3, 3, 3, 3. |
| 4. 2, 2, 3, 3, 3. | 5. 5, 5, 7. | 6. 2, 2, 2, 2, 2, 5. |
| 7. 5, 5, 13. | 8. 3, 11, 13. | 9. 2, 2, 3, 23. |
| 10. 2, 2, 2, 2, 2, 5, 5. | 11. 3, 3, 5, 19. | 12. 3, 5, 7, 11. |
| 13. 5, 5, 5, 5, 2. | 14. 2, 2, 2, 2, 2, 2, 2, 2, 2. | |
| 15. 5, 5, 5, 11. | | |

Exercise 99. Page 143

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|-------------|----------------|--------------------|----------|
| 1. 2, 5. | 2. 3. | 3. 2. | 4. 3, 3. |
| 5. 2, 2, 2. | 6. 3, 7. | 7. 2, 2, 2, 3, 5. | |
| 8. 3, 5, 7. | 9. 2, 2, 5, 5. | 10. 2, 2, 2, 3, 5. | |

Exercise 100. Page 143

- 7, 14, 21, 28, 35, 42, 49.
- 208, 221, 234, 247, 260, 273, 286, 299.
- 5, 10, 15, 20, 25, 30, 35, 40. 4. 5 or 0.
- 9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99, 108, 117, 126.
0. 7. 21, 23, 25, 27, 29, 31, 33, 35, 37, 39.
- 11, 22, 33, 44, 55, 66, 77, 88, 99, 110, 121, 132, 143.
- 9, 21, 243, 193, 83.

Exercise 101. Page 145

- | | | | |
|----------|-------------|-----------|-----------|
| 1. 2. | 2. 12. | 3. 12. | 4. 18. |
| 5. 30. | 6. 72. | 7. 20 yd. | 8. 72 bu. |
| 9. \$22. | 10. 135 yd. | 11. \$2. | |

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5.**Exercise 102. Page 147**

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|---------|---------|---------|---------|
| 1. 6. | 2. 12. | 3. 16. | 4. 13. |
| 5. 21. | 6. 5. | 7. 4. | 8. 8. |
| 9. 14. | 10. 10. | 11. 42. | 12. 24. |
| 13. 11. | 14. 75. | | |

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10.**Exercise 103. Page 149**

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|--------|---------|--------|--------|
| 1. 23. | 2. 37. | 3. 41. | 4. 56 |
| 5. 45. | 6. 61. | 7. 42. | 8. 11. |
| 9. 1. | 10. 21. | | |

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7**Exercise 104. Page 149**

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|---------------------------|-----------------------------|-------------|
| 1. 8 ft. | 2. 21 ft. | 3. 16 ft. |
| 4. 4 qt. | 5. 33 pupils in each class. | |
| 6. 19 lb. in each parcel. | | 7. 21. |
| 8. 27 mi. | 9. 32 gal. | 10. 220 yd. |
| 11. 6 ac.; 16 fields. | 12. 8 oz. | |

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7**Exercise 105. Page 152**

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|--|---|
| 1. $2 \times 2 \times 2 \times 2 \times 3 \times 3 = 144.$ | 2. $2 \times 2 \times 2 \times 3 \times 3 = 72.$ |
| 3. $2 \times 2 \times 2 \times 3 \times 3 \times 3 = 216.$ | 4. $2 \times 2 \times 3 \times 5 \times 7 = 420.$ |
| 5. $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 7 = 448.$ | |
| 6. $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 7 = 20160.$ | |

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1**Exercise 106. Page 152**

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|---------|---------|---------|----------|-----------|
| 1. 30. | 2. 60. | 3. 36. | 4. 150. | 5. 360. |
| 6. 180. | 7. 360. | 8. 770. | 9. 2520. | 10. 1512. |

Exercise 107. Page 153

1. 173. 2. 2100 3. 360 bu. 4. 240c.
5. 84 bu. 6. 105 gal. 7. 546 ac. 8. 882 gal.

Exercise 108. Page 154

1. 9c. 2. 356.
3. Length of rail = 13 ft; No. of rails = 9672.
4. 75c. 5. \$1080.
6. 3600. 7. 10,565,999.
8. 1,267,994,828,100. 9. Book work; 10296.
10. 4 and 3.

Exercise 109. Page 160

1. $7\frac{1}{2}$, $9\frac{1}{2}$, $8\frac{1}{2}$, $10\frac{1}{2}$, $12\frac{1}{2}$, $11\frac{1}{2}$. 2. $6\frac{1}{3}$, $7\frac{2}{3}$, $9\frac{1}{3}$, $11\frac{2}{3}$, $12\frac{2}{3}$, $10\frac{1}{3}$.
3. $4\frac{1}{4}$, $5\frac{1}{4}$, $6\frac{3}{4}$, $8\frac{1}{4}$, $8\frac{3}{4}$, $12\frac{1}{4}$. 4. $7\frac{3}{8}$, $8\frac{3}{8}$, $11\frac{1}{8}$, $12\frac{5}{8}$, $11\frac{5}{8}$, $12\frac{7}{8}$.
5. $12\frac{1}{3}$, $10\frac{5}{6}$, $11\frac{1}{3}$, $8\frac{5}{6}$, $11\frac{5}{6}$, $11\frac{1}{3}$. 6. $12\frac{3}{8}$, $11\frac{3}{8}$, $10\frac{7}{8}$, $9\frac{3}{8}$, $7\frac{7}{8}$, $6\frac{1}{2}$.
7. $8\frac{9}{10}$, $10\frac{1}{5}$, $7\frac{9}{10}$, $6\frac{9}{10}$, $8\frac{9}{10}$, $5\frac{9}{10}$. 8. $6\frac{9}{13}$, $4\frac{1}{13}$ ft., $8\frac{5}{13}$ in., $3\frac{9}{13}$ lb.

Exercise 110. Page 164

1. $\frac{9}{2}$. 2. $\frac{21}{4}$. 3. $\frac{38}{5}$. 4. $\frac{47}{6}$. 5. $\frac{41}{9}$. 6. $\frac{37}{5}$.
7. $\frac{83}{10}$. 8. $\frac{67}{12}$. 9. $\frac{84}{5}$. 10. $\frac{195}{8}$. 11. $\frac{130}{7}$. 12. $\frac{247}{12}$.

Exercises 111, 112 — Oral

Exercise 113. Page 169

1. $\frac{9}{12}$, $\frac{5}{12}$. 2. $\frac{12}{15}$, $\frac{7}{15}$. 3. $\frac{14}{16}$, $\frac{5}{16}$. 4. $\frac{8}{12}$, $\frac{9}{12}$.
5. $\frac{8}{20}$, $\frac{15}{20}$. 6. $\frac{9}{12}$, $\frac{10}{12}$. 7. $\frac{21}{24}$, $\frac{10}{24}$. 8. $\frac{11}{20}$, $\frac{15}{20}$.
9. $\frac{6}{12}$, $\frac{4}{12}$, $\frac{3}{12}$. 10. $\frac{20}{30}$, $\frac{25}{30}$, $\frac{18}{30}$. 11. $\frac{12}{24}$, $\frac{21}{24}$, $\frac{20}{24}$. 12. $\frac{30}{36}$, $\frac{16}{36}$, $\frac{21}{36}$.
13. $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{5}{6}$; $\frac{1}{3}$, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{6}$; $\frac{3}{5}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$. 14. $\frac{5}{8}$, $\frac{3}{4}$, $\frac{2}{3}$; $\frac{1}{2}$, $\frac{4}{5}$, $\frac{1}{6}$; $\frac{5}{6}$, $\frac{3}{4}$, $\frac{5}{6}$.
15. Greatest $\frac{4}{5}$, least $\frac{2}{3}$; greatest $\frac{5}{6}$, least $\frac{3}{4}$; greatest $\frac{5}{6}$, least $\frac{7}{12}$.
16. $\frac{7}{9}$, $\frac{3}{4}$. 17. $\frac{6}{12}$, $\frac{4}{12}$, $\frac{3}{12}$, $\frac{40}{60}$, $\frac{24}{60}$, $\frac{45}{60}$.

Exercise 114. Page 170

1. $\frac{11}{12}$. 2. $\frac{1}{3}$. 3. $1\frac{3}{20}$. 4. $1\frac{7}{12}$.
5. $1\frac{1}{12}$. 6. $1\frac{11}{12}$. 7. $1\frac{11}{12}$. 8. $\frac{1}{3}$.
9. $2\frac{1}{12}$. 10. $1\frac{5}{18}$. 11. $1\frac{31}{60}$. 12. $7\frac{1}{12}$.
13. $10\frac{5}{12}$. 14. 15. 15. $15\frac{1}{3}$. 16. $13\frac{7}{24}$.

Exercise 115. Page 171

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|-------------------------|-------------------------|------------------------|-------------------------|----|
| 1. $5\frac{2}{4}$. | 2. $\frac{1}{15}$. | 3. $\$2\frac{1}{4}$. | 4. $4\frac{1}{8}$ tons. | 1. |
| 5. $42\frac{7}{80}$ mi. | 6. $10\frac{3}{8}$ yd. | 7. $8\frac{7}{24}$ yd. | 8. $29\frac{1}{16}$. | 5. |
| 9. $141\frac{1}{4}$ rd. | 10. $56\frac{2}{8}$ lb. | | | 9. |

Exercise 116. Page 172

- | | | | | |
|---------------------|----------------------|----------------------|----------------------|----|
| 1. $\frac{1}{6}$. | 2. $\frac{1}{12}$. | 3. $\frac{4}{15}$. | 4. $\frac{1}{30}$. | 1. |
| 5. $\frac{3}{20}$. | 6. $\frac{1}{4}$. | 7. $\frac{1}{8}$. | 8. $\frac{1}{24}$. | 5. |
| 9. $\frac{1}{9}$. | 10. $\frac{1}{36}$. | 11. $\frac{7}{45}$. | 12. $\frac{1}{24}$. | 9. |

Exercise 117. Page 172

- | | | | | |
|------------------------|--------------------------------|------------------------|------------------------|----|
| 1. $\frac{1}{24}$. | 2. $\$9\frac{5}{8}$; $\$22$. | 3. $37\frac{1}{2}$ bu. | 4. $10\frac{5}{8}$ da. | 1. |
| 5. $11\frac{7}{8}$ rd. | 6. $2\frac{5}{8}$. | 7. $33\frac{5}{8}$ mi. | | 5. |

Exercise 118. Page 174

- | | | | | |
|----------------------|---------------------------|----------------------|----------------------|-----|
| 1. $3\frac{1}{2}$. | 2. $1\frac{3}{8}$. | 3. $4\frac{1}{2}$. | 4. 9. | 1. |
| 5. $11\frac{1}{4}$. | 6. $22\frac{2}{5}$. | 7. $27\frac{1}{2}$. | 8. $22\frac{1}{2}$. | 7. |
| 9. 51. | 10. $\$1.87\frac{1}{2}$. | 11. $\$30$. | 12. $\$13.14$. | 13. |
| | | | | 19. |
| | | | | 25. |
| | | | | 27. |

Exercise 119. Page 175

- | | | | | |
|----------------------|-------------------------|------------------------|---------------------------|-----|
| 1. $\frac{5}{16}$. | 2. $\frac{3}{13}$. | 3. $\frac{3}{10}$. | 4. $1\frac{1}{3}$. | 1. |
| 5. $2\frac{1}{5}$. | 6. $3\frac{2}{7}$. | 7. $3\frac{1}{8}$. | 8. $2\frac{1}{20}$. | 6. |
| 9. $3\frac{3}{24}$. | 10. $\$1\frac{1}{20}$. | 11. $3\frac{1}{4}$ ac. | 12. $2\frac{1}{4}$ cords. | 11. |

Exercise 120 — Oral

Exercise 121. Page 177

- | | | | | |
|---------------------|---------------------|----------------------|---------------------|-----|
| 1. $\frac{5}{12}$. | 2. $3\frac{5}{8}$. | 3. $1\frac{2}{33}$. | 4. $1\frac{3}{8}$. | 1. |
| 5. $4\frac{5}{8}$. | 6. $\$1$. | 7. $\$3$. | 8. $\frac{7}{15}$. | 7. |
| 9. $\frac{7}{20}$. | 10. $\frac{4}{7}$. | 11. $\frac{5}{14}$. | 12. $\frac{5}{8}$. | 13. |

Exercise 122. Page 177

- | | | | | |
|-----------------------|-----------------------|----------------------|----------------------|-----|
| 1. $10\frac{1}{2}$. | 2. $3\frac{17}{20}$. | 3. $7\frac{7}{8}$. | 4. $17\frac{1}{2}$. | 19. |
| 5. $7\frac{7}{8}$. | 6. $8\frac{1}{5}$. | 7. $10\frac{1}{5}$. | 8. $4\frac{2}{5}$. | 20. |
| 9. $10\frac{2}{15}$. | | | | 23. |

Exercise 123. Page 178

- | | | | |
|--------------------|---------------------|----------------------|--------------------------|
| 1. 15. | 2. 40. | 3. $35\frac{5}{8}$. | 4. $54\frac{1}{4}$. |
| 5. $\frac{1}{2}$. | 6. $\frac{3}{50}$. | 7. $\frac{3}{5}$. | 8. $\frac{7}{4}$. |
| 9. 1. | 10. $\frac{1}{8}$. | 11. $\frac{7}{18}$. | 12. $\frac{104}{1251}$. |

Exercise 124. Page 179

- | | | | |
|--------------------|--------------------|--------------------|---------------------|
| 1. 15. | 2. 16. | 3. 21. | 4. 2. |
| 5. $\frac{4}{5}$. | 6. $\frac{4}{5}$. | 7. $\frac{3}{4}$. | 8. $1\frac{3}{8}$. |
| 9. $\frac{2}{3}$. | | | |

Exercise 125. Page 179

- | | | | |
|------------------------|----------------|-----------------------|------------------------|
| 1. 32c. | 2. 24 bu. | 3. $139\frac{1}{6}$. | 4. $22\frac{5}{6}$ bu. |
| 5. $24\frac{0}{3}$ wk. | 6. 11 persons. | 7. $3\frac{3}{5}$ wk. | 8. $11\frac{1}{4}$ bu. |

Exercise 126. Page 180

- | | | | | | |
|---|-----------------------|-----------------------|---|-----------------------|------------------------|
| 1. $\frac{60}{10}$. | 2. $\frac{56}{8}$. | 3. $1\frac{8}{2}$. | 4. $\frac{52}{4}$. | 5. $\frac{80}{5}$. | 6. $\frac{66}{11}$. |
| 7. $\frac{11}{3}$. | 8. $\frac{57}{8}$. | 9. $\frac{80}{10}$. | 10. $\frac{31}{8}$. | 11. $\frac{60}{7}$. | 12. $\frac{101}{14}$. |
| 13. 11. | 14. 6. | 15. $17\frac{3}{5}$. | 16. 8. | 17. $26\frac{1}{6}$. | 18. $12\frac{1}{2}$. |
| 19. $\frac{4}{11}$. | 20. $\frac{16}{55}$. | 21. $\frac{12}{13}$. | 22. $\frac{1}{2}$. | 23. $\frac{5}{7}$. | 24. $\frac{9}{10}$. |
| 25. $\frac{24}{30}$, $\frac{28}{30}$, $\frac{27}{30}$. | | | 26. $\frac{36}{120}$, $\frac{112}{120}$, $\frac{27}{120}$. | | |
| 27. $\frac{30}{60}$, $\frac{40}{60}$, $\frac{45}{60}$, $\frac{48}{60}$, $\frac{50}{60}$. | | | | | |

Exercise 127. Page 180

- | | | | | |
|----------------------|-----------------------|-----------------------|------------------------|------------------------|
| 1. $1\frac{5}{2}$. | 2. $1\frac{3}{6}$. | 3. $\frac{41}{63}$. | 4. $110\frac{1}{20}$. | 5. $19\frac{1}{2}$. |
| 6. $7\frac{5}{28}$. | 7. $298\frac{1}{6}$. | 8. $811\frac{3}{4}$. | 9. $\frac{16}{33}$. | 10. $4\frac{31}{80}$. |
| 11. $\frac{25}{2}$. | 12. $\frac{29}{3}$. | 13. $4\frac{3}{6}$. | 14. $5\frac{5}{8}$. | 15. $21\frac{3}{4}$. |

Exercise 128. Page 181

- | | | | | | |
|--|----------------------|----------------------|---------|-----------------------|----------------------|
| 1. $\frac{3}{5}$. | 2. $1\frac{1}{8}$. | 3. $1\frac{1}{2}$. | 4. 1. | 5. $3\frac{3}{5}$. | 6. $\frac{4}{7}$. |
| 7. $9\frac{9}{11}$. | 8. $4\frac{17}{2}$. | 9. $3\frac{6}{7}$. | 10. 27. | 11. $7\frac{1}{8}$. | 12. $4\frac{1}{2}$. |
| 13. $1\frac{1}{2}$. | 14. $2\frac{2}{5}$. | 15. $\frac{1}{38}$. | 16. 42. | 17. $11\frac{2}{5}$. | 18. $7\frac{1}{4}$. |
| 19. $\$5.00 - \$1.71\frac{5}{8}$ (i. e., $\$1.72$) = $\$3.28$. | | | | | |
| 20. $\$2.75$. | | 21. 90c. | | 22. $\$16.80$. | |
| 23. $\$34\frac{3}{4}$ = $\$34.75$. | | | | | |
| 24. $36\frac{3}{8}$ in. by $22\frac{1}{2}$ in. | | | | | |

Exercises 129, 130— Oral

Exercise 131. Page 185

- | | | |
|---------------|--------------|-----------------|
| 1. 65.046. | 2. 600.7354. | 3. 4475.105045. |
| 4. 2.4397464. | 5. 101.209. | 6. 10.867. |
| 7. 114.1377. | 8. 959.0483. | 9. 40.52753. |
| 10. 114.646. | | |

1. 37
5. 3.
9. 27

Exercise 132. Page 186

- | | | | | | |
|--------------------|-----------|-----------------------------|----------|-----------|-----------|
| 1. 5.18. | 2. 26.78. | 3. 5.78. | 4. 6.35. | 5. 1.224. | 6. 4.544. |
| 7. 4.55 and 3.365. | | 8. 3.55, 15.092, and 1.125. | | | |
| 9. 7.357. | | 10. 4.295. | | | |

1. \$
4. 3

Exercise 133. Page 186

- | | | | | |
|---|------------|-------------|---------------|----------|
| 1. 7.485. | 2. 44.235. | 3. 7.942. | 4. 56.571 ac. | 5. 17.4. |
| 6. 11.291 ; 6.875 ; 19.78. | | | | |
| 7. This question is somewhat ambiguous. If he sold $\frac{87.5}{1000}$ of what he owned, then he would have left $\frac{12.5}{1000}$ of $\frac{9}{16}$ of the farm = $\frac{112.5}{10000}$ farm = .1125 farm. | | | | |
| If he sold $\frac{87.5}{1000}$ of the farm, then he would have left $(.9 - .875)$ farm = .025 of the farm. | | | | |
| 8. 9.71. | 9. 1.086. | 10. 62.225. | | |

1. 2
4. 1
7. 4
10. 1

3.
9.
15.
21.

Exercise 134. Page 187

- | | | |
|---|---------------|--|
| 1. .988. | | |
| 2. Wheat .48 of farm = 48 ac. | | |
| Oats .14 " = 14 ac. | | |
| Barley .065 " = 6.5 ac. | | |
| Uncleared .315 of farm = 31.5 ac. | | |
| 3. 3.942. | 4. 1.863. | |
| 5. The third number should read one hundred, and one-hundredth. The result then would be 2102.115. The sum of the numbers as they stand = 2003.115. | | |
| 6. 1.65 mi. west. | | |
| 7. Perimeter = 63.294 in.; length is 4.483 in. greater than the width. | | |
| | 8. 54.175 ft. | |

1.
5.
9.

1
4
8

Exercise 135. Page 188

1. 375. 2. .56. 3. 139.84. 4. 37.5.
 5. 3.43. 6. 768.55. 7. 3.75. 8. 56.4.
 9. 275.04. 10. Book work. 11. \$241.345. 12. 832.884.

Exercise 136. Page 189

1. \$320, \$63, \$108. 2. \$375, \$75, \$90. 3. 7 black sheep.
 4. 33 girls. 5. 315 passed. 6. .12075.

Exercise 137. Page 189

1. 32, 3.2, .32. 2. 24, .24, .024. 3. 1.2, .12, .012.
 4. 1.51, 1.411, .015. 5. 18.5625. 6. 1.1675.
 7. 3.642. 8. 19.5025. 9. 3.449.
 10. 37.072.

Exercise 138. Page 190

3. 4. 4. .8. 5. 2. 6. 21. 7. 50. 8. .7.
 9. 40. 10. 4. 11. 20. 12. 210. 13. 5. 14. 7.
 15. 400. 16. 4. 17. 2. 18. 21. 19. 500. 20. 70.
 21. \$9.10. 22. 35 bu. 23. \$446.448. 24. \$33.6525.

Exercise 139 — Oral

Exercise 140. Page 193

1. 25%. 2. 40%. 3. 25%. 4. $33\frac{1}{3}\%$.
 5. 72c. 6. \$22. 7. $33\frac{1}{3}\%$. 8. 300.
 9. 200 pupils present.

Exercise 141. Page 193

1. \$40; 20 mi.; 14.5 lb. 2. 700. 3. 200 mi.
 4. 225 head. 5. \$9180. 6. 640. 7. 1400.
 8. $31\frac{1}{4}\%$. 9. \$5.50.

Exercise 142. Page 194

1. $77\frac{1}{2}\%$. 2. $85\frac{1}{3}\%$. 3. $97\frac{2}{3}\%$.
 4. (i) .05, .1, .15, .2, .25, .75. (ii) 50%, 52.5%, 62.5%.
 (iii) $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{16}$, $\frac{1}{2}$, $\frac{1}{3}$. 5. \$5192.
 6. \$52.80. 7. $33\frac{1}{3}\%$. 8. \$1111 $\frac{1}{3}$. 9. 75c.

Exercise 143. Page 196

1. \$13.60. 2. \$32.40. 3. \$6.72. 4. \$12.75.
 5. \$6.72. 6. \$6.66. 7. \$4.71 $\frac{1}{4}$.
 8. \$6.26 $\frac{2}{3}$ (in interest or \$84.564 to pay debt).
 9. \$73.20 + \$105.60 + \$195.00 + \$150.00 = \$523.80.
 10. \$4736.

Exercise 145. Page 197

1. \$9.92. 2. \$8.40. 3. \$2.12 $\frac{4}{3}$ or \$2.13.
 4. \$5.60. 5. \$2.33 $\frac{2}{3}$ or \$2.34.
 6. \$21.02 $\frac{2}{3}$ or \$21.02. 7. \$11.52.

Exercise 146. Page 198

1. Four thousand eight hundred and fifty-nine.
 Four thousand and fifty-nine.
 Four thousand five hundred and nine.
 Four thousand five hundred and ninety.
 Four thousand and nine.
 2. Six thousand and seventy-eight.
 Seven thousand and sixty-eight.
 Eight thousand seven hundred and six.
 Seven thousand six hundred and eight.
 Six thousand seven hundred and eight.
 3. Nine thousand one hundred.
 Nine thousand and eleven.
 Nine thousand and one.
 One thousand nine hundred, or nineteen hundred.
 One thousand and ninety, or ten hundred and ninety.

- 62.5%.
9. 75c.
- \$12.75.
- 0.
- or \$2.13.
4. Thirty-six thousand seven hundred and eighty-nine.
Thirty-seven thousand six hundred and eighty-nine.
Thirty-eight thousand seven hundred and sixty-nine.
Thirty-nine thousand eight hundred and seventy-six.
Thirty-six thousand eight hundred and ninety-seven.
 5. Seventy thousand and eight.
Seventy thousand eight hundred.
Seventy thousand eight hundred and nine.
Seventy-eight thousand and nine.
Seventy thousand eight hundred and ninety.
 6. Seventy-five thousand eight hundred and six.
Seventy-five thousand and eighty-six.
Seventy thousand five hundred and eighty-six.
Seventy-eight thousand and fifty-six.
Fifty-eight thousand seven hundred and sixty.
 7. Ninety thousand and five.
Ninety-five thousand.
Ninety-five thousand five hundred and fifty-five.
Fifty-five thousand and ninety.
Fifty thousand nine hundred and five.
 8. Seven hundred and thirty thousand six hundred and one.
Nine hundred thousand and five.
Nine hundred and five thousand and fifty.
One hundred and ninety thousand and seventy-six.
Nine hundred and ten thousand.

Exercise 147. Page 198

- | | |
|---------------------------|---------------------------|
| 1. 149 ; 308 ; 974. | 2. 200 ; 420 ; 694. |
| 3. 735 ; 960 ; 406. | 4. 6006 ; 4300 ; 9080. |
| 5. 40004 ; 44400 ; 90090. | 6. 99000 ; 99900 ; 90900. |
| 7. 9090 ; 99009 ; 99099. | 8. Oral. |

Exercise 148. Page 199

- | | |
|--|-----------------------|
| 1. 100 ; 999. | 2. 9999999 ; 1000000. |
| 3. Seven hundred and eighty-nine million six hundred and forty-three thousand nine hundred and sixty-five. | |

Nine hundred and eighty-seven million one hundred and eight.

4. 28000 ; 302000 ; 900000.
5. 49999 ; 89908 ; 479899.
6. 5005050 ; 300003300 ; 500000006.
7. XIX ; XXIV ; XLIX ; LXXXIV ; XCIX ; XLIV ; XXXIX ; XCIV ; CLXXXVII ; CCVIII ; DCCLXXXI ; CMLXII ; CMXCIX ; CDXLIV ; CDIX ; CMIV.
8. 555 ; 1604 ; 1819 ; 1090 ; 1902.
9. 999 = CMXCIX.

1. 976
4. 208
7. 321
10. 42.
13. 11.
16. 22.

Exercise 149. Page 200

- | | | |
|------------|-----------|------------|
| 1. 33935. | 2. 36187. | 3. 36708. |
| 4. 28343. | 5. 32927. | 6. 251776. |
| 7. 252364. | 8. 94903. | 9. 76931. |

1. \$2
4. 87
7. \$
9. C
- C
10. \$
11. 9
12. \$
14. 1
16. 5
17. 5

Exercise 150. Page 200

Horizontal lines—

- | | | | | |
|-----------|-----------|-----------|-----------|-----------|
| 1. 4938. | 2. 3094. | 3. 5793. | 4. 5714. | 5. 5475. |
| 6. 4236. | 7. 3892. | 8. 5460. | 9. 5847. | 10. 5371. |
| 11. 6508. | 12. 5235. | 13. 5789. | 14. 4125. | 15. 4849. |

Vertical lines—

8988 ; 9589 ; 10342 ; 9714 ; 10301 ; 8030 ; 9074 ; 10288.
Total—76326.

Total
Gain
18.

Exercise 151. Page 201

1. 7164.
2. \$11165.
3. 162 degrees.
4. 699921.
5. A, \$375 ; B, \$834 ; C, \$3537 ; D, \$4762 ; \$10000 - \$9508 = \$492.
6. 323637.
7. 1782 mi.
8. Deposits, \$2722.49 ; withdrawals, \$1252.38 ; balance, \$1470.11.
9. 6699 ; 3797 ; 700 ; 2697 ; 2816 ; 2810 ; 91. Sum = 19610.
10. 8280694.
11. 98993.

- 1.
- 3.
- 5.
- 7.
- 9.
- 11.
- 13.

hundred

Exercise 152. Page 202

- | | | |
|------------------------|--------------------------|------------------------|
| 1. 976100. | 2. \$56962.75. | 3. 457086296634. |
| 4. 2082134. | 5. \$397443.16. | 6. 86081703319. |
| 7. 3215933. | 8. \$409157.84. | 9. 45850097562. |
| 10. 42. | 11. 209. | 12. \$44. |
| 13. $114\frac{1}{2}$. | 14. 22. | 15. $189\frac{1}{2}$. |
| 16. $22\frac{1}{2}$. | 17. $110\frac{97}{98}$. | 18. 99. |

Exercise 153. Page 202

- | | | |
|---|----------------------|---------------|
| 1. \$288. | 2. \$954. | 3. 608 sheep. |
| 4. 87 times. | 5. 86, i.e., 2 times | 43. 6. \$53. |
| 7. \$31250. | 8. 24. | |
| 9. Cost = (\$6750 - \$990 - \$1530) = \$4230.
Cost per bu. = \$4230.00 ÷ 9000 = 47c. | | |
| 10. \$7.20. | | |
| 11. $9319200 + 9317550 + 7687659375 + 11295 = 7706307420$. | | |
| 12. \$1116. | 13. 365 ac. | |
| 14. 16 bu. | 15. 1971 bu. | |
| 16. 580 ac., \$61 per ac. | | |
| 17. 29 ac. at \$95 = \$2755.
75 " \$112 = \$8400.
46 " \$96 = \$4416. | | |

Total selling price, \$15571.

Gain = \$15571 - \$12000 = \$3571.

18. 663 mi.

Exercise 154. Page 204

- | | |
|--------------------------|--------------------------------|
| 1. 92 pence. | 2. 1104 farthings. |
| 3. £29 15s. 5d. | 4. £309 5s. |
| 5. 2406 pence. | 6. 560 pence. |
| 7. 65296 oz. | 8. 86 oz. |
| 9. 13 cwt. 52 lb. 13 oz. | 10. 2 tons 7 cwt. 74 lb. 1 oz. |
| 11. 4933 oz. | 12. 25 tons 16 cwt. 49 lb. |
| 13. 65142 in. | |

XLIV;
LXXXI;. 5475.
. 5371.
. 4849.

288.

99921.
\$492.70.11.
810.

14. 1 mile 1091 ft. = 1 mile 66 rd. 2 ft.
 15. 36 ft.
 17. 12 ac. 77 sq. rd.
 19. 4 cu. ft. 1557 cu. in.
 21. 662400 sec.
 23. 678 pints.
 25. 61 bu. 25 lb.
 26. 1 wk. 2 da. 2 hr. 14 min. 53 sec.
 27. 6739740 sec.
 29. \$120.57 $\frac{1}{8}$.

5.
6.
7.
8.
1.
4.
5.

Exercise 155. Page 204

1. 174 lb. 3 oz.
 3. 88 rd. 5 yd. 1 ft. 6 in.
 5. 22 rd. 2 yd. 8 in.
 7. 19 mi. 280 rd. 4 yd. 1 ft. 6 in.
 8. 58 ac. 146 sq. rd. 25 sq. yd. 2 sq. ft. 36 sq. in.
 9. 142 bu. 2 pk. 5 qt.
2. 74 cwt. 21 lb. 3 oz.
 4. 6 wk. 3 da. 6 hr. 50 min. 33 sec.
 6. 11 months.
 10. 31 gal. 2 qt. 1 pt.

6.
8.
10.
12.
14.
15.
16.

Exercise 156. Page 205

1. 90 cwt. 80 lb.
 3. 75 da. 23 hr. 34 min. 40 sec.
 5. 249 tons 5 cwt. 25 lb.
 6. 13 oz. 12 dwt. = 1 lb. 1 oz. 12 dwt.
 7. This question should read (£61 18s. 4d.) ÷ 4 and the result is £15 9s. 7d.
 8. 12 lb. 9 oz. 15 dwt. 18 gr.
 10. $\frac{3^6}{141}$ pt. = $1\frac{2}{7}$ pt.
 12. $10\frac{3}{7}$.
2. 50 lb. 2 oz. 7 dwt. 3 gr.
 4. £600 9s. 6 $\frac{3}{4}$ d.
 9. 16 tons 2 cwt. 38 lb.
 11. 2 cu. yd. 6 cu. ft. 960 cu. in.
 13. $11\frac{4}{7}\frac{2}{10}$.

1.
3.
5.
6.
7

Exercise 157. Page 206

1. Decimal fractions are $\frac{5}{1000}$; .106; 4.325; $\frac{9}{10}$.
 Common fractions are $\frac{3}{8}$; $\frac{1}{2}$; $\frac{4}{5}$.
2. $4\frac{4}{80}$.
 3. $177\frac{19}{24}$.
 4. $46\frac{11}{27}$; $267\frac{5}{98}$; $5\frac{2883}{10000}$.

5. $1\frac{1}{2}$; $\frac{7}{24}$; $\frac{3}{20}$; $2\frac{1}{2}$; $9\frac{2}{5}$; $\frac{28}{37}$; 25; $1\frac{77}{800}$.
 6. $\frac{113}{100}$; $\frac{73}{660}$; $1\frac{66}{470}$; $\frac{11084}{11577} = \frac{652}{881}$.
 (H. C. F. of 11084 and 11577 = 17.)
 7. 452; 13140; 5631; 5530; 7018.
 8. $16\frac{1}{8}$.

Exercise 158. Page 206

1. $\frac{25}{144}$; $\frac{7}{180}$; $2\frac{1}{4}$. 2. .01. 3. .00007208.
 4. $\frac{7}{10}$; $1\frac{6}{60} = \frac{3}{10}$; $1\frac{36}{60} = 1\frac{3}{5}$; $1\frac{25}{60} = \frac{1}{2}$.
 5. 557211. (Pupils should be instructed not to reduce the multiplicand to an improper fraction.)
 6. \$35.50. 7. 74 lb. 7 oz.
 8. $\frac{9}{11}$; $\frac{5}{7}$; $\frac{41}{37}$; $\frac{25}{28}$; $\frac{4}{5}$; $\frac{2}{3}$. 9. (a) $\frac{2}{3}$ (b) 4.
 10. $\frac{71}{120}$; $7\frac{1}{2}$; $40\frac{1}{8}$. 11. \$36.90 (six working days per week).
 12. 24 da. 13. 18 bags.
 14. $\frac{2}{3}$ of $\frac{9}{10} = \frac{3}{5}$; $\frac{3}{8}$; $\frac{2}{5}$; $\frac{3}{7}$; $\frac{7}{15}$; $\frac{13}{25} = \frac{1575}{4200}$, $\frac{1680}{4200}$, $\frac{1800}{4200}$, $\frac{1260}{4200}$ and $\frac{2184}{4200}$.
 15. (a) \$7.74; (b) \$9.05; (c) \$7.41 $\frac{1}{2}$ or \$7.42.
 16. 35 tons, 18 cwt. 8 lb.

Exercise 159. Page 208

1. \$211.20; \$190.08. 2. $12\frac{1}{2}\%$.
 3. \$247. 4. $22\frac{1}{7}\%$.
 5. \$44.53 $\frac{1}{2}$; \$22.26 $\frac{3}{4}$; \$111.33 $\frac{1}{4}$; \$11.13 $\frac{3}{8}$.
 6. \$250.00 + \$12.49 $\frac{2}{3}$ or \$262.49.
 7. \$600.00 + \$7.29 $\frac{2}{3}$ or \$607.30. 8. \$15.71 $\frac{1}{3}$.

PART II

Exercise 1. Page 9

1. 361280202. Three hundred and sixty-one million, two hundred and eighty thousand, two hundred and two ;
275248604. Two hundred and seventy-five million, two hundred and forty-eight thousand, six hundred and four ;
720006. Seven hundred and twenty thousand and six.
201204000. Two hundred and one million, two hundred and four thousand ;
2002012. Two million, two thousand and twelve.
2. 607070. Six hundred and seven thousand and seventy.
8100180. Eight million, one hundred thousand, one hundred and eighty ;
10150105. Ten million, one hundred and fifty thousand, one hundred and five ;
1015010. One million, fifteen thousand and ten ;
101501. One hundred and one thousand, five hundred and one ;
7007022. Seven million, seven thousand and twenty-two.
3. 70070220. Seventy million, seventy thousand, two hundred and twenty ;
700702202. Seven hundred million, seven hundred and two thousand, two hundred and two ;
770077077. Seven hundred and seventy million, seventy-seven thousand, and seventy-seven ;
500050005. Five hundred million, fifty thousand and five ;
6076076. Six million, seventy-six thousand, and seventy-six.
4. Seven hundred and seven, and seven tenths ;
Eight hundred and fifty, and seventy-nine hundredths ;
Five thousand six hundred and ninety-five, and six hundredths ;
Four hundred and seventy-three, and six hundred and twenty-eight hundredths.

5. Five hundred and sixty-four, and eighteen hundredths ;
Seven thousand, eight hundred and forty, and six hundredths ;
Four thousand and five, and seven hundredths ;
Thirty-six thousand, and forty-one hundredths.
6. Three thousand, and seventy-one hundredths ;
Nine hundred and one thousand and seven.
Seven hundred and twenty thousand and nine ;
One thousand, eight hundred and twenty, and one hundred
and six thousandths.
7. Thirty-one thousand four hundred, and six hundredths ;
Fifty thousand, and six hundred and four thousandths ;
Thirty-six thousand, and one hundred and seven thousandths.
8. Four hundred and four thousand and four, and one
thousandth ;
Four hundred and forty thousand, and four hundredths ;
Forty thousand and four, and four thousandths.
9. Five hundred million, five hundred thousand, five hundred,
and one hundredth ;
Five hundred and five million, five thousand and fifty, and
five hundredths ;
Five million, five thousand, and five hundred and five
thousandths.
10. Seventy-seven million, seven thousand, seven hundred, and
seven hundred and seven thousandths ;
Eight billion, ninety-seven million, eighty-eight thousand
and seven, and six hundredths ;
Nine hundred and four million, four hundred and forty, and
one thousandth.
11. Five hundred and sixteen million, three hundred and sixty-
two thousand, and seventy-six, and four hundred and one
thousandths ;
Seven hundred million and one, and two thousandths ;
Nine billion, two hundred million, seven hundred thousand,
seven hundred, and seven hundred and four thousandths.
12. Hundreds, thousands, millions, billions, trillions.

13. (a) 800008; (b) 800080; (c) 800800; (d) 8808; (e) 8880; (f) 80800.
 14. (a) 1001101; (b) 1010110; (c) 1101001; (d) 1100001; (e) 1000001.
 15. $\frac{1}{10} = .1$; $\frac{1}{100} = .01$; $\frac{1}{1000} = .001$; $\frac{6}{10} = .6$; $\frac{66}{100} = .66$; $\frac{666}{1000} = .666$; $\frac{7}{10} = .7$; $\frac{70}{100} = .70$; $\frac{5}{1000} = .005$; $\frac{405}{1000} = .405$; 2000.0006.
 16. 5.5; 4.04; 6.006; 10.11; 11.074; 19.0095.

Exercise 2. Page 10

1. CDXLIV, CMXCIX, CMXLIX.
2. MCDXCIX, MMCDIX, MCMII.
3. MDCCCLXXV, MCMXIV, MDCCCXXXIX.
4. MMMDCCCXLIX, MDCCCXLIV, MCM.
5. MDCCXCIV, MCDXCVII, MCMXC.
6. MMCCCXLV, MCMXCIX, MCDXLIV.
7. 99, 1129, 990, 994, 554.
8. 1009, 1509, 1400, 1339, 544.
9. 1889, 1540, 1490, 1995.
10. 10, 20, 30, 90, 100, 110, 120, 130, 190, 200, 210, 220, 230, 290, 300, 310, 320, 330.
11. $(1902 \times 1814) \div 317 = 10884$.

Exercise 3. Page 11

1. 11277349. (2) 11871791. (3) 10892561. 4. 11527333.
5. First week, \$420.52; second week, \$417.44; third week, \$453.62; fourth week, \$368.00; fifth week, \$395.36; sixth week, \$440.14; Monday, \$449.96; Tuesday, \$355.46; Wednesday, \$408.49; Thursday, \$458.24; Friday, \$426.98; Saturday, \$395.95. Total, \$2495.08.
6. 172907090947. 7. 365338049326.
8. 743712815593. 9. 150550736973.
10. 102442; the remainders are 809509; 730946; 652383; 573820; 495257; 416694; 338131; 259568; 181005; 102442.
11. 365491989306236. 12. 77924824040448.
13. 1739946670192879. 14. 653452078096964.

(e) 8880;

Exercise 4. Page 12

1100001;

$\frac{6}{50} = .66$;

$\frac{5}{14} = .405$;

1. Quotient = 128640 and remainder = 2329.
2. " = 5479 " " = 10728.
3. " = 2839 " " = 95122.
4. " = 240870 " " = 1240.
5. No. to be added is 5. $\left(\frac{399 \times 95}{133} - 280 = 5 \right)$.
6. $\frac{70541 - 54678}{29} = 547$. 7. $827658432 \div (12 \times 144) = 478969$.
8. Rem. = 8966. Dividend = $8967 \times 8967 + 8966 = 80416055$.
9. Divisor = $(87911123 - 2743) \div 12434 = 7070$.

Exercise 5. Page 13

1. Gain is \$50.92. 2. Cheaper to hire boys by \$312.
3. 14 gal. of water added.
4. No. tons bought = $\{(965 - 160 \times 5) \div 3\} + 160 = 215$.
5. Gain = \$311.15.
6. After 20 da. the provisions would last the 720 men 30 da. longer, 2160 men for 10 da.
 \therefore No. *additional* men = $2160 - 720 = 1440$.
7. Value of sheep = $\$ \frac{455 \times 3 \times 5}{7 \times 2 \times 26} = \18.75 .
8. Had he worked 40 da. he would have received $\$1.50 \times 40 = \60 .
 Every day he was idle he lost his wages and 50c. for board, or \$2.
 \therefore he was idle $\frac{2}{2}^0$ da. = 10 da.; and \therefore he worked 30 da.

Exercise 6. Page 14

1. $236\frac{1}{2}$ yd.; $557\frac{1}{2}$ yd.
2. $95\frac{1}{11}$ rd. = 95 rd. 1 ft. 6 in.; $151\frac{3}{33}$ rd. = 151 rd. 5 yd. 6 in.;
 $51\frac{4}{18}$ rd. = 5 rd. 3 yd. 2 ft. 9 in.
3. 444617 in. 4. $11041\frac{1}{4}$ sq. yd.; $2287\frac{3}{4}$ sq. yd.
5. $29\frac{5}{121}$ sq. yd. = 29 sq. rd. 12 sq. yd. 6 sq. ft. 108 sq. in.;
 $165\frac{35}{121}$ sq. rd. = 165 sq. rd. 8 sq. yd. 6 sq. ft. 108 sq. in.
6. 32897152 sq. in. 7. 5 mi. 311 rd. 5 yd. 2 in.
8. 92 mi. 126 rd. 2 yd. 9. 16 mi. 162 rd. 3 yd. 5 in.
10. $3\frac{1}{3}$ mi. per hr. 11. 198.

230,

333.

week,

ixth

46;

98;

33;

42.

Exercise 7. Page 15

1. No. da. from end of June 15 to beginning of Dec. 31 = 198.
 " hr. " " " " " = 4752.
 But there are 12 hr. on June 15, and 9 hr. on Dec. 31 to be added; \therefore No. hr. required = 4773.
3. No. mi. per hr. = $\frac{80 \times 60 \times 60}{4 \times 1760} = 40\frac{19}{11}$.
3. Cost of hay = $\$ \frac{10 \times 15 \times 7 \times 40 \times 13}{2000} = \273 .
 " " oats = $\$ \frac{40 \times 12 \times 7 \times 40 \times 13}{32} = \546 .
 Total cost = \$819. 4. 12 ft. 6 in.
5. $22\frac{1}{8}$ ft. or 22 ft. 8 in. board measure; 10648 cu. in.
6. A's farm = 25 ac. 19 sq. rd. 7 sq. yd.
 B's " = 6 " 44 " 24 " 3 sq. ft. 135 sq. in.
 C's " = 47 " 82 " 19 " 5 " 135 "
 Total = 78 " 146 " 20 " 7 " 90 "
7. No. mi. = $\frac{3 \times 160 \times 30\frac{1}{2} \times 9 \times 144}{9 \times 12 \times 3 \times 1760} = 33$.
8. No. revolutions = $\frac{30 \times 85 \times 60}{46} = 3326\frac{2}{23}$.
9. No. bu. = $\frac{1785}{84}$. No. bu. to ac. = $2\frac{1}{2}$; \therefore No. ac. = $\frac{1785 \times 2}{84 \times 5} = 8\frac{1}{2}$.

Exercise 8. Page 16

1. No. bu. = $(8 \times 5 \times 3 \times 48) \div 60 = 96$. 2. \$13.40. 3. \$145.94.
4. 6 mi. per hr. 5. No. bu. oats = $\frac{(68 \times 48) + (51 \times 60)}{34} = 186$.
6. Cost of land = $\$(300 \times 40 \times 25) \div 160 = \1875 .
 " " fence = \$195. Total cost = \$2070.
7. \$14.56. 8. \$37.50.

Exercise 9. Page 17

1. $1\frac{1}{4}$ mi. 2. No. lb. butter = $\frac{1\frac{1}{2} \times 12\frac{1}{2} \times 7 \times 16}{25} = 84$.
3. 12 lb. 4. \$2.80. 5. 3627 cords.
6. No. cu. yd. = $\frac{200 \times 20 \times 33}{27} = 4888\frac{2}{3}$.

7. \$
 9. V
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7. \$120. 8. (a) \$4.80; (b) \$2.50.
 9. Value of barley = $\$(.40 \times 4032) \div 48 = \33.60 . Value reckoned as rye = $\$(.49 \times 4032) \div 56 = \35.28 . Farmer's gain = \$1.68.
 10. No. bu. in bin = $12 \times 12 \times 12 \times \frac{199}{128}$.
 Weight of 1 bu. = $\frac{45900 \times 128}{12 \times 12 \times 12 \times 100}$ lb. = 34 lb.

Exercise 10. Page 18

1. 990 ft. = 330 yd. = 60 rd.; 10 chains.
 2. \$422.40. 3. $733\frac{1}{8}$ e. yd. 4. 128 ft.
 5. $3\frac{3}{4}\frac{7}{8}$ lb., or $6\frac{7}{16}$ oz.
 6. $\frac{1}{4}$ of 45 ac. = 6 ac. 68 rd. 17 sq. yd. 2 sq. ft. $82\frac{2}{7}$ sq. in.
 7. 1000000 in. = 15 mi. 250 rd. 2 yd. 2 ft. 4 in.
 Difference = 84 " 69 " 2 " 2 " 2 "

Exercise 11. Page 18

1. No. ac. = 24. Length = 120 rd.
 2. 27909 shingles. 3. \$51.28.
 4. Perimeter = 1100 yd. = 3300 ft. Cost = \$247.50.
 5. 3520 cu. yd. 6. 10 mi. 7. \$71.28. 8. 15 times.
 9. 8640 cu. ft.; 216 cu. ft. per pupil.

Exercise 12. Page 19

1. $\frac{9}{16}$ ac. 2. $\frac{2}{3}\frac{8}{5}$ ac. 3. $14\frac{2}{3}$ ac.
 4. 320 ac. Area enclosed is half the section.
 5. 50 ac.; 360 rd.; $137\frac{1}{2}$ hr. or $13\frac{3}{4}$ da. of 10 hr. each.
 6. (a) Breadth = 24 rd.; perimeter = 128 rd.
 (b) Area = 16 ac.; " = 56 ch.
 (c) " = $3\frac{3}{4}$ " length = 30 rd.
 (d) Length = 20 ch.; perimeter = 50 ch.
 7. (a) Cubic content = 72 cu. ft.; surface = 108 sq. ft.
 (b) Length = 5 ft.; " = 184 "
 (c) Breadth = $2\frac{4}{11}$ ft.; " = $88\frac{10}{11}$ "
 8. \$2156. 9. Depth = 20 ft.
 10. (a) Area = 484 sq. yd.; (b) area = 16 sq. rd.

Exercise 13. Page 21

1. $10=2 \times 5$; $35=5 \times 7$; $14=2 \times 7$; $77=7 \times 11$; $33=3 \times 11$;
 $55=5 \times 11$.
2. $45=3 \times 3 \times 5$; $30=2 \times 3 \times 5$; $42=2 \times 3 \times 7$; $70=2 \times 5 \times 7$;
 $66=2 \times 3 \times 11$.
3. $144=2 \times 2 \times 2 \times 2 \times 3 \times 3$; $90=2 \times 3 \times 3 \times 5$; $75=3 \times 5 \times 5$;
 $72=2 \times 2 \times 2 \times 3 \times 3$; $84=2 \times 2 \times 3 \times 7$.
4. 61, 67, 71, 73.
5. Common factors of 16 and 24 are 2, 4, 8; of 24 and 30 are
2, 3, 4, 6; of 36 and 42 are 2, 3, 6; of 70 and 60 are 2, 5, 10;
of 25 and 35 the common factor is 5.
6. 2 and 5; 3 and 7; 10 and 13; etc. *N.B.—Unity is a factor
of all numbers.*
7. H.C.F. of 27 and 36 is 9; of 72 and 64 is 8; of 45 and 75 is
15; of 100 and 75 is 25; of 125 and 75 is 25; of 108 and 81
is 27.
8. The number is divisible by 3 when the sum of its digits is
divisible by 3.
9. 111, 243, 510, 321, or 114, 246, 513, 324, etc.
10. $360=2 \times 2 \times 2 \times 3 \times 3 \times 5=2^3 \times 3^2 \times 5$; $560=2^4 \times 5 \times 7$; $845=$
 5×13^2 ; $1640=2^3 \times 5 \times 41$.
11. No. $=2 \times 3 \times 5 \times 7 \times 11=2310$.
12. $249984=2^7 \times 3^2 \times 7 \times 31=(2 \times 31) \times (3^2 \times 7) \times 2^6=62 \times 63 \times 64$.

Exercise 14. Page 22

- | | | |
|------------------|------------------------|--------------------|
| 1. 3, 4, 5. | 2. 45. | 3. 12. |
| 4. 24. | 5. 8. | 6. \$3.60 per bbl. |
| 7. 21c. per doz. | 8. \$10. | 9. \$1.20. |
| 10. 4. | 11. $28\frac{1}{2}$ c. | 12. 24. |
13. 20160, i.e., $\frac{8 \times 15 \times 24 \times 42 \times 65 \times 77}{2 \times 3 \times 5 \times 7 \times 11 \times 13}$.

Exercise 15. Page 23

1. $248=2^3 \times 31$; $356=2^2 \times 89$; common factors are 2 and 4,
each of which is a factor of 108.

2. Write the numbers 27 and 42 having a common factor 3 which is also a factor of their sum (69), and of their difference (15).
3. Take the numbers 6 and 20 having a common factor 2. Take any multiple of 6, say 4 times 6 or 24; the factor 2 is a factor of the difference between 24 and 20.

Exercise 16. Page 24

1. 23. 2. 37. 3. 41. 4. 56. 5. 45. 6. 61.
7. 42. 8. 11. 9. 813. 10. 630. 11. 928. 12. 1249.

Exercise 17. Page 24

1. 7. 2. 21. 3. 7. 4. 607.

Exercise 18. Page 25

1. 40 ft. 2. 6 ac.
3. Lots are 60 ft. wide; A has 10, B has 12, and C has 15.
4. A makes 1 circuit in 30 da., B in 20 da., C in 24 da., and D in 15 da. They will all be together at the starting point in 120 da. (L.C.M. of 30, 20, 24 and 15) when A will have made 4 rounds; B, 6; C, 5; D, 8. 5. 12 in.
6. Cost of each horse is \$89; A bought 7 and B 12.
7. H. C. F. of (64610 - 27) and (72204 - 23) is 3799. The smallest divisor must be greater than 27 and a factor of 3799, and is 29. ($3799 = 29 \times 131$). 8. 37. 9. 7 ft.

Exercise 19. Page 26

1. Multiples of 5 are 10, 15, 20, etc.; of 7 are 14, 21, 28, etc.; of 8 are 16, 24, 32, etc.; of 9 are 18, 27, 36, etc.; of $2\frac{1}{2}$ are 5, $7\frac{1}{2}$, 10, etc.; of $3\frac{1}{4}$ are $6\frac{1}{4}$, $9\frac{3}{4}$, 13, etc.
2. 21 is a multiple of 3 and 7; 35 of 5 and 7; 55 of 5 and 11; 63 of 7 and 9; 77 of 7 and 11.
3. 14, 28, 42, 56. 4. 28, 66, 40, 18, 24, 30, 36.
5. 12, 24, 36, 48, 60; 12, 24, 36, 48, 60; 60, 120, 180, 240, 300; 60, 120, 180, 240, 300. 6. 180. 7. 2400. 8. 600.
9. 1440. 10. 2520. 11. 1680. 12. 21, 41, 61. 13. 32, 62, 92.

Exercise 20. Page 26

1. L.C.M. is 149688; G.C.M. is 119.
2. (a) 354025; (b) \$300.
3. \$435. (L.C.M. of sums = \$420.)
4. Width of room = 45 ft. (L.C.M. of $\frac{3}{4}$ yd., 1 yd., $1\frac{1}{4}$ yd., $1\frac{1}{2}$ yd.).
No. of strips of carpet, $\frac{3}{4}$ yd. wide = 20.
No. yd. carpet = $\frac{6}{3} \times 20 = 400$. Cost = \$440.
5. 28 bu. wheat. (L.C.M. of 60, 56, 48 = 1680; $\frac{1680}{60} = 28$).
6. They strike in unison every 84 sec., \therefore first time they strike in unison is 1' 24" after 12. In 7 min. they are in unison 5 times.
7. Left foot is down every 60", 66", 72". Distance when left feet are first down together = L.C.M. of 60", 66", 72" = 3960".
 \therefore No. times in 1 mile = $\frac{5280 \times 12}{3960} = 16$.
8. 6. (L.C.M. of 48 and 56 = 336; $336 \div 56 = 6$).
9. Same cogs together in every 8 revolutions of the larger wheel, or 8 times per sec.
Required No. times = $6 \times 8 \times 60 \times 60 \times 6 = 1382400$.
10. Other No. = $(120120 \times 210) \div 2730 = 9240$. (Show that the product of the G.C.M. and the L.C.M. of two Nos. = the product of the Nos.).

Exercise 21. Page 28

- | | | | |
|------------------------------|----------------------------------|-------------|-------|
| 1. \$360. | 2. 123. | 3. 12. | 4. 6. |
| 5. 25. | 6. 42. | 7. 1584. | |
| 8. 23 ft. long, 15 ft. wide. | 9. \$10. | 10. \$1.70. | |
| 11. 432. | 12. A gets \$4; B, \$6; C, \$12. | 13. 81. | |
| 14. 16 in. | 15. \$45. | | |

Exercise 22. Page 29

1. A, \$8; B, \$12.
2. 5, 7, 11, 13.
3. Length = 18 ft.; breadth = 9 ft.
4. G.C.D. of 560 and 840 = 280. All the factors of 280 will be common factors of 560 and 840.

5. 9.

10. 8.

11. R

12. 11

13. 8

14. 7

16. 1

3

17. 3

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18. 3

21. 2

22. 1

11.

15.

1.

4.

7.

10.

7.

11.

15.

5. 9. 6. 33. 7. 309. 8. 165 cu. ft. 9. \$132.84.
10. 825371. Divisor = 908.
11. Rails are 13 ft. long. No. = 2976.
12. 1650 (L.C.M. of 25, 30, 55).
13. $8400 = 2^4 \times 3 \times 5^2 \times 7$; $3820 = 2^2 \times 5 \times 191$; $1380 = 2^2 \times 3 \times 5 \times 23$.
 \therefore G.C.M. = $2^2 \times 5$, and L.C.M. = $2^4 \times 3 \times 5^2 \times 7 \times 23 \times 191$.
14. $7\frac{1}{2}$ lb. 15. 1938. Each tile is 10 in. square.
16. Divisors of 360 are 2, 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24, 30, 36, 40, 45, 60, 72, 90, 120, 180.
17. $3252 = 2^2 \times 3 \times 271$; $4248 = 2^3 \times 3^2 \times 59$; (a) 2, 3, 4, 6, 12;
 (b) $2^2 \times 3 = 12$; (c) $2^3 \times 3^2 \times 59 \times 271 = 1151208$.
18. 336 cu. ft.; 10080 lb. 19. $6\frac{2}{3}$ ft. 20. \$3.12.
21. 28 mi. L.C.M. of $9\frac{1}{3}$ ft. and $11\frac{2}{3}$ ft. = $1\frac{1}{3}$ ft.
 Dist. = $1\frac{1}{3} \times \frac{3168}{3 \times 2 \times 8}$ mi. = 28 mi.
22. No. cu. ft. lumber = $(6 \times 4\frac{1}{2} \times 3\frac{1}{3} - 5\frac{5}{8} \times 4\frac{1}{3} \times 3\frac{1}{6}) = 90 - 80\frac{5}{16}$
 $= 9\frac{10}{16}$.
- No. ft. lumber, board measure = $9\frac{10}{16} \times 12 = 10\frac{75}{8}$.
 Cost per M. = $\$3.10 \times \frac{9}{1075} \times 1000 = \$25.95\frac{15}{8}$.

Exercise 23. Page 31

11. $\frac{133}{12}$. 12. $\frac{99}{8}$. 13. $\frac{431}{12}$. 14. $\frac{1409}{17}$.
15. $\frac{1199}{23}$. 16. $\frac{1639}{19}$. 17. $\frac{1099}{11}$. 18. $\frac{7711}{66}$.

Exercise 24. Page 31

1. 9 boys. 2. $\frac{99}{9}$. 3. 23 mi.
4. $1\frac{1}{2}$; $2\frac{5}{11}$. 5. 47. 6. 2.
7. $1\frac{28}{32}$; $2\frac{56}{32}$; $5\frac{12}{32}$. 8. $\frac{44}{14}$; $\frac{366}{40}$. 9. 60.
10. 15. 11. 43. 12. 5.

Exercise 25. Page 32

7. $6\frac{3}{4}$. 8. $15\frac{3}{8}$. 9. $8\frac{1}{7}$. 10. $24\frac{1}{4}$.
11. $12\frac{5}{12}$. 12. $16\frac{13}{8}$. 13. $65\frac{7}{15}$. 14. $16\frac{1}{2}$.
15. 13. 16. 28. 17. $51\frac{13}{8}$. 18. $32\frac{56}{88}$.

Exercise 26. Page 33

1. $\$ \frac{7}{8} = 87 \frac{1}{2} \text{c.}$
2. $\$ 1.75.$
3. 9 pies.
4. 13 eighths ($\frac{13}{8}$).
5. $16 \frac{4}{5}$ gal.
6. 65 mi.
7. $55 \frac{2}{3}$ bu.
8. Length = $18 \frac{2}{3}$ ft.; width = 13 ft.
9. $\frac{5000}{7}$ rd. = 2 mi. $74 \frac{2}{7}$ rd.
10. 440, or 441 if one at each end.
11. No exact number of lb.-weights will balance; 46 lb.-weights, one 8-oz. weight and one 4-oz. weight would do, i.e., $46 \frac{3}{4}$ lb.
12. $33 \frac{1}{3}$ hr.; 4 additional boxes.

Exercises 27, 28 — Oral

Exercise 29. Page 35

5. $\frac{3}{4}.$
6. In lowest terms.
7. $\frac{2}{5}.$
8. $\frac{2}{3}.$
9. $\frac{5}{8}.$
10. $\frac{5}{7}.$
11. $\frac{5}{9}.$
12. $\frac{9}{10}.$
13. $\frac{1}{3}.$
14. $\frac{11}{12}.$
15. $\frac{15}{17}.$
16. $\frac{7}{9}.$
17. $\frac{21}{71}.$
18. $\frac{3}{4}.$
19. $\frac{81}{224}.$
20. $\frac{216}{417}.$
21. $\frac{19}{87}.$
22. $\frac{4}{7}.$
23. $\frac{7}{11}.$
24. $\frac{4}{15}.$

Exercises 30, 31, 32 — Oral

Exercise 33. Page 37

1. $\frac{20}{30}, \frac{25}{30}, \frac{18}{30}.$
2. $\frac{4}{8}, \frac{6}{8}, \frac{7}{8}.$
3. $\frac{35}{40}, \frac{36}{40}, \frac{14}{40}.$
4. $\frac{20}{36}, \frac{21}{36}, \frac{22}{36}.$
5. $\frac{30}{36}, \frac{16}{36}, \frac{21}{36}.$
6. $\frac{45}{60}, \frac{42}{60}, \frac{50}{60}.$
7. $\frac{15}{60}, \frac{35}{60}, \frac{33}{60}.$
8. $\frac{25}{30}, \frac{24}{30}, \frac{20}{30}.$
9. $\frac{35}{40}, \frac{30}{40}, \frac{32}{40}.$
10. $\frac{70}{105}, \frac{63}{105}, \frac{75}{105}.$
11. $\frac{75}{105}, \frac{70}{105}, \frac{84}{105}.$
12. $\frac{36}{60}, \frac{40}{60}, \frac{45}{60}.$
13. $\frac{20}{10}, \frac{3}{10}, \frac{8}{10}.$
14. $\frac{15}{6}, \frac{20}{6}, \frac{5}{6}.$
15. $\frac{7}{9}, \frac{39}{9}, \frac{45}{9}.$
16. $\frac{48}{16}, \frac{72}{16}, \frac{1}{16}.$
17. $\frac{147}{168}, \frac{60}{168}, \frac{70}{168}, \frac{52}{168}.$
18. $\frac{44}{77}, \frac{35}{77}, \frac{9}{77}, \frac{462}{77}.$

Exercise 34. Page 37

1. $\frac{15}{36}, \frac{20}{36}, \frac{14}{36}.$ In order of magnitude: $\frac{7}{18}, \frac{5}{12}, \frac{5}{9}.$
2. $\frac{162}{216}, \frac{144}{216}, \frac{135}{216}, \frac{126}{216}.$ In order of magnitude: $\frac{3}{4}, \frac{6}{9}, \frac{5}{8}, \frac{7}{12}.$
3. $\frac{18}{20}, \frac{15}{20}; \frac{4}{5}$ of a field is the greater.
4. $\frac{4}{7}.$
5. $\frac{25}{27}.$
6. $\frac{10}{21}.$
7. $\frac{11}{18}.$
8. $\frac{17}{20}.$
9. $\frac{17}{21}.$
10. $\frac{5}{34}.$
11. $\frac{7}{46}.$

12. Greatest = $\frac{10}{20}$, least = $\frac{1^6}{3^5}$. 13. Greatest = $\frac{1^6}{3^3}$, least = $\frac{9}{2^2}$.
 14. " = $\frac{2}{9}$, " = $\frac{3}{16}$. 15. " = $\frac{9}{10}$, " = $\frac{21}{25}$.
 16. " = $\frac{13}{15}$, " = $\frac{17}{21}$. 17. " = $\frac{5}{5}$, " = $\frac{6}{7}$.
 18. $\frac{4}{84}$, $\frac{3}{18}$, $\frac{5}{27}$, $\frac{17}{81}$, $\frac{2}{9}$. 19. $\frac{1}{2}$, $\frac{1^3}{2^6}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{4}{5}$.
 20. $\frac{4}{5} = \frac{48}{60}$, $\frac{5}{6} = \frac{50}{60}$, \therefore reqd. fr. = $\frac{49}{60}$.
 21. $\frac{97}{112}$.

Exercise 35 — Oral

Exercise 36. Page 40

1. $\frac{20}{77}$. 2. $\frac{3}{11}$. 3. $\frac{51}{16} = 3\frac{3}{16}$. 4. $\frac{55}{38} = 1\frac{17}{38}$. 5. $\frac{8}{21}$.
 6. $\frac{5}{66}$. 7. $\frac{10}{21}$. 8. $\frac{5}{9}$. 9. $\frac{36}{175}$. 10. $\frac{10}{33}$.
 11. $\frac{1}{9}$. 12. $\frac{3}{32}$. 13. $\frac{51}{55}$. 14. 3. 15. $\frac{75}{28} = 2\frac{15}{28}$.
 16. $\frac{17}{72}$. 17. $\frac{9}{26}$. 18. $\frac{7}{5} = 1\frac{2}{5}$.

Exercise 37. Page 40

1. $\frac{1}{2}$. 2. $\frac{15}{32}$. 3. $\$2\frac{9}{25} = 36c$. 4. $\frac{2}{15}$.
 6. $\frac{1}{8}$. 7. $12\frac{1}{2}$ ac. 8. $\$8750$. 9. 24 mi.
 10. $\$6900$. 11. $746\frac{2}{3}$. 12. $\$7035$.

Exercise 38. Page 41

1. Four hundred and four millions, forty thousand, four hundred and four, and four hundredths.
 2. CDXCIV, CCCXLIX, CMIX, CDIV, CMXCIX, MDCCCXCVII, MCMIX, MCMX, MCMXXXV.
 3. 52095. 4. 254519. (Rem. = 503.)
 5. $2700 = 2^2 \times 3^3 \times 5^2$; 108, 135, 150, 180, 225, 300.
 6. No. = $17 \times 19 \times 23 \times 29 \times 31 \times 37$.
 7. $360 = 2^3 \times 3^2 \times 5$; $540 = 2^2 \times 3^3 \times 5$; $588 = 2^2 \times 3 \times 7^2$.
 (1) Common factors are 2, 4, 6, 12; (2) G. C. F. = 12.
 8. 192 ac. 9. 3. 10. 6 yr. 11. 22.
 12. A, $\$20$; B, $\$35$. 13. $1\frac{7}{30}$ bu. 14. $\$3738$.
 15. Amount of bill = $\$49.29$; payment = $\$14.31$; balance = $\$34.98$.
 16. $\frac{1}{2}$. $\frac{1}{2}$ (sum + difference) = larger No. (denominator);
 $\frac{1}{2}$ (sum - difference) = smaller No. (numerator).

Give reason for this.

pies.
 mi.
 lth = 13 ft.
 each end.
 l.-weights,
 e., $46\frac{3}{4}$ lb.

9. $\frac{5}{8}$.14. $\frac{11}{12}$.19. $\frac{81}{224}$.24. $\frac{4}{15}$. $\frac{14}{10}$. $\frac{10}{10}$. $\frac{12}{6}$. $\frac{5}{6}$.

.

 $\frac{462}{77}$.

Exercise 39 — Oral

Exercise 40. Page 43

1. $1\frac{5}{12}$. 2. $1\frac{27}{40}$. 3. $\frac{29}{38}$. 4. $1\frac{7}{12}$. 5. $1\frac{39}{40}$. 6. $\frac{107}{200}$.
 7. $2\frac{2}{7}$. 8. $2\frac{7}{16}$. 9. $2\frac{9}{35}$. 10. $1\frac{91}{80}$. 11. $3\frac{31}{20}$. 12. $\frac{37}{51}$.

Exercise 41. Page 43

1. $\frac{11}{20}$. 2. $\$2\frac{51}{15}$. 3. $\frac{47}{63}$. 4. $2\frac{63}{144}$ t.
 5. $\frac{8}{9}$. 6. $2\frac{1}{16}$. 7. $2\frac{97}{240}$. 8. $1\frac{43}{20}$ bbl.
 9. $4\frac{1}{4}$ doz. 10. $13\frac{7}{2}$ 11. $9\frac{11}{2}$ yd. 12. $3\frac{3}{4}$ ac.

Exercise 42. Page 44

1. $3\frac{3}{4}$ bu. 3. $10\frac{11}{30}$. 4. $10\frac{7}{15}$. 5. $10\frac{29}{42}$.
 6. $5\frac{29}{60}$. 7. $4\frac{19}{60}$. 8. $46\frac{8}{15}$. 9. $22\frac{89}{180}$.
 10. $29\frac{7}{18}$. 11. $12\frac{5}{8}$. 12. $21\frac{17}{20}$. 13. $12\frac{5}{9}$.
 14. $16\frac{2}{9}$. 15. $14\frac{43}{360}$ gal. 16. $51\frac{33}{80}$ lb. 17. $108\frac{4}{15}$ lb.
 18. $53\frac{17}{20}$. 19. $9\frac{49}{20}$ yd. 20. $72\frac{7}{2}$ mi. 21. 861 bu.

Exercise 43—Oral

Exercise 44. Page 47

1. $\frac{4}{35}$. 2. $\frac{17}{45}$. 3. $\frac{13}{38}$. 4. $\frac{1}{20}$.
 5. $\frac{1}{18}$. 6. $\frac{1}{60}$. 7. $\frac{7}{60}$. 8. $\frac{49}{700}$.
 9. $\frac{7}{171}$. 10. $\frac{7}{18}$. 11. $\frac{1}{18}$. 12. $\frac{1}{42}$.

Exercise 45. Page 47

1. $\frac{1}{8}$. 2. $\frac{1}{5}$. 3. $\frac{31}{48}$. 4. $\frac{13}{30}$.
 5. $\frac{19}{45}$. 6. $\frac{3}{4}$; $\frac{1}{60}$. 7. $\frac{47}{100}$. 8. $\frac{11}{35}$.
 9. \$4.20. 10. \$7.25. 11. $9\frac{1}{3}$. 12. $11\frac{7}{12}$ yd.

Exercise 46. Page 48

1. 522. 2. $6\frac{1}{2}$; $3\frac{1}{4}$. 3. 36. 4. $4\frac{2}{3}$.
 5. $2\frac{3}{4}$. 6. $1\frac{22}{25}$. 7. $1\frac{1}{60}$. 8. $3\frac{7}{12}$.
 9. $2\frac{23}{33}$. 10. $1\frac{7}{12}$. 11. $1\frac{1}{4}$. 12. $2\frac{11}{2}$.
 13. $2\frac{53}{60}$. 14. $4\frac{1}{4}$. 15. $14\frac{7}{18}$. 16. $24\frac{11}{18}$.
 17. $10\frac{5}{8}$.

1.
5.
9.1.
5.
9.
12.1.
5.
8.
11.1.
3.4.
8.
12.1.
5.
6.
10.
14.

Exercise 47. Page 48

1. $2\frac{19}{8}$. 2. $4\frac{1}{2}$. 3. $\frac{7}{18}$. 4. $1\frac{4}{84}$.
 5. $3\frac{5}{18}$. 6. $31\frac{8}{9}$. 7. $13\frac{7}{18}$. 8. $\frac{3}{20}$.
 9. $\frac{13}{14}$. 10. $7\frac{7}{24}$. 11. $5\frac{2}{55}$. 12. $12\frac{2}{700}$.

Exercise 48. Page 48

1. $18\frac{15}{8}$. 2. $16\frac{9}{15}$ gal. 3. $\frac{49}{90}$. 4. $20\frac{11}{15}$ yd.
 5. $\$3\frac{1}{2}$. 6. $101\frac{1}{15}$ ac. 7. $14\frac{13}{30}$ reams. 8. $34\frac{7}{84}$ lb.
 9. $36\frac{1}{8}$ mi. 10. $\$38\frac{1}{15}$. 11. $\$98\frac{2}{33}$.
 12. In ascending order of magnitude:
 $\frac{5}{21}$, $\frac{7}{20}$, $\frac{3}{8}$, $\frac{4}{9}$; $\frac{5}{21} + \frac{4}{9} = \frac{43}{63}$; $\frac{7}{20} + \frac{2}{8} = \frac{29}{40}$; $\frac{29}{40} - \frac{43}{63} = \frac{107}{2520}$.

Exercise 49. Page 49

1. $\$383\frac{7}{12}$. 2. $\$1.70$. 3. $49\frac{7}{18}$. 4. $\$211\frac{1}{12}$.
 5. $107\frac{31}{48}$ gal. 6. $8\frac{3}{8}$. 7. $145\frac{17}{84}$ yd.; $\$403\frac{1}{3}$.
 8. $44\frac{9}{16}$ lb. 9. $\$3$. 10. $10\frac{1}{84}$ gal.
 11. $\$177\frac{7}{8}$. 12. $774\frac{1}{3}$ ac.

Exercise 50. Page 50

1. $\$12$; 40 lb. 2. 4; 22.
 3. *Either* by multiplying the numerator *or* dividing the denominator of the fraction by the whole number.
 4. $7\frac{1}{2}$. 5. $6\frac{2}{3}$. 6. $2\frac{1}{4}$. 7. $9\frac{1}{3}$.
 8. $37\frac{1}{3}$. 9. $71\frac{1}{2}$. 10. $.26\frac{1}{4}$. 11. $10\frac{2}{10}$.
 12. $4\frac{2}{3}$.

Exercise 51. Page 51

1. $\$5$; 5 mi. 2. $\frac{5}{17}$; $\frac{5}{27}$. 3. $\frac{6}{7}$; $\frac{6}{7}$. 4. $\frac{3}{7}$; $\frac{3}{8}$.
 5. *Either* by dividing the numerator *or* multiplying the denominator of the fraction by the whole number.
 6. $\frac{3}{17}$. 7. $\frac{1}{8}$. 8. $\frac{7}{84}$. 9. $\frac{15}{136}$.
 10. $\frac{6}{5} = 1\frac{1}{5}$. 11. $\frac{3}{5}$. 12. $\frac{31}{70}$. 13. $8\frac{1}{10}$.
 14. $\frac{767}{32} = 23\frac{31}{32}$.

Exercise 52 — Oral

Exercise 53. Page 52

- | | | | |
|-------------------------|-----------------------|----------------------|-----------------------|
| 1. 15. | 2. 40. | 3. $37\frac{1}{2}$. | 4. $54\frac{1}{4}$. |
| 5. $\frac{12}{5}$. | 6. $\frac{3}{50}$. | 7. $\frac{3}{5}$. | 8. $\frac{7}{44}$. |
| 9. 1. | 10. $\frac{19}{83}$. | 11. $\frac{7}{18}$. | 12. $\frac{29}{83}$. |
| 13. $\$25\frac{1}{5}$. | 14. $\$5$. | | |
15. A, \$281.25; B, \$225; C, \$303.75; total = \$810.

Exercise 55. Page 52

- | | | | |
|------------------------|----------------------|---------|----------|
| 1. $17\frac{5}{8}$. | 2. $49\frac{1}{3}$. | 3. 290. | 4. 1320. |
| 5. $7390\frac{3}{4}$. | 6. $20\frac{1}{2}$. | | |

Exercise 56. Page 52

- | | | | |
|--------------------------|------------------------|---------------------------|---------------------|
| 1. $14\frac{13}{40}$. | 2. \$93. | 3. $\$1.66\frac{3}{4}$. | 4. $\frac{22}{5}$. |
| 5. $394\frac{2}{5}$. | 6. $\frac{38}{1125}$. | 7. $\$12.10\frac{1}{4}$. | 8. \$95.60. |
| 9. $\$1.95\frac{1}{4}$. | 10. \$5500. | 11. \$1667.25. | |
12. $\$235.39\frac{1}{8}$. ($\$375\frac{5}{8} \times \frac{2}{3} \times \frac{47}{50}$).
 13. 9 ac. ($\frac{2}{3}$ field in corn;
 $\frac{2}{7}$ in wheat; $\frac{2}{7}$ in potatoes; $\frac{1}{7}$ in beans.)

Exercise 57. Page 53

- | | | | |
|--------------------|----------------------|----------------------|------------------------|
| 1. $\frac{1}{4}$. | 2. $23\frac{1}{3}$. | 3. $37\frac{7}{8}$. | 4. $21\frac{3}{8}$. |
| 5. 6. | 6. 0. | 7. $\frac{77}{44}$. | 8. $\frac{139}{300}$. |
| 9. 19. | 10. 7. | 11. $\frac{1}{4}$. | 12. $12\frac{3}{5}$. |

Exercise 58. Page 54 — Oral

Exercise 59. Page 54

- | | | | |
|----------------------|--------------------------|-----------------------|------------------------|
| 1. 14. | 2. 21. | 3. $34\frac{2}{7}$. | 4. $11\frac{2}{7}$. |
| 5. 3. | 6. $12\frac{9}{11}$. | 7. $12\frac{7}{8}$. | 8. $\frac{37}{35}$. |
| 9. $10\frac{5}{8}$. | 10. $\frac{865}{1504}$. | 11. $12\frac{1}{8}$. | 12. $17\frac{1}{10}$. |

Exercise 60. Page 54

1. $41\frac{2}{3}$. 2. 104 yd. 3. $34\frac{2}{3}\frac{5}{8}$ ft. 4. $1576\frac{2}{7}$ bu.
 5. $41\frac{1}{8}$ mi. 6. $6\frac{5}{8}$ ac. 7. $79\frac{5}{8}$ lb.
 8. $21\frac{5}{12}$ c. = $\$ \frac{107.08\frac{1}{2}}{30} \times \frac{6}{5} \times \frac{1}{20}$. 9. 24 da.
 10. $(\frac{4}{15} - \frac{3}{20})$ sum = \$28, \therefore sum = \$240.
 11. $7218\frac{3}{4}$ lb. = $3\frac{3}{4}$ ton. (1 cu. ft. water weighs $62\frac{1}{2}$ lbs.).
 12. $25\frac{2}{15}$. (Work backwards). 13. \$33075.

Exercise 61. Page 55

1. $7\frac{7}{8}$. 2. $3\frac{3}{4}$. 3. $7\frac{41}{100}$. 4. $4\frac{9}{11}$.
 5. $\frac{61}{70}$. 6. $2\frac{17}{11}$. 7. 5. 8. $21\frac{4}{13}$.
 9. $1\frac{17}{40}$. 10. $\frac{7}{12} = \frac{2}{4} \times \frac{1}{3} \times \frac{2}{11} \times \frac{5}{11}$.
 11. $\frac{27}{84} = \frac{3}{4} \times \frac{3}{10} \times \frac{2}{11} \times \frac{5}{11}$. 12. $\frac{1}{5} = \frac{2}{7} - \frac{1}{8}$.

Exercise 62. Page 56

1. 280. 2. 140400. 3. $11\frac{1}{4}$. 4. $13\frac{1}{3}$.
 5. $\$19\frac{1}{10}$. 6. $\frac{5}{8}$. 7. $\frac{3}{8}$.
 8. $85\frac{1}{3} = \frac{16 \times 24 \times 32 \times 36 \times 42}{27 \times 84 \times 96}$.
 9. $245 \times 245 \times 4 + 244 = 240344$. 10. $6\frac{3}{10}$.
 11. A, \$775; B, \$425. (A and B together spent \$300 and then had left \$900; of this, \$600 belonged to A and \$300 to B. \therefore at first A had \$600 + \$175, and B had \$300 + \$125).
 12. 384 bu. @ 77c.; 256 bu. @ 72c. (For every bu. @ 72c. he paid 3c. less than the average, and for every bu. @ 77c. he paid 2c. more than the average. \therefore he must take 2 bu. @ 72c. for every 3 bu. @ 77c. \therefore No. bu. @ 72c. = $\frac{2}{3}$ of 640).
 13. 403. ($10000 \div 457 = 21\frac{403}{457}$. \therefore 457 may be subtracted 21 times from 10000, and rem. = 403).
 14. Cost of 3 geese and 5 turkeys = \$14.40.
 " 5 " 3 " = \$12.
 " 25 " 15 " = \$60.
 " 9 " 15 " = \$43.20.
 \therefore " 16 " — = \$16.80.
 \therefore " 1 goose — = \$1.05.
 15. 32640 min. (22 da. 16 hr.; 1904 is leap year).

Exercise 63. Page 57

1. $\frac{2\frac{1}{2}}{4}$. 2. $\frac{6}{4\frac{2}{3}}$. 3. $\frac{3\frac{1}{2}}{5\frac{1}{4}}$.
6. The division of $2\frac{1}{2}$ by $3\frac{1}{3}$. (Rather the *ratio*, or *relation*, of $2\frac{1}{2}$ to $3\frac{1}{3}$).
7. $\frac{3}{4}$. 8. $1\frac{2}{3}$, i.e. $4 \div 2\frac{1}{2}$. 9. $\frac{40}{63}$, i.e. $\frac{20}{3} \div \frac{21}{2}$.
10. $5\frac{1}{4}$ and $1\frac{1}{7}$ are in their simplest forms; $4\frac{10}{12}$.
11. $\frac{4}{13}$; $\frac{1}{2}$. 12. The value of the fraction remains unchanged.
- $\frac{1\frac{1}{2} \times 2}{2\frac{1}{2} \times 2} = \frac{3}{5}$; $\frac{2\frac{1}{2} \times 3}{3\frac{2}{3} \times 3} = \frac{7}{11}$; $\frac{9}{11}$; $\frac{21}{27} = \frac{7}{9}$; $\frac{23}{33}$; $\frac{29}{35}$.
13. $\frac{5}{7}$; $\frac{51}{64}$; $\frac{51}{65}$; $\frac{30}{33}$; $\frac{69}{85}$; $\frac{82}{87}$.

Exercise 64. Page 58

1. 16. 2. $\frac{3}{4}$. 3. $\frac{5}{27}$. 4. $\frac{3}{25}$. 5. $1\frac{7}{9}$.
6. $4\frac{4}{5}$. 7. 2. 8. $1\frac{5}{9}$. 9. 2. 10. $2\frac{3}{4}$.
11. $7\frac{1}{2}$. 12. $3\frac{4}{7}$. 13. $\frac{465}{832}$. 14. $1\frac{73}{102}$. 15. $\frac{5}{11}$.
16. $2\frac{2}{5}$. 17. $29\frac{47}{7}$. 18. 16. 19. $1\frac{34}{55}$. 20. $1\frac{7}{15}$.
21. $\frac{61}{70}$. 22. $\frac{23}{85}$. 23. $\frac{13}{17}$. 24. $\frac{94}{115}$. 25. 19.
26. $1\frac{24}{47}$. 27. $\frac{1}{2}$. 28. $\frac{201}{803}$.

Exercise 65. Page 59

1. $\frac{8}{17}$. 2. $\frac{1}{3}$. 3. 18 bags.
4. \$21908. 5. \$15.85. 6. 24 da.
7. $\frac{2}{3}$ of $\frac{9}{16}$, $\frac{2}{5}$, $\frac{3}{7}$, $\frac{13}{25}$. 8. \$5.60. 9. Too large by $1\frac{5}{8}$.
10. \$359.45. 11. \$66.04 ($\$66.03\frac{107}{101}$). 12. $\frac{2}{3}$.

Exercise 66. Page 60

7. $\frac{9}{20}$. 8. $2\frac{2}{5}$ da. 9. 3 da.
10. 9 da. 11. 16 da.

Exercise 67. Page 61

1. $6\frac{2}{3}$ hr. 2. 8 da. 3. $3\frac{7}{10}$ da. 4. $13\frac{1}{2}$ da.
5. $14\frac{2}{7}$ da. (A works for 13 da. and does $\frac{13}{20}$ of the work.
∴ B does $\frac{7}{20}$ work in 5 da.). 6. 4 hr. 7. $1\frac{1}{2}$ da.

8. $13\frac{5}{8}$ da. (A can do the work in 12 da. and B in 16 da.)

9. 7 da.

10. 20 da. } 2 A, 2 B and 2 C can mow $(\frac{1}{12} + \frac{1}{15} + \frac{1}{20})$ field in 1 day.

$$= \frac{1}{5} \quad \text{"} \quad 1 \quad \text{"}$$

$$\therefore \text{A, B and C} \quad \text{"} \quad \frac{1}{10} \quad \text{"} \quad 1 \quad \text{"}$$

B and C can mow $\frac{1}{20}$ field in 1 day.

$$\therefore \text{A} \quad \text{"} \quad (\frac{1}{10} - \frac{1}{20}) \quad \text{"} \quad 1 \quad \text{"}$$

$$= \frac{1}{20} \quad \text{"} \quad 1 \quad \text{"} \quad \} \quad 11. \quad 5\frac{11}{21} \text{ da.}$$

12. 15 da. B and C can dig $\frac{1}{12}$ garden in 1 day.

$$\text{B} \quad \text{digs} \quad \frac{1}{20} \quad \text{"} \quad 1 \quad \text{"}$$

$$\therefore \text{C} \quad \text{"} \quad (\frac{1}{12} - \frac{1}{20}) \quad \text{"} \quad 1 \quad \text{"} = \frac{1}{30} \text{ garden.}$$

$$\therefore \text{A} \quad \text{"} \quad (\frac{1}{10} - \frac{1}{30}) \quad \text{"} \quad 1 \quad \text{"} = \frac{1}{15} \quad \text{"}$$

13. A in 36 da., B in 45 da., C in $51\frac{3}{4}$ da.

If A can do a work in 4 da., B can do it in 5 da., and both together can do it in $2\frac{2}{3}$ da.

\therefore When A and B require $2\frac{2}{3}$ da., A requires 4 da. and B 5 da.

\therefore " " " 20 " " 36 " " 45 "

14. 5 da. A's time alone is 20 da., and C's alone 12 da.

Exercise 68. Page 62

1. 4s. 2. 4s. 3. $\frac{4}{25}$. 4. $\frac{77}{99}, \frac{84}{99}, \frac{7}{99}$. 5. $\frac{35}{83}, \frac{30}{83}, \frac{135}{83}; \frac{5}{83}$.

6. (1) Reduce to least common denominator;

(2) Find G.C.M. of numerators;

$$(3) \text{ G.C.M. of the fractions} = \frac{\text{G.C.M. of numerators}}{\text{Least common denominators}}$$

7. $48d. = 4s.$ 8. $48d. = 4s.$ 9. $\frac{4}{23}$.

10. $\frac{195}{135}, \frac{70}{135}, \frac{84}{135}$. L.C.M. = $\frac{420}{135} = \frac{28}{9} = \frac{\text{L.C.M. of 7, 14, 28}}{\text{G.C.M. of 9, 27, 45}}$

11. $\frac{60}{15}, \frac{40}{15}, \frac{36}{15}$. L.C.M. = $\frac{360}{15} = 24$.

12. (1) Reduce fractions to their lowest common denominator.

(2) Find L.C.M. of numerators.

$$(3) \text{ L.C.M.} = \frac{\text{L.C.M. of numerators}}{\text{Lowest common denominators}}$$

This, with reference to the original fractions,

$$= \frac{\text{L.C.M. of numerators}}{\text{G.C.M. of denominators}}$$

ation, of

$\frac{21}{2}$.

changed.

5. $1\frac{7}{9}$.

10. $2\frac{3}{4}$.

15. $\frac{5}{11}$.

20. $1\frac{7}{5}$.

25. 19.

$\frac{15}{86}$.

$\frac{1}{2}$ da.

work.

da.

Exercise 69. Page 63

1. $\frac{1}{120}$; 70.
2. $\frac{1}{42}$; $\frac{49}{7}$.
3. $\frac{1}{72}$; 35.
4. $\frac{5}{128}$; 30.
5. $\frac{1}{12}$; 170.
6. $\frac{3}{4}$; 63.
7. $\frac{7}{12}$ yd. = $6\frac{5}{12}$ yd.
8. G.C.M. = $\frac{3}{200}$; L.C.M. = $\frac{36}{5}$; $\frac{36}{5} \div \frac{3}{200} = 480$.
9. 8350 $\frac{1}{3}$ hr. A has made 1927 circuits; B, 1599; C, 2444.

Exercise 70. Page 64

1. 3 pk. 1 qt. $1\frac{1}{5}$ pt.
2. 213 rd. 1 yd. 2 ft. 6 in.
3. 4 yd. 2 ft. $5\frac{1}{4}$ in.
4. £1 12s. $10\frac{1}{2}$ d.; £5 2s. $8\frac{1}{2}$ d.
5. 4 da. 23 hr. 28 min. ($\frac{3}{8}$ wk. = 4 da. 4 hr. 48 min.; $\frac{3}{4}$ da. = 18 hr.; $\frac{2}{3}$ hr. = 40 min.).
6. 1 lb. $7\frac{5}{13}$ oz. ($\frac{33}{1100}$ cwt. = 3 lb.; $\frac{8}{13}$ of 2 lb. 8 oz. = 1 lb. $8\frac{8}{13}$ oz.).
7. 96 rd.
8. 1750 lb. = 17 cwt. 2 qr. = 17 cwt. 50 lb.
9. 88 sq. rd. 26 sq. yd. 8 sq. ft.

Exercise 71. Page 64

1. $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{7}$, $\frac{1}{10}$.
2. $\frac{3}{4}$, $\frac{3}{5}$, $\frac{3}{7}$, $\frac{3}{10}$.
3. $\frac{1}{12}$, $\frac{1}{6}$, $\frac{1}{4}$, $\frac{1}{3}$.
4. $\frac{17}{36}$.
5. $\frac{1}{33}$.
6. $\frac{2050}{480} = \frac{41}{18}$.
7. In the lowest denomination mentioned in either of the Nos.
8. (a) Express each No. in the same denomination; (b) Write in fractional form; (c) Reduce the fraction to its lowest terms.
9. $\frac{3}{20}$.
10. $\frac{9}{13}$.
11. 3; 2; $\frac{1}{2}$; $\frac{1}{4}$.

Exercise 72. Page 65

1. $\frac{1}{80}$. (1 oz. = 24 scruples.)
2. $\frac{1}{40000}$.
3. $\frac{1}{360}$.
4. $\frac{1}{65340}$.
5. $\frac{1}{9}$.
6. $\frac{5}{1380}$.
7. $\frac{7}{16000}$.
8. $\frac{713}{3003}$.
9. $\frac{4161}{14875}$.
10. $\frac{391}{737}$ (1 per. = 1 sq. rd.).
11. $\frac{39}{22400}$ t. = $4\frac{2}{7}$ oz.
12. $\frac{44}{13}$ in. ($\frac{1}{18720}$ mi. = $3\frac{5}{13}$ in.).

Exercise 73. Page 66

1. \$85.75 (1 lb. avoird. = $\frac{175}{44}$ lb. troy; 1 lb. troy = 12 oz.).
2. $12\frac{1}{2}$ lb.
3. \$65.10 $\frac{5}{12}$ (1 lb. avoird. = 7000 grains; 1 oz. apoth. = 480 grains).

4. $3\frac{3273}{8144}$. 5. $1\frac{10}{21}$ in. 6. £155 7s. $2\frac{1}{2}d$.
7. £34 12s. 4d. 8. 5s. 2d. 9. $11\frac{7}{10}d$.
10. $6\frac{1}{4}$ oz. 11. \$567.52 $\frac{1}{2}$.
12. $\$7152\frac{48}{181} = \$7152.31\frac{119}{181}$. 13. \$173.74 $\frac{7}{2}$.
14. 7 hr. 11 min. 8 sec. 15. \$2.10.
16. 18 yd. 17. 98 yd. 18. $30\frac{2}{7}$ yd.
19. $4166\frac{2}{3}$ yd. 20. 21c. 21. \$1108.80.
22. $\pounds\frac{505}{8304} = 3s. 7\frac{8}{173}d$. 23. \$1736.23 $\frac{1}{3}$.
24. \$880. 25. $10\frac{1}{8}$.
26. \$26160. (A has $\frac{5}{12}$ estate; B, $\frac{2}{15}$; C, $\frac{9}{20}$).
27. $38\frac{1}{2}$ lb. ($\frac{7}{8}$ cord @ \$3.60 = \$3.15; tea and rice = \$1.40; sugar = \$1.75, etc.).
28. $1031\frac{1}{4}$ tons; \$3300. 29. \$60.
30. $22933\frac{1}{3}$ lb. (No. bu. wheat = 120; value = \$77.40. No. tons = $\frac{77.40}{20} = 3.87$. \therefore No. lb. = etc.).
31. $\frac{7}{8}$ ac. ($\frac{1}{2}$ of $\frac{1}{2}$ of $\frac{1}{5}$ ac. = $\frac{3}{8}$ ac. = 60 sq. rd.; $\frac{2}{3}$ of $\frac{1}{2}$ of $\frac{3}{5}$ of 100 sq. rd. = 40 sq. rd.; $\frac{1}{4}$ of $2\frac{1}{2}$ times 605 sq. yd. = 1210 sq. yd. = 40 sq. rd.; total = 140 sq. rd.).
32. $184\frac{1}{2}\frac{9}{25}$ lb. (Value of oats = \$17.33 $\frac{1}{10}$; value of apples = \$51.97 $\frac{1}{2}$, etc.).
33. $4\frac{2}{3}$ ft. (Circumference = $\frac{5280}{3}$ ft.; diameter = $\frac{5280}{3} \times \frac{7}{22}$ ft.).
34. \$349.71 $\frac{9}{10}$. (Length of orchard = 407 ft.; width = $251\frac{5}{8}$ ft.; perimeter = $1317\frac{1}{4}$ ft.; length of ditch = $1317\frac{1}{4} + 3\frac{3}{4} \times 4$ (corners) = $1332\frac{1}{4}$ ft.).
35. \$2261. (House cost $\frac{5}{19}$ money; cattle, $\frac{6}{19}$; farm, $\frac{8}{19}$).
36. Value of house = \$1200, and of lot = \$900. (Value of house = $\frac{4}{3}$ value of lot = $\frac{4}{3}$ of \$2100). 37. $\frac{3}{20}$. 38. $\frac{3}{7}$.
39. 100 ac. (A has $\frac{3}{4}$ land; B, $\frac{1}{8}$; C, $\frac{1}{4}$; rem. = $\frac{1}{20}$ land = $\frac{5}{8}$ ac.).
40. 15. 41. $5\frac{1}{2}$. 42. 52.
43. 20 mi. (A must gain 5 mi. on B before he overtakes him; A gains 1 mile in every 4 miles he walks).
44. \$93.75. 45. £41 1s. $5\frac{1}{2}d$. 46. \$8.76. 47. \$1000.
48. He sold 60 ac. for $\frac{2}{3}$ of whole cost; he sold 20 ac. for \$1200. Then $\frac{2}{3}$ of cost + \$1200 = cost; $\frac{2}{3}$ cost = \$1200; cost = \$3000.
49. $\frac{5}{39}$. 50. (a) $7\frac{2}{3}$; (b) $\frac{1}{2}$. (A guinea = 21s.). 51. $\frac{1}{240}$.
52. 104448. 53. 552. 54. $8\frac{1}{10}$ ac. 55. $8\frac{8}{7}$ da.

56. $77\frac{1}{2}$ ft. = $25\frac{5}{8}$ yd. (Carpet running lengthwise will require 5 strips, each $15\frac{1}{2}$ ft. long). 15.
57. $\frac{4}{20}$; $\frac{7\frac{1}{2}}{20}$; $\frac{6\frac{1}{2}}{20}$; $\frac{3}{10}$. 58. $\$37.91\frac{7}{8}$. (£1 = $\$4.86\frac{2}{3}$).
59. 4770. (Out of every 6 voters, 5 voted—3 for one candidate and 2 for the other; \therefore the majority of the successful candidate = $\frac{1}{3}$ No. of voters). 16.
17.
60. 225 lb. sulphur, $337\frac{1}{2}$ lb. charcoal, $1687\frac{1}{2}$ lb. nitre.
61. $\$2.20$. (Value of hay = $\$24.12$; value of groceries = $\$21.92$).
62. Dress goods = $\$9.42\frac{1}{2}$; linen = $\$1.35$; lining = 67c.; buttons = 36c.; thread = 15c.; tweed = $\$5.94$; cotton = $\$2.00$; cloth = $\$6.75$; total = $\$26.65$. 18
63. Hay = $\$12.60$; wood = $\$18.00$; apples = $\$11.00$; flour = $\$8.75$; butter = $\$4.90$; total = $\$55.25$. Balance due farmer, 80c. 19
64. Currants = 68c.; rice = $\$1.25$; soap = 75c.; cotton = $\$3.01$; dress goods = $\$4.64$; thread = 20c.; syrup = 90c.; total = $\$11.43$. Bal. paid on Aug. 9 = $\$6.43$. 20
65. Tea = $\$3.00$; sugar = $\$14.25$; print = $\$5.17\frac{1}{2}$; syrup = $\$1.46\frac{1}{4}$; towelling = $\$1.50$; knives and forks = $\$1.87\frac{1}{2}$; cheese = $\$4.05$; lemon peel = 52c; total = $\$31.83\frac{1}{4}$. Bal. = $\$21.83$ ($\$21.83\frac{1}{4}$). 1
2
4
f
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66. Wheat = $\$2834.22\frac{1}{2}$; peas = $\$39.26$; barley = $\$20.92\frac{1}{2}$; flour = $\$6.97\frac{1}{2}$; bran = $\$35.13\frac{3}{4}$; total = $\$2936.53$ ($\$2936.52\frac{1}{2}$). 1
2
4
f
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Exercise 74. Page 73

8. .1; .01; .001; .0001; .00001; .000001.
9. The tens occupy the second place to the left of the decimal.
 “ tenths “ “ first “ “ right “ “
 “ hundreds “ “ third “ “ left “ “
 “ hundredths “ “ second “ “ right “ “
11. (a) Hundreds, thousands, millions. (b) Thousandths.
 (c) Thousands occupy the second period to the left, while thousandths occupy the first period to the right of the decimal points. (d) Millionths. The millions period is the third period to the left of the decimal point. 1
1
1
1
12. $\frac{72}{10}$; $\frac{84}{10}$; $\frac{65}{10}$; $\frac{97}{10}$. 13. $\frac{724}{100}$; $\frac{835}{100}$; $\frac{27}{100}$; $\frac{7}{100}$.
14. $\frac{465}{1000}$; $\frac{7250}{1000}$; $\frac{75}{1000}$; $\frac{8100}{1000}$.

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15. Eighty-four, and ninety-six hundredths; three hundred and sixty-four, and seventy-two thousandths; twenty-eight, and three hundred and seven thousandths; seventeen and eight thousandths.
 16. .7; .08; .27; 6.3; .078; 8.29; 7.008.
 17. Seven hundred and seven thousand and five; seventy thousand seven hundred, and five tenths; seven thousand and seventy, and five hundredths; seven hundred and seven, and five thousandths; seventy, and seven thousand and five ten-thousandths.
 18. To affix a cipher to the right of a whole No. *increases* the value of the No. 10 times.
 19. Each cipher, as in the question, *decreases* the value of the significant digit 10 times.
 20. Each may be read as four tenths, since $.40 = \frac{40}{100} = \frac{4}{10} = .4$, etc.

Exercise 75. Page 75

1. Nine tenths.
2. Twenty-seven hundredths.
3. Three hundred and sixty-eight thousandths.
4. Sixty-four thousandths.
5. Four, and thirty-one hundredths.
6. Seven, and two hundred and sixteen thousandths.
7. Three, and three hundred and fourteen thousandths.
8. Five, and eight thousand one hundred and sixty-seven ten-thousandths.
9. Twenty-one, and three thousand six hundred and one ten-thousandths.
10. Seventeen, and sixty-four ten-thousandths.
11. Eighteen, and eighty-one hundred-thousandths.
12. Twenty, and one thousand four hundred and fifty-eight hundred-thousandths.
13. .8; 2.07; .009.
14. 807.094; 3017.0709; 3.001008.
15. 6.0004; 80.0000609; 101.01001.

Exercise 76. Page 75

1. Like numbers.
 2. They may be written in columns, having the units in one column, the tens in another, etc.
- | | | |
|---------------|-----------------|------------------|
| 3. 3.4 | 4. 65.046. | 5. 600.7354. |
| 71.61 | 6. 4475.105045. | 7. 2.4397464. |
| 7.984 | 8. 101.209. | 9. 10.867. |
| .689 | 10. 114.1377. | 11. 959.0483. |
| <u>367.8</u> | 12. 40.52753. | 13. 15156.66886. |
| 14. 200.1211. | 15. 25.749445. | 16. 227.5024. |

Exercise 77. Page 76

- | | | |
|------------------|-----------------|-----------------|
| 1. 164.25 ac. | 2. 663.0388. | 3. 61.19 ac. |
| 4. 8.82 t. | 5. 975.875 yd. | 6. 163.135 mi. |
| 7. 150.164575. | 8. 490.3013. | 9. 122.002 cwt. |
| 10. 201.9009 mi. | 11. 122.625 yd. | 12. 58.4905 ac. |

Exercise 78. Page 77

- | | | |
|-------------|----------------|-------------|
| 1. 84.25 | 2. 96. | 3. 16.1524. |
| <u>7.56</u> | <u>2.75</u> | |
| 4. 2.3806. | 5. .43876. | 6. .23296. |
| 7. 1.8316. | 8. .00521. | 9. 3.9249. |
| 10. 1.405. | 11. 168.098. | 12. .01. |
| 13. .6322. | 14. 8.3416. | 15. 2.5527. |
| 16. 15.809. | 17. 173.03863. | |

Exercise 79. Page 78

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|----------------|----------------------|--------------|
| 1. 36.003 gr. | 2. .099. | 3. .146. |
| 4. 13.75 yd. | 5. 999.999999. | 6. 5.564 lb. |
| 7. 829.375 ac. | 8. .012 of the ship. | 9. 22.5881. |
| 10. 28.375 yd. | 11. 52.632. | |

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6.
7.9.
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11.
12.
13.1.
4.
7.
10.
13.1.
4.
7.
10

Exercise 80. Page 79

- | | | | |
|----------------|-------------|-------------|----------------|
| 1. 22.659. | 2. 28.114. | 3. 87.1314. | 4. 6.7605. |
| 5. 11.5493. | 6. 4.724. | 7. 2.002. | 8. .01. |
| 9. 131.371 ac. | 10. 553.69. | 11. 2.3081. | 12. 199.75 mi. |

Exercise 81. Page 79

- | | |
|--|-----------------------------|
| 1. 15, 21, 27, 36, 39. | 2. 1.5, 2.1, 2.7, 3.6, 3.9. |
| 3. .15, .21, .27, .36, .39. | 4. 1.5, 2.1, 2.7, 3.6, 3.9. |
| 5. .015, .021, .027, .036, .039. | |
| 6. .00015, .00021, .00027, .00036, .00039. | |
| 7. The No. of decimal places in the product is equal to the sum of the No. of decimal places in the multiplicand and the multiplier. | |
| | 8. 7, 8, .7, .8, .07, .08. |
| 9. The decimal point is moved one place to the right. | |
| 10. 70, 80, 7, 8, .7, 800. | |
| 11. The decimal point is moved two places to the right. | |
| 12. 723, 8010, 6.4, 700.6, 502.5. | |
| 13. To multiply a No. by 10, 100, or 1000, we simply remove the decimal point one, two, or three places to the right. (Note.— $25 = 25.000 \dots$). | |

Exercise 82. Page 80

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|---------------|-------------------------|---------------|
| 1. 4; 7. | 2. $15.5440 = 15.544$. | 3. 240.37086. |
| 4. .0273238. | 5. 5.4008. | 6. 2474.11. |
| 7. .26928. | 8. 9.6142. | 9. .000072. |
| 10. .310104. | 11. 803.2104. | 12. .040527. |
| 13. 1.010009. | 14. .015045. | |

Exercise 83. Page 81

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|-----------------------|---------------|---------------------|
| 1. 56.4235 mi. | 2. 6.53146. | 3. 773.4375 sq. yd. |
| 4. 1.141166125. | 5. \$140.432. | 6. 7748977.6. |
| 7. 334141.402 sq. in. | 8. 9.75 lb. | 9. 334.00692 lb. |
| 10. 117.05936022 mi. | 11. 728.9271. | 12. 312.275 lb. |

Exercise 84. Page 82

1. Each No. to the right is ten times the No. immediately preceding it.
2. To increase it 10 times, *or* to multiply it by 10. To multiply by 100. To multiply by 1000. 4. None.
5. 700; 70; 7; .07; 110; 11. 6. 2800; 28; 2.8; 2880; 288; 28.8.
7. .8; .28; .048; .642; .008; .0008.

Exercise 85. Page 82

- | | | |
|----------------|---------------|------------|
| 1. 3.07. | 2. 50.615625. | 3. 800. |
| 4. .006446875. | 5. 1240. | 6. .00075. |
| 7. .00016125. | 8. .568. | 9. 20200. |
| 10. 22600. | 11. .082. | 12. .83. |

Exercise 86. Page 82

1. 1562.5.
2. 300 times.
3. $\frac{.1}{.001} = 100$; 50.
4. 27.16 yd.
5. \$3.24484 ..., *or* \$3.24.
6. 5.08.
7. 118.614 ... bu.
8. 88.8 bu. wheat.
9. 42.55 t.
10. 518.814 bu.
11. 135 bu. each. (To buy 1 bu. each requires \$1.725).
12. 3.2989894 ft. (For 25 deg., increase = .0003 of length = .0009894 ft.).

Exercise 87. Page 83

1. 168000.
2. \$319.375.
3. .0001.
4. 779.01 ... gal.
5. 20.057 ... oz.
6. .11. (Sum = 102.96; $\frac{102.96}{6.05} = 17$ and remainder = .11).
7. .00421 in. (64 m. = 70 yd. = 2520 in.; \therefore 1 m. = 39.375 ... in.).
8. 2000 sheep. (He lost .44 of his sheep; he had left .56 No.; .25 of .56 No. = 280, i.e., .14 of the No. = 280).
9. \$10.
10. .03012.
11. 24.3385c.
12. 13.3787 ac. $\left(\frac{763.4 \times 763.4}{160 \times 30\frac{1}{4} \times 9} \text{ ac.} \right)$.
13. 3887.51 ... cu. in. $(1728 \times 16 \times 1000) \div (1000 \times 7.112)$.

Exercise 88. Page 85

1. $\frac{7}{10}$. 2. $\frac{9}{25}$. 3. $\frac{2}{25}$. 4. $\frac{98}{125}$. 5. $\frac{709}{1000}$.
 6. $\frac{307}{5000}$. 7. $\frac{39}{5000}$. 8. $\frac{3807}{5000}$. 9. $\frac{601}{2000}$. 10. $\frac{427}{100000}$.
 11. $\frac{9}{25000}$. 12. $\frac{2007}{100000}$. 13. $\frac{142493}{200000}$. 14. $\frac{3}{500000}$. 15. $\frac{7}{8000}$.
 16. .8. 17. .17. 18. .27. 19. .07. 20. .136.
 21. 2.07. 22. 4.16. 23. 16.126. 24. 126.367. 25. .18496.
 26. 3.00007. 27. 16.00163.

Exercise 89. Page 85

4. .875. 5. .75. 6. .375. 7. .1875. 8. .28. 9. .9375.

Exercise 90. Page 85

1. .75. 2. .625. 3. .1875. 4. .225.
 5. .15625. 6. .0375. 7. 1.875. 8. .06875.
 9. .078125. 10. .008. 11. 6.6. 12. 24.008.
 13. 3.525. 14. 46.3125. 15. 47.140625.

Exercise 91. Page 86

1. $\frac{1}{4}$, $\frac{9}{25}$, $\frac{24}{25}$, $\frac{12}{125}$, $\frac{3}{8}$. 2. .08, .006, .056, .00364.
 3. 5.7, 34.08, 6.4, 8.85. 4. $\frac{19}{30}$, $\frac{11}{25}$, $\frac{11}{250}$, $\frac{7}{80}$.
 5. $7\frac{11}{20}$, $4\frac{8}{25}$, $5\frac{67}{100}$, $7\frac{1}{20}$.
 6. $\frac{50}{1000}$, $\frac{33\frac{1}{2}}{100}$, $\frac{66\frac{2}{3}}{100}$, $\frac{75}{100}$, $\frac{12\frac{1}{2}}{100}$, $\frac{37\frac{1}{2}}{100}$, $\frac{8\frac{1}{8}}{100}$, $\frac{41\frac{2}{3}}{100}$.
 7. .75, .625, .7, .484375, .85, .075, 3.484375.
 8. 6 tablecloths; 2.35 yd. remain.
 9. 1.234; 12.34; 123.4; 1234.
 10. .01234; .001234; .0001234; .00001234.
 11. .0166375. ($1.25 \times 11 \times 1.1 \times .0011$).
 12. .2804 ... ($\frac{.25 \times .4 \times 8\frac{3}{4}}{.4 \times 7.8}$).

Exercise 92. Page 87

1. .714285. 2. .8. 3. .83. 4. .916.
 5. .513. 6. .3863. 7. .923076. 8. .96428571.
 9. .7916. 10. .86.
 11. .9411764705882352. 12. .514857.

Exercise 93. Page 89

1. $\frac{3}{8}$; $\frac{8}{11}$; $\frac{437}{888}$; $\frac{1}{7}$. 2. $\frac{377}{1100}$; $\frac{707}{2475}$; $\frac{1}{10}$; $\frac{23}{80}$
 3. $\frac{2096}{495}$; $\frac{9913}{4950}$; $\frac{713}{1998}$; $\frac{294}{55}$.

Exercise 94. Page 89

1. 1.7053. 2. 1.0009. 3. 1.1686. 4. .3076.
 5. .830327176861. 6. 1.026925. 7. 1.79723224.
 8. 1.1799401561777. 9. 4.67490. 10. .857142; $\frac{6}{7}$.

Exercise 95. Page 90

1. 8 oz.; 8 oz. 2. 250 lb. 4. 15 min. 5. 18 in. 6. 13.2 ft.
 7. 12 oz. 8. 39 min. 9. 16.2 ft. 10. 36 oz.

Exercise 96. Page 91

1. 151 sq. rd. 2. 9 oz. 15 dwt. 18 gr. 3. 10.5d.
 4. 47 min. 6 sec. 5. 11 hr. 55 min. 40.8 sec. 6. 8s. 9d.
 7. 309 rd. 8. 15 cwt. 56 lb. 4 oz. 9. 12s. 6 $\frac{3}{4}$ d.
 10. 3s. 5 $\frac{1}{2}$ d. 11. 2 da. 12 hr. 55 min. 21 sec. 12. $\frac{1}{2}$ d.

Exercise 97. Page 91

1. $\frac{1}{8}$ ft. 2. .8 ft. 3. $\frac{1}{4}$ yd. 4. .25 yd. 5. $\frac{3}{4}$ yd.; .75 yd.
 6. 5s. 7. .125 da. 8. .008 t. 9. .6 bu.

Exercise 98. Page 92

1. £.525. 2. .282 t. 3. .78125 oz. troy. 4. .775 mi.
 5. .3125 pk. 6. £9.26875. 7. 17.895 cwt. 8. 7.875 bu.
 9. .625 fath. 10. .71 of 4 oz. 11. 129.78 hr. 12. .001625 t.

Exercise 99. Page 92

1. .000625 wk. 2. .56285714 in. 3. 5s. 3d.
 4. 6.741. 5. .40156625 mi. 6. 5.7725 wk.
 7. First by 158.4 yd. 8. 175.125 lb. $\left(\frac{3 \times 15 \times .934}{.24} \text{ lb.}\right)$.
 9. 126 sec. (L.C.M.) 10. 32 men. $\left(\frac{28 \times 3.663 \times 8}{16.28 \times 5 \times .315}\right)$.

Exercise 100. Page 93

- \$4404. (.575 of A's money = \$2532.30).
- .52. $(1.00503 \times 4) \div (9 \times .859)$. 3. £10 16s. $9\frac{11}{38}d$.
- A, $3\frac{97}{141}$ oz.; B, $9\frac{31}{141}$ oz.; C, $7\frac{13}{141}$ oz.
(A's share = .4 of B's = .4 of 1.3 of C's = .52 of C's).
- 220.0929 ... gal. $(1.308 \times 27 \times 1728) \div 277.274$.
- 17888.0625 sq. ft.
- 11436 $(11435.91) =$ No. who can *not* read ; 229320 = No. who can read ; 131859 $(229320 \times .575) =$ No. who can write.
- $\frac{57}{57}$ mi. = .1023 ... mi. 9. $\frac{91}{435}$. 10. 3.26953125 t.
- Man's share = \$109.0827 ... ; woman's share = \$62.3329 ...
(If a woman receives \$1, a man receives \$1.75 ; 3 men and 4 women receive \$9.25, \therefore a man's share = $\$576.58 \times \frac{175}{925}$).

Exercise 101. Page 94

- .3911 ... $\left(\text{Fr.} = \frac{\text{£}8 \ 9\text{s.} \ 3\text{d.}}{\text{£}21 \ 12\text{s.} \ 9\text{d.}} = \frac{2031\text{d.}}{5193\text{d.}} = \frac{677}{1731} = \text{etc.} \right)$.
- 39 mi. 3. 37678.275 ft. 4. 149.4475 sq. rd.
- \$1278.75. $(.125 = \frac{1}{8} \text{ of } .25)$.
- 259 mi. 81 rd. 3 yd. 2 ft. $5\frac{7}{8}$ in. 7. .62963 yd.
- $\frac{40}{63}$. $(\frac{114}{399} + \frac{12}{28} - \frac{674}{3033} = \frac{2}{7} + \frac{2}{7} - \frac{2}{9})$. 9. 605.0745 lb.
- \$1.80. $(.275 \text{ price} = \frac{2}{9} \text{ price} = 9\frac{1}{2}\text{c.})$.

Exercise 102. Page 94

- Thirty thousand three hundred and three, and three hundred and three ten-thousandths.
- 7000.007. 3. \$227.50.
- $9012\frac{1}{2}$ grs. (1 gal. water weighs 10 lb.; \therefore 1 gal. milk weighs 10.3 lb.; \therefore 1 pt. milk weighs $\frac{10.3}{8}$ lb. = $\frac{10.3}{8} \times 7000$ grs.).
- .0027855 ... 6. \$262.50. (No. of 5c. pieces = $12 \times 7000 \div 16$).
- Green, 12 oz.; black, 1 lb. 4 oz.
- Turkeys, 85c. each ; geese, 60c. each. (If the turkey's were the same price as the geese, the woman would have received \$2 less, i.e., 8 @ 25c.; \therefore s.p. of 16 geese = \$9.60).

9. John, \$200; James, \$400; Henry, \$1200.
10. \$70. (No. strips = $17\frac{2}{3} \div 2\frac{1}{4} = 8$; length of each strip = 21 ft. = 7 yd.)
11. A, \$250; B, \$160; C, \$110.
12. Man, \$1.50; boy, 75c. (Weekly wages of 5 men = \$45).
13. Men, \$56.70; boys, \$25.90. (27 men receive as much as 81 boys).
14. $133\frac{1}{3}$ cwt.; 100 cwt. nitre; $13\frac{1}{3}$ cwt. sulphur. ($\frac{3}{20}$ total wt. = 20 cwt.)
15. \$8. (Wages for 12 mo. = \$160 + 10 sheep; wages for 7 mo. = \$60 + 10 sheep; \therefore wages for 5 mo. = \$100; wages for 12 mo. = \$240 = \$160 + 10 sheep; \therefore value of 10 sheep = \$80).
16. $31\frac{3}{4}$ mi. $\{(160 \times 30\frac{1}{4} \times 9 \times 5) \div (14 \times \frac{3}{4} \times 3 \times 1760)\}$ mi.
17. A, \$266 $\frac{2}{3}$; B, \$933 $\frac{1}{3}$.
18. \$24.81; \$33.08. (Ratio of 3 to 4).
19. \$1. $\{2$ men get as much as 5 boys; 6 men get as much as 15 boys; 12 women get as much as 18 boys; \therefore (15 + 18 + 15) boys would get \$19.20; 1 boy would get 40c.; 1 man would get 40c. $\times \frac{5}{2}\}$.
20. 109 ft. ($94 \times 6 - 91 \times 5$).
21. 75c. $\$1.20 \times 6 - \frac{\$(1.80 + 2.40)}{4}$.
22. \$32.20; 57 $\frac{1}{2}$ c. 23. 23 bu.; \$598.
24. 1716 yd.; 71 $\frac{1}{2}$ yd. 25. 30c. $\left(\frac{23 \times 10 - 20 \times 7}{3}\right)$.
26. 37 $\frac{2}{3}$ lb.; 8 $\frac{1}{3}$ $\frac{1}{3}$ c. 27. \$5000; \$25.
28. 18.338 = $18\frac{61}{180}$. 29. 26.
30. 510 lb. ($550 \times 6 + 462 \times 5$) \div 11.
31. 25 $\frac{5}{3}$ gal. $\left(\frac{4.60 \times 92}{3.60} - 92\right)$.
32. 4928 cu. ft. (Length of wall = 308 ft).
33. 148 $\frac{1}{2}$ mi. (No. furrows = 792). 34. 307 $\frac{5}{8}$ sq. yd.
35. 14580. (6 in. to the weather require 45 courses for each side. Shingles 4 in. wide require 162 to the course; \therefore *162 \times 45 \times 2).
36. \$30. 37. \$448.80. 38. 170 $\frac{2}{3}$ yd.
39. \$50. (No allowance for doors or windows).

Exercise 103. Page 99

10. $\frac{1}{20}$, $\frac{1}{10}$, $\frac{1}{8}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{1}{3}$. 11. 30 in.
 12. 7%, 12%, 25%, 30%. 13. 10%, 5%, 4%, $12\frac{1}{2}\%$.
 14. $\frac{50}{100}$, 50%; $\frac{25}{100}$, 25%; $\frac{20}{100}$, 20%; $\frac{12\frac{1}{2}}{100}$, $12\frac{1}{2}\%$; $\frac{6\frac{1}{4}}{100}$, $6\frac{1}{4}\%$; $\frac{10}{100}$,
 10%; $\frac{60}{100}$, 60%; $\frac{75}{100}$, 75%; $\frac{33\frac{1}{3}}{100}$, $33\frac{1}{3}\%$; $\frac{66\frac{2}{3}}{100}$, $66\frac{2}{3}\%$.
 15. 50%, 25%, 20%, 25%. 16. 100%.

Exercise 104. Page 100

1. $\frac{7\frac{1}{2}}{100}$. 2. $\frac{6\frac{1}{4}}{100}$. 3. $\frac{33\frac{1}{3}}{100}$. 4. $\frac{12\frac{1}{2}}{100}$. 5. $\frac{37\frac{1}{2}}{100}$
 6. $\frac{87\frac{1}{2}}{100}$. 7. $5\frac{1}{2}\%$. 8. $7\frac{1}{4}\%$. 9. 25%. 10. $25\frac{1}{4}\%$.
 11. $3\frac{3}{10}\%$. 12. 12500%. 13. $\frac{1}{8}$. 14. $\frac{23}{200}$. 15. $\frac{1}{8}$.
 16. $\frac{1}{3}$. 17. $\frac{77}{200}$. 18. $\frac{7}{8}$. 19. 25%. 20. 20%.
 21. 75%. 22. $33\frac{1}{3}\%$. 23. 40%. 24. $37\frac{1}{2}\%$.

Exercise 105. Page 100

1. 64; 72; 100. 2. 88; 104; 120. 3. 128; 144; 160.
 4. 72. 5. \$15. 6. 23 sheep.
 7. 45 ft. 8. \$25. 9. 15 mi.
 10. \$10.50. 11. 14 men. 12. 45.
 13. 6 men. 14. 48 sheep. 15. \$280.

Exercise 106. Page 101

2. 6%. 3. $\frac{7}{25}$; 28%. 4. $\frac{13}{200}$; $6\frac{1}{2}\%$.
 5. 50%, 25%, 20%, 75%, $16\frac{2}{3}\%$, 40%. 6. 32%.
 7. 40%. 8. 75%. 9. 60%; $36\frac{4}{11}\%$.
 10. $8\frac{1}{3}\%$. 11. 40%. 12. $66\frac{2}{3}\%$. 13. $19\frac{731}{1051}\%$.

Exercise 107. Page 101

1. 1100. 2. \$1200. 3. 357 ac. 4. $208\frac{1}{3}$ ac.
 5. \$4 each. 6. \$100. 7. \$2050. 8. 20 lb.
 9. \$7280. 10. 605. 11. \$4800. 12. 2880.

Exercise 108. Page 102

1. 110 men, 88 women, 66 boys. (If No. of boys be 3, No. women is 4, and No. men is 5). 2. 3600; 4185.
3. 13310. 4. \$12937.50. 5. \$4076.163; $\frac{431}{116}$.
6. \$1620. 7. 600 bu.; 720 bu. 8. \$20.
9. \$4700. 10. B, $\frac{5}{27}$; C, $\frac{5}{23}$. 11. $\frac{7}{80} = 11\frac{2}{3}\%$.
12. $6\frac{1}{4}\%$. $\$(380 - 340) =$ twice the gain when goods are sold for \$340; \therefore cost of goods = \$320. 13. 24 yr.

Exercise 109. Page 103

1. \$480; \$1680. 2. \$1183.50. 3. \$567; \$1.13 $\frac{2}{3}$.
4. $8\frac{1}{4}$ c. 5. \$720. 6. \$3726.
7. \$9806.28. 8. \$699.30. 9. \$420.
10. \$240. 11. 12.
12. \$3808.86 $\frac{2}{3}$. (3% cost = \$117.80).
13. (a) \$12, 50%; (b) \$105, 25%; (c) \$60, 25%; (d) \$160, \$40; (e) \$1450, 20%; (f) \$1860, \$620; (g) \$1860, \$124.
14. (a) \$8, $14\frac{2}{7}\%$; (b) \$8, 25%; (c) \$80, \$16; (d) \$160, \$40; (e) \$200, $17\frac{1}{2}\%$.

Exercise 110. Page 105

1. \$225. 2. \$400. 3. \$108. 4. 25%, or \$125.
5. \$2.50. 6. \$150. 7. \$45. 8. \$57.

Exercise 111. Page 106

1. \$405. 2. \$155. 3. \$584.25.
4. \$1114.92. 5. \$380. 6. \$301.53.
7. \$12.75. 8. \$137.88. 9. $37\frac{1}{2}\%$.
10. $37\frac{1}{2}\%$. 11. \$500. (Cost = \$216; gain = 25% of \$216 = \$54; s. p. = \$270. If list price = \$100, 1st dis. = \$25; 1st reduced price = \$75; 2nd dis. = \$15; 2nd reduced price = \$60; 3rd dis. = \$6; 3rd reduced price = \$54; \therefore s. p. = $\frac{54}{100}$ list price = \$270).

Exercise 112. Page 107

- | | | |
|------------------------|----------------------------------|------------------------|
| 1. $28\frac{3}{4}\%$. | 2. $35\frac{7}{8}\%$. | 3. 28%. |
| 4. 25%. | 5. \$289.80; $19\frac{1}{2}\%$. | 6. \$250. |
| 7. \$400. | 8. First. | 9. $49\frac{1}{3}\%$. |
| 10. \$855. | | |

Exercise 113. Page 108

- | | | | |
|-----------------|-----------------|----------|---------|
| 1. \$4, or 20%. | 2. \$4, or 20%. | 7. \$110 | 8. 50%. |
| 9. 20%. | 10. 15%. | | |

Exercise 114. Page 109

- | | | |
|--|------------------------|---------|
| 1. 25%. | 2. 20%. | 3. 4%. |
| 4. $11\frac{1}{10}\%$ loss. | 5. $62\frac{1}{2}\%$. | 6. 44%. |
| 7. 21%. | 8. 125%. | 9. 25%. |
| 10. $58\frac{1}{3}\%$. Value = \$140. | | |

Exercise 115. Page 109

- | | | |
|--|-----------------------|------------|
| 1. \$45.80. | 2. \$1.45. | 3. \$5.07. |
| 4. $21\frac{1}{2}\%$. | 5. $6\frac{1}{4}\%$. | 6. \$3125. |
| 7. \$9.90. | 8. \$320. | 9. 11c. |
| 10. Merchant; 50c. (Cost of wheat to the farmer = \$22.50; gain = \$4.50. Cost of goods to merchant = \$20; gain = \$5). | | |
| 11. \$250 loss. (Cost of 1st farm = \$2500; cost of 2nd = \$3750). | | |

Exercise 116. Page 111

- | | | |
|---|--------------|------------|
| 1. \$20. | 2. \$237.50. | 3. \$1200. |
| 4. Cost to purchaser = \$8500; sum received by seller = \$8160. | | |

Exercise 117. Page 111

- | | | |
|---|--|-----------|
| 1. \$14.40. | 2. \$15.90. | 3. \$10. |
| 4. \$30. | 5. \$247. | 6. \$112. |
| 7. \$37.50. | 8. \$13.12 $\frac{1}{2}$. | |
| 9. Com., \$117; sum paid to employer, \$2483. | | |
| 10. \$1086.75 | 11. \$5659.87 $\frac{1}{2}$; com., \$145.12 $\frac{1}{2}$. | |
| 12. \$4384.25. | | |

Exercise 118. Page 112

1. 5%.
2. $3\frac{1}{4}\%$.
3. 2%.
4. $5\frac{3}{4}\%$.
5. $2\frac{1}{2}\%$.
6. $2\frac{118}{391}\%$.
7. $2\frac{1}{2}\%$.
8. $13\frac{118}{2737}\%$.
9. 2%. Net proceeds of sale = \$680 - \$136 (freight) - \$34 (com.) = \$510, or 75% of \$680.
10. $4\frac{1}{2}\%$. Com. on \$325 = \$14.62 $\frac{1}{2}$.

Exercise 119. Page 113

1. \$610.
2. \$1636.
3. \$448.
4. \$1400.
5. \$16.45.
6. \$820.30.
7. \$2500.
8. 65c. (First cost = $\$62 \times \frac{100}{2\frac{1}{2}} = \2480 . Com. + freight = \$120. Total cost = \$2600).
9. 680 bbls. (Com. for buying 1 bbl. = 2% of \$5 = 10c. Total cost of 1 bbl. = \$5.10; \therefore No. bbls. = $\frac{3468}{5.10}$).
10. 13333 $\frac{1}{3}$ bu.
11. 30%. Net proceeds = \$1750 - \$(87.50 + 25 + 12.50) = \$1625.

Exercise 120. Page 116

1. \$25.
2. \$100.
3. \$48.
4. \$4000.

Exercise 121. Page 116

1. \$18.
2. \$11.20.
3. \$15.20.
4. \$11.25.
5. \$100.
6. \$110.40.
7. \$166.25.
8. \$65.20.
9. \$47.10.
10. \$30.75.
11. \$69.60.
12. \$171.75.
13. \$487.50.

Exercise 122. Page 116

1. $1\frac{3}{4}\%$.
2. $\frac{3}{4}\%$.
3. $\frac{3}{5}\%$.
4. $1\frac{547}{375}\%$.
5. $1\frac{1}{2}\%$.
6. $3\frac{1}{3}\%$.
7. $1\frac{1}{8}\%$. Prem. = \$(6000 - 5930 - 2.50) = \$67.50.
8. $\frac{5}{8}\%$. Policy = \$288000; prem. = \$1800.
9. \$27510. Policy = \$28000; prem. = \$490.
10. \$3739.20.

Exercise 123. Page 117

1. \$70000.
2. \$46000.
3. \$7792.
4. \$12000.
5. \$2500.
6. \$29730. Policy = $\$270 \times \frac{1000}{3} = \30000 .
7. \$9200.
8. \$30187.50.

Exercise 124. Page 120

1. \$100. 2. \$120. 3. $1\frac{1}{2}\%$, or 15 mills; \$113.85.
 4. \$43.20. 5. \$5280. 6. \$110.88. 7. \$612.50.
 8. \$7.12 $\frac{1}{2}$. 9. 15 mills, or $1\frac{1}{2}\%$. 10. \$164.06 $\frac{1}{4}$.
 11. (a) \$54; (b) 2 mills. 12. $3\frac{1}{4}$ mills.

Exercise 125. Page 122

1. \$675.40. 2. \$655.35. (No. ac. assessable land = 15420).
 3. \$52. 4. \$409.60. (There are 4 quarter-sections to a sq. mile; \therefore 64 quarter-sections).
 5. 6c. per ac. (No. ac. assessable = $640 \times 12 - 480$).
 6. 7c. per ac. (Tax for 1907 = \$518.40; for 1908 = \$806.40).
 7. 640 ac. 8. 4 mills. 9. \$25.50.
 10. \$12. (He pays taxes on \$800).
 11. 16 mills. (Taxes on an assessment of \$1800 = \$28.80).
 12. \$2400. ($\frac{1}{1000}$ of the taxable income = \$25.60).
 13. 20 mills; \$50000. (Taxes on \$15000 = \$300).

Exercise 126. Page 123

1. \$8400. 2. \$330000. 3. \$600000.
 4. \$304000. ($\frac{95}{100}$ total taxes = \$3610). 5. \$4218.75.
 6. \$3250. ($\frac{14\frac{3}{4}}{1000}$ total assessment = \$109.08). 7. \$24400.
 8. 2000 lb. (Sp. duty on 100 lb. = \$2; *ad val.* duty on 100 lb. = 10% of \$4 = 40c.; total duty on 100 lb. = \$2.40).
 9. \$3720000. ($97\frac{1}{2}\%$ total tax = \$18135).
 10. 207360 ac.; \$18662.40.

Exercise 127. Page 124

1. \$8000. (95% of $97\frac{1}{2}\%$ of sum levied = \$7410).
 2. \$3000. 3. \$607.95.
 4. \$148.932. (Duty calculated on $98\frac{1}{2}\%$ of invoice price).
 5. 280 gal. { *Ad val.* duty per gal. = 30% of \$1.50 = 45c.; total duty per gal. = \$(2.40 + .45) = \$2.85 }.
 6. \$1764. (25% invoice pr. = \$367.50; gain = 20% invoice pr.).

7. 35%. (Duty on \$875 worth of goods = \$306.25).
 8. \$2450. ($\frac{983\frac{3}{5}}{1000}$ taxable income = \$1721.30). 9. \$2360000.
 10. \$4871.25. 11. (b) No. of sections = 324 ; No. of acres = 207360. (c) Assessment = \$3317760.

12. (a)	Date.	Principal.	Interest.	Total.
	Dec. 15, 1913	\$1200.	\$720.	\$1920.
	" 1914	1200.	648.	1848.
	" 1915	1200.	576.	1776.
	" 1916	1200.	504.	1704.
	" 1917	1200.	432.	1632.
	" 1918	1200.	360.	1560.
	" 1919	1200.	288.	1488.
	" 1920	1200.	216.	1416.
	" 1921	1200.	144.	1344.
	" 1922	1200.	72.	1272.
		\$12000.	\$3960.	\$15960.

(b) 3 mills. (Sum to be raised = \$1848 + \$5616.96).

(c) \$71.68. (Assessment = \$16 × 640. Rate = 7 mills).

Exercise 129. Page 127

1. \$30. 2. \$38.50. 3. \$52.50. 4. \$236.412.
 5. \$233.3295. 6. \$328.95. 7. \$568.05. 8. \$451.50.
 9. \$236.64. 10. \$314.60. 11. \$729.90125.
 12. \$63.21. 13. \$311.64. 14. \$96.738.

Exercise 130. Page 128

1. \$520. 2. \$882. 3. \$1887.60. 4. \$934.92.
 5. \$784.665. 6. \$954.56. 7. \$2002.65. 8. \$14.958.
 9. \$215.753; (175 da.) 10. \$16.856; (215 da.)

Exercise 131. Page 129

1. 8%. 2. $7\frac{1}{2}\%$. 3. 6%. 4. 5%.
 5. $5\frac{2}{5}\%$. 6. 9%. 7. 7%. 8. $4\frac{1}{2}\%$.
 9. $2\frac{1}{8}\%$. 10. \$1017.50. (Int. = \$17.50; 7%).
 11. 8%. (If prin. = \$100, int. for 25 yr. = \$200; int. 1 yr. = \$8).

Exercise 132. Page 130

1. 3 yr.
2. $3\frac{9}{2}$.
3. 2 yr. 3 mo. = $2\frac{1}{4}$ yr.
4. 5 mo.
5. $\frac{47}{3}$ yr. = 235 da.
6. Dec. 2. (175 da. after June 10).
7. 3 yr.
8. Oct. 4, 1900. ($4\frac{3}{8}$ yr. = 4 yr. 137 da.).
9. $14\frac{2}{7}$ yr. (Int. on \$100 = \$7 for 1 yr. = \$100 in $1\frac{9}{10}$ yr.).
10. $16\frac{2}{3}$ yr.

Exercise 133. Page 130

1. \$760.
2. \$846.
3. \$3500.
4. \$2000.
5. \$9000.
6. \$32500.
7. \$360.
8. \$655.
9. \$750.
10. £491 13s. 4d.
11. \$1825.
12. \$240. (Prin. + int. for $3\frac{3}{4}$ yr. = \$312; prin. + int. for $3\frac{1}{2}$ yr. = \$307.20; int. for $\frac{1}{4}$ yr. = \$4.80; int. for $3\frac{1}{2}$ yr. = \$67.20).

Exercise 134. Page 132

1. \$19,118 ... (1 yr. 57 da.)
2. \$9,1613 ... (1 yr. 202 da.).
3. \$700.
4. \$15,6722 ... (246 da.).
5. \$392.40.
6. \$17.40. (Int. = \$.896 ... ; 305 da.).
7. Gain on Jan. 8 = \$35.20. (Int. = \$4.80; 146 da.).
8. \$81,668 ... (145 da.).
9. \$881,313 ... (218 da.).
10. \$563.50. (Int. on \$1000 for $1\frac{1}{2}$ yr. @ 6% = \$90; bal. due on July 1, 1911 = \$490; int. on \$490 for $2\frac{1}{2}$ yr. @ 6% = \$73.50).

Exercise 135. Page 132

1. (a) May 15, 1909, 1910, 1911, 1912.
 (b) \$155; \$147.50; \$140; \$132.50. (c) \$575.
 (b) First year int. is on \$500; the second year on \$375, etc.
2. (a) 10 yr. (b) \$56; \$196; \$50.40; \$190.40; \$44.80; \$184.80; \$39.20; \$179.20; \$33.60; \$173.60; \$28; \$168; \$22.40; \$162.40; \$16.80; \$156.80; \$11.20; \$151.20; \$5.60; \$145.60. (\$56 = int. on \$1400 for 1st $\frac{1}{2}$ yr.; \$196 = int. for $\frac{1}{2}$ yr. + \$140; \$50.40 = int. on \$1260 for 2nd $\frac{1}{2}$ yr.; \$190.40 = int. for $\frac{1}{2}$ yr. + \$140, etc.). (c) \$616.
3. (a) April 1, 1913-4-5-6-7-8-9, 1920-1-2.
 (b) \$186; \$179.40; \$172.80; \$166.20; \$159.60; \$153; \$146.40; \$139.80; \$133.20; \$126.60. (c) \$363.

4. (a) \$222; \$213; \$204; \$195; \$186; \$177; \$168; \$159.

(b) \$324.

5. (a)	Date.	Principal.	Interest.	Total.
	Oct. 1, 1913	\$100.	\$30.	\$130.
	" 1914	100.	54.	154.
	" 1915	100.	48.	148.
	" 1916	100.	42.	142.
	" 1917	100.	36.	136.
	" 1918	100.	30.	130.
	" 1919	100.	24.	124.
	" 1920	100.	18.	118.
	" 1921	100.	12.	112.
	" 1922	100.	6.	106.
		<hr/>	<hr/>	<hr/>
		\$1000.	\$300.	\$1300.

(b) \$1300.

6.	Date.	Principal.	Interest.	Total.
	Mar. 15, 1914	\$800.	\$720.	\$1520.
	" 1915	800.	672.	1472.
	" 1916	800.	624.	1424.
	" 1917	800.	576.	1376.
	" 1918	800.	528.	1328.
	" 1919	800.	480.	1280.
	" 1920	800.	432.	1232.
	" 1921	800.	384.	1184.
	" 1922	800.	336.	1136.
	" 1923	800.	288.	1088.
	" 1924	800.	240.	1040.
	" 1925	800.	192.	992.
	" 1926	800.	144.	944.
	" 1927	800.	96.	896.
	" 1928	800.	48.	848.
		<hr/>	<hr/>	<hr/>
		\$12000.	\$5760.	\$17760.

7. (a) Ap. 15, 1903. (b) Amount of last payment = \$1060.

Exercise 136. Page 137

1. Amount of deposit = \$200.07. 3. \$332.46.
 4. Deposit = \$407.38. 6. \$848.37.

Exercise 138. Page 138

1. (1) July 24, 1913. (2) 80 da. (3) \$493.42.
 2. (1) Jan. 18, 1914. (2) 125 da. (3) \$390.41.
 3. (1) Ap. 28, 1913. (2) 73 da. (3) \$647.145, or \$647.15.
 4. (1) Sep. 14, 1913. (2) 45 da. (3) \$507.22.
 5. (1) Ap. 22, 1913. (2) 55 da. (3) \$115.39.
 7. (1) Due date = Dec. 11. (2) Term of dis. = 215 da.
 (3) Dis. = $\$584 \times \frac{5}{100} \times \frac{215}{365} = \17.20 ; proceeds = \$566.80.
 8. \$3.60. 9. (a) Sep. 30, 1914. (b) Oct. 3, 1914.
 (c) Face value + int. for 187 da. = \$800 + \$30.74 = \$830.74.
 (d) Dis. = $\$830.74 \times \frac{9}{100} \times \frac{187}{365} = \38.31 ; proceeds = \$792.43.
 10. Note matures, Feb. 15; discounted, Jan. 1; term of dis. = 45 da. Dis. = $\$1200 \times \frac{7}{100} \times \frac{45}{365} = \10.36 .

Example 8. Page 139

Dis. for 33 days @ 6% = $\frac{33}{365}$ of $\frac{6}{100}$ of face value of note
 = $\frac{99}{18250}$ face value;

$$\therefore \text{Proceeds} = \text{Face} - \frac{99}{18250} \text{ face} = \frac{18151}{18250} \text{ face} = \$556.92;$$

$$\therefore \text{Face value} = \$556.92 \times \frac{18250}{18151} = \$559.96.$$

Exercise 139. Page 139

1. \$74.58. (Dis. = $\frac{93}{365}$ of $\frac{7}{100}$ face = $\frac{651}{36500}$ face; proceeds = $\frac{35849}{36500}$ face = \$73.25; \therefore Face = etc.).
 2. \$714.29. (Dis. = $\frac{3}{12}$ of $\frac{8}{100}$ face = $\frac{1}{50}$ face; proceeds = $\frac{49}{50}$ face = \$700).
 3. Due date = Jan. 4, 1915; term of int. = 1 yr. 3 da.; int. = \$40.33; maturity value = \$540.33; date of dis. = Sep. 4, 1914; term of dis. = 122 da.; dis. = $\$540.33 \times \frac{9}{100} \times \frac{122}{365} = \16.25 ; proceeds = \$524.08.

4. \$1723.75. (Due, Dec. 13. Term of dis. = 73 da. Dis. = $\$1750 \times \frac{15}{200} \times \frac{73}{365} = \26.25).
5. \$184. (Dis. = $\frac{3}{12} \times \frac{15}{200}$ face = $\frac{3}{80}$ face = \$3.45).
6. \$336. (Dis. = $\frac{3}{12} \times \frac{25}{100}$ face = $\frac{1}{4}$ face = \$5.25).

Exercise 140. Page 141

3. \$246.
4. $22\frac{13}{16}\%$. (Dis. on \$1200 for 40 da. = \$30; dis. on \$100 for 1 yr. = $\$30 \times \frac{1}{12} \times \frac{365}{40} = \$22\frac{13}{16}$. A note is *due* only when it is *legally due*).
5. \$584. (Dis. = $\frac{90}{365} \times \frac{15}{200}$ face = $\frac{27}{1480}$ face; proceeds = $\frac{1433}{1480}$ face = \$573.20).
6. $\frac{2}{3}$ yr. or 146 da. (Dis. for 1 yr. = \$25).
7. (1) Proceeds = \$572.32. (Term of dis. = 73 da.).
 (2) Rate = 8%. (Term of dis. = 73 da.).
 (3) Proceeds = \$695.35. Date of dis. = Feb. 7.
 (4) Date of note = July 26. (Dis. = \$35.75; dis. for 1 yr. = \$137.3715; term of dis. = $\frac{35.75}{137.3715}$ yr. = 95 da.; due date = 95 da. after Aug. 26 = Nov. 29; date of note = 4 mo. before Nov. 26; Nov. 26 to Nov. 29 being the *days of grace*).
- (5) April 17. (Term of dis. = 80 da.; due date = July 20).

Exercise 141. Page 142

1. \$102.50; \$1102.50. 2. \$477.54; \$2977.54.
3. \$312.16; \$2812.16.
4. C. int. = \$191.02; S. int. = \$180; diff. = \$11.02.
5. C. int. = \$153.02; S. int. = \$150; diff. = \$3.02.
6. C. int. = \$206.08; S. int. = \$200; diff. = \$6.08.
7. \$124.16. 8. \$6.90.
9. \$466.56. {1.16 sum = \$464; sum = \$400; \therefore \$400 (1.08)²}.
10. \$129.86. (.24 sum = \$120).
11. \$541.22, i.e., \$500 (1.02)⁴.

Exercise 142. Page 143

1. \$6000. 2. 160 ft. 3. 3960.
 4. \$487.50. 5. \$3816; \$954. 6. \$1622250.
 7. 25%; 21 $\frac{3}{4}$ %; 20%. 8. $\frac{63}{200}$; \$22000. 9. \$14400; \$9000.
 10. 3277 $\frac{7}{10}$. 11. 30 wk. 12. 1.9453125.
 13. $\frac{404}{1100 \times 4} = \frac{101}{1100}$. 14. 450 ft. board measure. 15. 3 $\frac{157}{334}$.
 16. 132 yd. (Carpet running lengthwise; 11 strips of 12 yd. each)
 17. \$1566. (Bank dis.). 18. 63 $\frac{7}{11}$ %.
 19. \$230.85. 20. 1 $\frac{1}{11}$ hr. 21. .0062112.
 22. $\frac{54}{3}$. 23. \$63; \$105.
 24. \$5050.80. (1 ac. = 10 sq. ch.). 25. \$99.74.
 26. \$450.
 27. \$640 $\frac{90}{100}$.

Regina, July 31, 1914.

Four months after date I promise to pay Fred. Thomas, or order, the sum of six hundred and forty dollars, with interest at 8 per cent. per annum. Value received. A. Brown.

28. \$4800. 29. 85%. 30. 88c. per lb.
 31. \$6.30. 32. 3 hr. (1 cu. ft. = 6 $\frac{1}{4}$ gal.).
 33. \$80; \$93 $\frac{1}{3}$. (Farms cost \$12000 and \$14000). 34. \$60.
 35. $924 = 2^2 \times 3 \times 7 \times 11$; $2520 = 2^3 \times 3^2 \times 5 \times 7$; G.C.M. = $2^2 \times 3 \times 7 = 84$. All the factors of 84 are common factors of 924 and 2520; \therefore 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84 are common factors.
 36. .765625. 37. 1 $\frac{1}{4}$ % for 3 yr. 38. \$4000.
 39. \$1000. 40. 901. 41. 34.28 mi. per hr.
 42. \$1320; \$1760. 43. Turkey, \$2.65; goose, \$1.35.
 44. \$3.75.
 45. 33 ac. 95 sq. rd. ($2\frac{1}{2}$ in. by $\frac{7}{8}$ in. represent 100 rd. by 35 rd.; $1\frac{7}{8}$ in. by $\frac{5}{8}$ in. represent 75 rd. by 25 rd.). 46. 60%.
 47. \$3.60. (Cost = \$2.70; gain = $\frac{1}{3}$ of \$2.70; s.p. = \$3.24 = $\frac{9}{10}$ m.p.).
 48. Amount of bill = \$5.96 (\$5.96 $\frac{1}{4}$); dis. = 30c.; am't p'd = \$5.66.
 49. 30.98. 50. 20 each. (If one of each, value = 3s. 7 $\frac{1}{4}$ d.;
 \therefore No. of each = $\frac{\text{£}3 \text{ } 12\text{s. } 1\text{d.}}{3\text{s. } 7\frac{1}{4}\text{d.}} = 20$).

51. £1 3s. 7½d.; £1 15s. 5¼d. 52. \$41.10. (Surface = 34¼ sq. ft.).
 53. 5⅞ ft. must be cut off the 24 ft. board. 54. \$6.40.
 55. A, \$800; B, \$1400; C, \$700. (A's share = 1⅞ times C's; B's = twice C's; 4⅞ times C's share = \$2900). 56. \$62.50; \$67.50.
 57. 128 lb. (A diff. of 4c. a bag gives a total diff. of \$50; ∴ No. of bags = 1250). 58. 80 ft.
 59. 12 sec. (Train goes 176 yd. in order to clear 100 yd.).
 60. \$46.30. (Value of a turkey is \$1.30, and of a goose 70c.).
 61. A, \$10; B, \$8.40; C, \$6.60. (B's share = C's share + \$1.80; A's share = C's share + \$3.40; ∴ 3 times C's share + \$5.20 = \$25). 62. \$32. 63. 96c.
 64. 328. (4 units + 5 sixes + 7 forty-twos). 65. 33⅔ gal.
 66. A, 30c.; B, 36c.; C, 40c.
 67. \$55. No. sold at 1st = $\frac{1120}{4} = 28$; loss on 28 = \$1.40, or \$5 each; cost of each = \$45; No. bought = $\frac{2720}{4} = 62$; No. left = 34; s.p. of 34 = \$(2790 + 200 - 1120) = \$1870; s.p. = \$55 each.
 68. 18. (One at each end). 69. \$8.40. (No. of posts = 24).
 70. \$6. (No. of posts = 30).
 71. \$40. (16 posts; 900 ft. lumber; 200 ft. scantling).
 72. \$41.02⅙, or \$41.03. (24 posts; 920 ft. lumber; 245⅓ ft. scantling). 73. 10779¼ bu. (Wheat, \$5157.49; oats, \$50.50; barley, \$73.91). 74. 97½%. (Possible day's attendance = 1180; actual day's attendance = 1150½).
 75. First. $\left(\frac{10}{9.009} = 1.11000111...; \therefore \text{Error} = .00000111...; \frac{10}{1.11} = 9.009009...; \therefore \text{Error} = .000009... \right)$.
 76. \$252.16. (1st com. = 2½% of \$6398.56 = \$159.96; balance = \$6238.60; 2nd com. = \$6238.60 × $\frac{1\frac{1}{2}}{101\frac{1}{2}}$ = \$92.20).
 77. 7 oxen, 14 cows, 42 sheep.
 78. Outer circumference = 44 in.; outer dia. = 14 in.; inner dia. = 7 in.; inner circumference = 22 in. Area to be painted = $\left(\frac{44+22}{12} \times 21 \right)$ sq. ft. Cost = \$17.32½, or \$17.33.
 79. 398 mi. (12 hr. 5 min. from Brandon to Moose Jaw).
 80. 810178.991919. (Other No. = 900.1; sum = 901.109; diff. = 899.091).

81. $2\frac{2}{3}\%$ gain. { Cost at Moosomin = \$2880 ; weight = 480000 lb. ; freight = \$1920 ; total cost in Revelstoke = \$(2880 + 1920 + 384) = \$5184. Loss in wt. = $7\frac{1}{2}\%$ of 480000 lb. ; No. lb. sold = 480000 - 36000 = 444000 ; proceeds = $\$24 \times \frac{444000}{480000} = \5328 ; gain = \$144 ; gain % = $\frac{144}{5184} \times 100 = 2\frac{2}{3}\%$. *Note.*—If freight be paid on Revelstoke weight, then freight = \$1776. Gain % = $5\frac{5}{7}\%$. }
82. \$461 ; \$365. (1st works 461 hr. and 2nd 365 hr.).
83. \$6.24 (\$6.24078). (Cost per m. = 7 fr. ; 5 yd. = $5 \times 36 \times .0254$ m. ; cost = $7 \times 5 \times 36 \times .0254$ fr. = $19.5 \times 7 \times 5 \times 36 \times .0254$ c. = \$6.24).
84. (a) \$161. (Perimeter = 560 ft. ; 4620 ft. lumber ; $746\frac{2}{3}$ ft. scantling). (b) Area = 9856 sq. ft. ; circumference = 308 ft. (Width of corral = 120 ft. ; dia. of circular pen = 112 ft. ; circumference = $2\frac{2}{7} \times 112$ ft. Area = $2\frac{2}{7} \times 56 \times 56$ sq. ft.). (c) 200 ft.
85. (a) 665338617 ; 472300192081. (b) .0056 ; .7.
86. A's loss = \$1440 ; B's loss = \$2385.
- (A has \$2500 in trade for 9 mo. = \$22500 for 1 mo.) = \$48000
 " 1700 " " 15 " = 25500 " 1 " } for 1 mo.
 B has \$3000 in trade for 9 mo. = \$27000 " 1 " } = \$79500
 " 3500 " " 15 " = 52500 " 1 " } for 1 mo.
 (Loss is shared in proportion of 480 to 795).

Exercise 144. Page 151

1. 72 ; 126. 2. 55 ; 66 ; 77. 3. 684 ; 576.
 4. A, \$125 ; B, \$225 ; C, \$150. 5. \$150 ; \$200 ; \$250.
 6. 120 ; 140 ; 280. 7. 61 ; 122 ; 183 ; 244 ; 305.
 8. 450 ; 600 ; 765. ($2\frac{1}{2} : 3\frac{1}{3} : 4\frac{1}{4} = 30 : 40 : 51$).
 9. 153 bu. ; 170 bu. ; 187 bu.
 10. 525 bu. wheat ; 350 bu. oats. ($\frac{1}{2} : \frac{1}{3} = 3 : 2$).
 11. 36 boys. (52% No. pupils = 39 ; $\therefore 48\%$ No. pupils = $\frac{39 \times 48}{52}$).
 12. \$330. (If B received \$6, A would receive \$9, and C \$10 ; $\therefore \frac{10}{25}$ sum = \$132).

Exercise 145. Page 152

1. A, \$750; B, \$500. 2. A, \$60; B, \$144; C, \$96.
3. Son, \$3900; widow, \$4800; daughter, \$3300. (Sum willed = \$20000; assets = \$12000; each gets $\frac{1}{3}$ of the sum willed).
4. A, \$14.40; B, \$9.60. 5. A, \$6.30; B, \$5.25; C, \$4.20.
6. A, \$10920; B, \$5460. 7. A, \$1080; B, \$1260; C, \$1440; D, \$1620. (Each gained 18% of his capital).
8. \$13275. ($\frac{90}{275}$ of total gain = \$4050).
9. \$1765. (C furnished $\frac{148}{353}$ of the capital).
10. B's profits = \$87; C's capital = \$320.
11. A, \$350; B, \$210; C, \$280. (C as manager gets $12\frac{1}{2}\%$ of \$840 = \$105; \therefore \$735 is divided in proportion to capital).
12. A, \$2333 $\frac{1}{3}$; B, \$2500; C, \$2666 $\frac{2}{3}$. (Total loss = \$7500).
13. 288 gal. of wine; 72 gal. of water.
14. A, \$2662; B, \$2420; C, \$2200; D, \$2000. (Suppose D gets \$1000). 15. A, 540 pages; B, 360 pages; C, 485 pages. {No. pages in A, B and C = $\frac{1}{2}(900 + 845 + 1025) = 1385$ }.
16. 33 $\frac{1}{3}\%$. (A receives $\frac{10}{18}$ gain = $\frac{1}{3}$ gain).
17. A, \$15.60; B, \$14.40; C, \$8. (A, 30 sheep for 13 wk. = 390 sheep for 1 wk., etc.).

Exercise 146. Page 154

1. A, \$369.20; B, \$563.80; C, \$184.60. (A's share = twice C's share; B's share = 3 times C's + \$10; total sum = 6 times C's + \$10; \therefore 6 times C's share = \$1107.60).
2. 62 $\frac{2}{7}$ yd.; 9 $\frac{2}{7}$ yd.; 82 $\frac{2}{7}$ yd. (Total No. yd. = $\frac{240.25}{1.55} = 155$).
No. yd. 1st bought = 3 times No. 2nd bought + 35 yd.; No. yd. 3rd bought = 3 times No. 2nd bought + 55 yd.; \therefore 7 times No. 2nd bought + 90 yd. = 155 yd.).
3. \$12 for 1st; \$16 for 2nd; \$9 for 3rd. (Price of 1st = price of 3rd + \$3; price of 2nd = price of 3rd + \$7; total = 3 times price of 3rd + \$10 = \$37).
4. 63 yd.; 82 yd. (Cost of tweed = \$205; of silk = \$204.75).
5. Oats, 27c.; wheat, 69c. {If the wheat were the same cost as the oats, the cost would be (42 \times 17)c. less, or \$14.97 - \$7.14, or \$7.83; \therefore cost of 29 bu. oats = \$7.83}.

96. willed
willed).
\$4.20.
\$1440;
6. 14 ten-cent pieces; 12 five-cent pieces. (If No. of 10-cent pieces were same as No. of 5-cent pieces, Mary would have 20c. less than she has, or \$1.80. Value of 1 coin of each = 15c.; \therefore No. of 5-cent pieces = $\frac{1.80}{.15}$).
7. 12 men. {If each received 92c., each boy would have an advance of 27c.; \therefore the 8 boys would get (27×8) c. more.
Each man would get 18c. less; \therefore No. men = $\frac{27 \times 8}{18}$ }.
8. $112\frac{1}{2}$ ninths; $337\frac{1}{2}$ tenths; $562\frac{1}{2}$ twelfths. (If 1 ninth 3 tenths and 5 twelfths, the sum = $\frac{140}{80}$. \therefore No. ninths = $93\frac{1}{3} \div \frac{140}{80}$).
9. 10 horses; 30 cows. (Value of 1 horse and 3 cows = \$200).
10. A, 26 bu.; B, $19\frac{1}{2}$ bu. ($\frac{7}{8}$ A's share = B's share + $\frac{1}{8}$ A's share; $\therefore \frac{3}{4}$ A's share = B's share; \therefore if A has 4 bu., B has 3 bu.).

Exercise 147. Page 155

- c. = 390
- rice C's
times
- 55).
- No. yd.
7 times
- = price
3 times
- 75).
cost as
\$7.14,
1. (a) 1478; 295.6. (b) $28\frac{2}{3}$; $5\frac{14}{10}$. (c) 31.3; 6.26.
2. 34. 3. (a) 3010 ft. (b) $3656\frac{2}{3}$ ft. (c) $1408\frac{1}{4}$ ft.
4. 28.72. 5. 73.5 lb. 6. $14\frac{1}{2}$ lb. 7. 111 lb.
8. $14.858\dot{3}$ ft. = $14\frac{103}{20}$ ft. = 14 ft. $10\frac{3}{10}$ in. (Total = 59.43 ft.).
9. $1608\frac{3}{4}$ lb. (Total = 12870 lb.). 10. 8.8.
11. 15602 ft. 12. 65c. 13. $\$2.06\frac{1}{4}$.
14. $43^\circ.9925$. 15. 4 ft. 7 in. 16. $44\frac{4}{5}$ c.
17. 225 bbl. @ \$6.50; 250 bbl. @ \$6.75. ($\$6\frac{1}{3}$ - $\$6\frac{1}{2}$ = $\$1\frac{2}{3}$; $\$6\frac{2}{3}$ - $\$6\frac{1}{3}$ = $\$7\frac{2}{3}$; \therefore 9 bbl. @ \$6.50 to 10 bbl. @ \$6.75).
18. \$2 an oz. (8 oz. silver and 7 oz. gold. If all were gold, the value = $\$16 \times 15 = \240 . In first case, because of silver, depreciation = \$112; in second case, because of silver, depreciation = \$98. Ratio of silver in two cases = $112 : 98 = 8 : 7$. But weight of silver in second = weight of gold in first; \therefore Ratio by weight of silver to gold = 8 : 7, or 8 oz. silver and 7 oz. gold. Value of 7 oz. gold = $\$16 \times 7 = \112 ; \therefore value of 8 oz. silver = $\$128 - \$112 = \$16$).
19. \$12 an acre. (Cost of 320 ac. = \$5200; of 240 ac. = \$4240; of 80 ac. = \$960). 20. $\$42\frac{7}{10}$.

Exercise 148. Page 157

11. (a) 1 : 3. (b) 1 : 5. (c) 1 : 6. (d) 16 : 3. (e) 3 : 1. (f) 10 : 7;
 12. (a) 9. (b) 84. (c) 8. (d) $1\frac{1}{2}$. (e) 10. (f) .2.
 13. 8 : 4 = 12 : 6. 14. 4 : 12 = 5 : 15. 15. 20 : 5 = 24 : 6.
 16. (a) 36 : 12 = 6 : 2. (b) 56 : 7 = 24 : 3. (c) 25 : 5 = 55 : 11.
 (d) 5 : 8 = 25 : 40. (e) $1\frac{2}{3} : \frac{1}{3} = 21 : 3$. (f) 54 : 9 = 72 : 12.
 20. (a) 12 : 6 = 4 : 2. (b) 35 : 6 = 4 : $\frac{2}{3}$. (c) 5 : 8 = 10 : 16.

Exercise 149. Page 159

1. 375 lb. 2. 44.625 ft. 3. 273 bu. 4. \$16.
 5. \$720. 6. \$70. 7. $3\frac{1}{2}$ da. 8. $\$1\frac{3}{32}$.
 9. 150 men. 10. \$12187.50. 11. 288 mi. 12. 34 lb.
 13. \$25. 14. $\$20.41\frac{2}{3}$.

Exercise 150. Page 160

1. \$143.65; 25%. 2. \$3000. 3. $8\frac{2}{3}$ da.
 4. 20; 40; 60. 5. He still gains 10% of cost.
 6. $3\frac{1}{8}$ da. 7. \$37.30. 8. 2880 ft. board measure.
 9. 94885. (Dividend = $\frac{1}{4}$ divisor \times 948 + 85).
 10. \$5484.37 $\frac{1}{2}$. 11. \$76.85.
 12. 900 men; 1800 men; 2100 men. (6 times No. men in 1st
 regiment = 4800 + 600). 13. $\frac{5}{7}$. 14. \$278.50.
 15. \$1.25. ($3\frac{1}{2}\%$ of $\frac{5}{8}$ value = \$175). 16. $5\frac{1}{8}\%$.
 17. 48 yr.; 16 yr.
 18. \$6.37. (Cost of 3 bu. @ \$1.75 = \$5.25; of 2 pk. = $\frac{1}{2}$ of \$1.75 =
 \$.875; of 1 gal. = $\frac{1}{4}$ of \$.875 = \$.21875; of 1 pt. = $\frac{1}{8}$ of \$.21875
 = \$.02734375. Total cost = \$6.37109375).
 19. $9\frac{1}{2}\%$. (Net annual receipts = \$32.50 \times 12 - \$50 = \$340).
 20. 999.99475. (10000 - .0525) \times .10.
 21. \$29 $\frac{1}{8}$; \$33 $\frac{5}{8}$. 22. 87357. 23. $5\frac{7}{8} = 5.28$.
 24. \$744. (\$109 = amount of \$100 in $1\frac{1}{2}$ yr. @ 6%).
 25. \$273.75. 26. 4.9150423. 27. 1.9490.

Exercise 152. Page 164

- | | | | |
|---------------------|-------------------------|-----------------------|------------------------|
| 1. 529. | 2. $650\frac{1}{4}$. | 3. $300\frac{1}{5}$. | 4. 9409. |
| 5. $6\frac{1}{4}$. | 6. $297\frac{9}{8}$. | 7. 72.25. | 8. 62.41. |
| 9. 134689. | 10. $1320\frac{1}{5}$. | 11. $\frac{3}{84}$. | 12. $55\frac{1}{14}$. |

Exercise 153. Page 164

- | | | | |
|-------------|--------------------------|-----------------------|-------------------------|
| 1. 6859. | 2. 421875. | 3. 658503. | 4. 857357. |
| 5. 91.125. | 6. $12\frac{1}{2}$. | 7. $32\frac{9}{25}$. | 8. 405.224. |
| 9. 8869743. | 10. $47634\frac{9}{7}$. | 11. 14706.125. | 12. $376\frac{5}{24}$. |

Exercise 154. Page 164

- | | | | |
|---------------------|----------------------|-----------------------|------------------------|
| 1. 8836. | 2. 15625. | 3. 4096. | 4. 7225. |
| 5. .0049. | 6. .003375. | 7. 15.625. | 8. .01185921. |
| 9. $3\frac{1}{8}$. | 10. $\frac{1}{81}$. | 11. $12\frac{1}{7}$. | 12. $10\frac{9}{18}$. |

Exercise 155. Page 164

- | | | | |
|------------------------|-----------------------|--------------|-------------|
| 1. 72. | 2. 500. | 3. 64. | 4. 4913. |
| 5. 8. | 6. 405. | 7. 2187. | 8. 1250000. |
| 9. $\frac{3}{2}$. | 10. $\frac{1}{785}$. | 11. 1.30321. | |
| 12. $10^6 = 1000000$. | | | |

Exercise 156. Page 164

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|---|----------------------------|--|
| 1. 169; 196; 225; 256; 289; 324; 361; 400. | | |
| 2. 1331; 2197; 3375; 4913; 6859. | 3. Eighth power. | |
| 4. Fifth power. | 5. $(5007)^2 = 25070049$. | |
| 6. $(202)^3 = 8242408$. | 7. $(.5)^4 = .0625$. | |
| 8. 2025 sq. rd. (Side of sq. field = 45 rd.). | | |
| 9. Third power. | 10. 4; 729; 262144. | |
| 11. Sixth power. | 12. $\frac{1}{2}$. | |

Exercise 157. Page 165

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|---|--------------------------|-----------------|
| 1. 25; 81; 144. | 2. 6; 7; 11; 9. | 3. 3; 5; 8; 12. |
| 4. 4×4 ; 5×5 ; 9×9 ; 7×7 ; 10×10 . | 5. 3; 6; 8; 12. | |
| 6. Not more than two. | 7. Either three or four. | |
| 8. Either five or six. | 9. Three. | |

10. 2; 2; 2; 3; 2; 3. 11. 2; 3; 2; 1; 4.
 12. Either 5 or 6.
 13. The No. of figures in the sq. root is the same as the No. of *periods* of the two figures each in the No.

Exercise 158. Page 166

2. 1849. 3. 3136.
 4. $(\text{Tens})^2 + 2 \times \text{tens} \times \text{units} + (\text{units})^2$.
 5. $(40)^2 + 2 \times 40 \times 7 + 7^2$. 6. $(70)^2 + 2 \times 70 \times 8 + 8^2$.

Exercise 159. Page 167

1. 17. 2. 19. 3. 24. 4. 25. 5. 36.
 6. 75. 7. 95. 8. 49. 9. 64. 10. 37.
 11. 47. 12. 56.

Exercise 160. Page 168

1. 625. 2. 512. 3. 343. 4. 707.
 5. 906. 6. 857. 7. 2401. 8. 6325.
 9. 5008. 10. 4385. 11. 6671. 12. 7854.

Exercise 161. Page 168

1. 40 rd. 2. \$2560. (Side of field = 160 rd.).
 3. 30 ft. square. (Area = 100 sq. yd.; side = $\sqrt{100}$ yd. = 10 yd.).
 4. 125.
 5. 66 yd. long, 22 yd. wide. (Three times square of width = 1452 sq. yd.; square of width = 484 sq. yd.; width = 22 yd.).
 6. 63 yd. long, 42 yd. wide.
 7. 85 yd.; 85c. per yd. (No. yd. = $\sqrt{7225}$).
 8. 246 ft. 11.39 ... in. (Area of square = 8781696 sq. in.).
 9. 250 ft. long, 125 ft. wide. 10. 57. ($\sqrt{361 \times 9}$).
 11. 20 yd. long, 4 yd. wide. (No. sq. yd. = $\frac{19 \times 20 \times 12d.}{57d.}$; five times square of width = 80 sq. yd.).
 12. \$1496. (Side of field = 40 rd.).

Exercise 162. Page 169

1. 300 ; 160. (Greater No. = $\frac{1}{8}$ smaller No.; $\therefore \frac{7}{8}$ smaller No. = 140).
2. 50 rd. $\left(88 \text{ ft.} = 5\frac{1}{2} \text{ rd. Length} = \frac{1\frac{2}{3} \times 160}{5\frac{1}{3}} \text{ rd.}\right)$.
3. 6 min. (Area of field = 3600 sq. rd.; side = 60 rd.; perimeter = 240 rd. = $\frac{3}{4}$ mi. To ride $7\frac{1}{2}$ mi. takes 60 min.; to ride $\frac{3}{4}$ mi., etc.).
4. \$6. ($2\frac{1}{2}\%$ cost of flour = \$375). 5. 55.07 ; 792.
6. $2\frac{1}{2}$ da. (12 boys do as much work per day as 6 men ; 8 boys do as much per day as 4 men ; \therefore 8 men and 8 boys take same time as 12 men).
7. 6 hr. 40 min. $8\frac{1}{2}$ sec. (A difference of 16° in longitude gives a difference of 1 hr. in time).
8. \$15600. $\left(\frac{12\frac{1}{2}}{1000} \text{ of } \frac{3}{4} \text{ value} = \$146.25\right)$.
9. 20 min. 36 sec. past 4 p.m. (Diff. in longitude = $132^\circ 39'$).
10. 111 yd. long, 37 yd. wide. 11. \$1500 ; \$2100 ; \$1800.
12. 105 bbl. ; 175 bbl.
13. 12520 yd. (S.p. = \$3300 ; 1st com. = \$88 ; sum paid for cloth = \$3300 - \$88 - \$82).
14. \$17.29. { Amount of \$1 computed yearly = $\$(1.08)^2 = \1.1664 ; computed half-yearly = $\$(1.04)^4 = \1.16985856 ; difference for \$1 = \$.00345856 }. 15. $1675\frac{1}{3}$ bu. wheat.
16. $\frac{9}{4}$; $\frac{1}{8}$; $\frac{1}{4}$. 17. $12\frac{1}{3}\frac{1}{4}$ mi. (Rate up stream = $2\frac{7}{8}$ mi. an hr).
18. 6 hr. { Part filled in 1 hr. = $(\frac{1}{3} + \frac{1}{4} - \frac{1}{2})$ cistern }.
19. \$30. (S.p. = $\frac{9}{10}$ of \$40 = \$36 = $\frac{6}{5}$ cost). 20. $6\frac{2}{3}\%$.
21. $194\frac{2}{3}$. ($12\frac{1}{2}\%$ No. = $24\frac{1}{3}$).
22. (a) 108 yd. (b) $69\frac{9}{14}$. (c) 280 bu.
23. \$510.20. (98% face of note = \$500).

Exercise 164. Page 174

1. $2\frac{3}{8}$ sq. yd. ($1\frac{3}{4}$ yd. by $1\frac{1}{4}$ yd.). 2. $114\frac{6}{11}$ sq. rd.
3. \$91.94. $\left(\$45 \times \frac{87 \times 62}{16\frac{1}{2} \times 160}\right)$.
4. \$41.10. (See Exercise 52, page 147). 5. \$316.80.

No. of

36.
37.

yd.)

lth =
yd.)

five

6. 132. (Perimeter = 96 rd.). 7. $5\frac{1}{2}$ ft. (See Ex. 53, page 147).
 8. $328\frac{7}{8}$ sq. ft. = 328 sq. ft. 28 sq. in.
 9. 24 rd. long; 18 rd. wide. (Area = 432 sq. rd. If length were the same as the width, the area would be $\frac{3}{4}$ as great, or 324 sq. rd.; \therefore width = $\sqrt{324}$ rd. = 18 rd.).
 10. $\$35 = \$25 \times \frac{6 \times 7}{5 \times 6}$.
 11. 2560 ac. (Area = 2 mi. sq. = 4 sq. mi = 640×4 ac.).

Exercise 165. Page 175

1. $12\frac{1}{3}$ yd. by $6\frac{1}{8}$ yd. 2. \$13.20. (Per. = 90 ft.; No. strips = $\frac{90 \times 12}{18} = 60$; length of strip = 4 yd.; No. rolls = $\frac{60 \times 4}{8} = 30$.
 For ceiling, No. strips = 14; length of strip = 24 ft. = 8 yd.; No. rolls = 14; \therefore total No. rolls = 44).
 3. 200 rd. (If length were only as great as the width the area would be $\frac{2}{3}$ as great, or 10 ac., or 1600 sq. rd.; \therefore width = $\sqrt{1600}$ rd. = 40 rd.). 4. 10 yr. (No. drains = 15; length of each = 1320 ft.; cost = \$396. No. ac. = 30; value of extra yearly yield = \$39.60). 5. \$23.25. (No. ac. = 108; total cost = \$3688.20; net cost = \$2511).
 6. 12130560 ac. (4' 6" represents 162 mi.; 3' 3" represents 117 mi.).
 7. 15360 ac. 8. \$320.64. (Length of walk = 2672 ft.).
 9. \$132. (Perimeter = 80 rd. = 1320 ft.). 10. \$96 $\frac{2}{3}$.
 11. \$281.65 (nearly). (Per. of rect. field = 340 rd.; area = 98×72 sq. rd.; side of sq. field = $\sqrt{98 \times 72}$ rd. = $\sqrt{49 \times 2 \times 2 \times 36}$ rd. = $7 \times 2 \times 6$ rd. = 84 rd.; per. = 336 rd.; cost = $\$285 \times \frac{336}{10}$).

The Parallelogram. Page 176.

2. (a) $8\frac{1}{8}$ sq. ft.; (b) 390.975 sq. ch. = 39.0975 ac.; (c) $6\frac{20}{105}$ ac. = 6 ac. 54 sq. rd. 14 sq. yd. 4 sq. ft. 72 sq. in.
 3. 24 ft. 6 in.; 2.5 ch.; $318\frac{2}{3}$ ac. (1 ch. = 4 rd.).
 Page 177—1. $114\frac{6}{11}$ sq. rd. (Ex. 2, page 174).
 2. (Ex. 3, page 174). \$91.94. 3. 6. 4. 192 sq. ft.

20. 14 in. (Side of square = 22 in.; circumference of circle = 88 in.; radius = 14 in.) 21. \$158.40. (Circum. = 44 yd.)
 22. 8. $\left(\frac{60 \times 1760 \times 3}{11 \times 60 \times 60}\right)$ times per sec. Train goes 11 ft. per rev.)

Exercise 172. Page 183

5. 154 sq. in. 6. 154 sq. in. 7. 616 sq. in.

Exercise 173. Page 183

1. 5544 sq. in. = $38\frac{1}{2}$ sq. ft. 2. 7546 sq. yd.
 3. 24062 $\frac{1}{2}$ sq. yd. 4. 13898 $\frac{1}{2}$ sq. ft.
 5. 18.32985 sq. ch. 6. 1386 sq. yd.
 7. 471 $\frac{5}{8}$ sq. in. (R. = 12 $\frac{1}{4}$ in.) 8. 647.185 sq. ch. (R. = 14.35 ch.)
 9. 3850 sq. yd. (R. = 35 yd.) 10. $\frac{6\frac{3}{8}}{4}$ sq. rd. (R. = $\frac{3}{4}$ rd.)
 11. 17796.625 sq. l. (R. = 75 $\frac{1}{4}$ l.)
 12. $\frac{7}{8}$ sq. mi. (R. = $\frac{7}{4}$ mi.; $\frac{7}{8}$ sq. mi. = 50 $\frac{0}{1}$ ac.)
 13. 38 $\frac{1}{2}$ sq. ft. 14. 180 $\frac{3}{4}$ sq. ft. = 180 sq. ft. 106 sq. in.
 15. 154 sq. ch. 16. 9 $\frac{5}{8}$ sq. rd. 17. 346 $\frac{1}{2}$ sq. yd.
 18. 3850 sq. ch. = 385 ac.

Exercise 174. Page 184

1. 176 $\frac{1}{4}$ sq. yd. 2. $\frac{7}{8}$ sq. mi. (See Ex. 12, page 184).
 3. 150 $\frac{3}{4}$ ft. 4. 412 $\frac{1}{2}$ ft.
 5. 27 in. $\{\pi R^2 = \pi(8^2 + 9^2 + 12^2); \therefore R = \sqrt{8^2 + 9^2 + 12^2}\}$.
 6. \$1013.76. (R. of lawn = 110 yd.; R. outer circum. of path = 114 yd.; area of path = $\pi\{(114)^2 - (110)^2\}$ sq. yd. = $2^2 \times 896$ sq. yd.) 7. 77 sq. in. ($\frac{1}{2}$ large circle is covered).
 8. Circum. = 396 in. When angle = 50°, arc = $396 \times \frac{5}{36}$ in. = 55 in.; angle = 65°, arc = $396 \times \frac{65}{360}$ in. = 71 $\frac{1}{2}$ in.; angle = 80°, arc = $396 \times \frac{8}{36}$ in. = 88 in.; angle = 90°, arc = $396 \times \frac{9}{36}$ = 99 in.
 9. 62.048 ... yd. (Area = 2 $\frac{1}{2}$ ac. = 2 $\frac{1}{2}$ \times 160 \times 30 $\frac{1}{4}$ sq. yd. = $\frac{2^2}{7^2} r^2$; $\therefore r^2 = 3850$ sq. yd.)
 10. 556 $\frac{2}{7}$ sq. in. [R. of larger circle = 31 in.; of smaller = 28 in.; area = $\frac{2^2}{7^2}\{(31)^2 - (28)^2\}$ sq. in.]
 11. 21 $\frac{3}{4}$ sq. ft. (Dia. of circle = 5 $\frac{1}{4}$ ft.)
 12. 75 $\frac{3}{4}$ sq. in. (Dia. of one cent coin = 1 in.; area of circle = 154 sq. in.; area of 100 cents = 78 $\frac{1}{4}$ sq. in.)

Exercise 175. Page 185

1. (a) $121\frac{1}{2}$ sq. in.; (b) $91\frac{1}{8}$ cu. in. 2. (a) $86\frac{2}{3}$ sq. ft.; (b) 50 cu. ft.
 3. (a) 138 sq. in.; (b) $87\frac{3}{4}$ cu. in. 4. 216. 5. 4320 sq. in.
 6. $14\frac{1}{7}$ ft. 7. 2197 cu. in. (Area of cube = 1014 sq. in.;
 of 1 face = 169 sq. in.; edge = 13 in.) 8. $\frac{5}{56}$ in.
 9. $16\frac{2}{3}$ ft. (Length cut off = $\frac{2\frac{1}{2} \times 1728}{18 \times 15}$ in.).
 10. $1\frac{3}{8}$ ft. ($6\frac{1}{4}$ gal. = 1 cu. ft.; \therefore 40 cu. ft. water). 11. $2\frac{2}{5}$ ft.

Exercise 176. Page 186

1. 36 ft. (Area of floor = 864 sq. ft. If length were only as
 great as the width the area would be $\frac{2}{3}$ of 864 sq. ft. = 576
 sq. ft.; \therefore width = $\sqrt{576}$ ft. = 24 ft.) 2. $6\frac{1}{4}$ ft.
 3. $1107\frac{2}{3}$ gal. (Internal dimensions are 9' 8", 3' 8", 5').
 4. 10 in. $2(15 \times 14 + 15 \text{ depth} + 14 \text{ depth}) = 1000$ sq. in.
 5. 8640. 6. $4\frac{4}{5}$ ft. (Length cut off = $\frac{11 \times 1728'}{22 \times 15}$ in.).
 7. $3\frac{1}{5}$ ft. (1000 gal. = $\frac{1000}{6\frac{1}{4}}$ cu. ft. = 160 cu. ft.).
 8. 18 ft. (Depth = $\frac{584.50 \times 27}{.25 \times 125\frac{1}{4} \times 28}$ ft.).
 9. $\frac{1}{10}$. (Thickness = $\frac{1728}{48 \times 12 \times 4 \times 12}$ in.).
 10. $5\frac{4}{5}$ ft. 11. 4515 lb. 12. 500 loads. (Weight of $\frac{1}{10}$ cu. ft.
 ice = 1000 oz. = $62\frac{1}{2}$ lb.; weight of 1 cu. ft. ice = $\frac{1 \times 25}{2} \times \frac{10}{11}$ lb.).

Exercises 177 — Oral

Exercise 178. Page 188

1. 8052 sq. in. (Curved surface = 5280 sq. in.; ends = 2772 sq. in.).
 2. $129\frac{1}{4}$ " " " = 110 " ; " = $19\frac{1}{4}$ "
 3. 528 sq. ft. " " = 220 sq. ft.; " = 308 sq. ft.
 4. $833\frac{1}{4}$ " " " = 660 " ; " = $173\frac{1}{4}$ "
 5. 957 " " " = 264 " ; " = 693 "
 6. $207\frac{1}{8}$ " " " = $102\frac{2}{3}$ " ; " = $104\frac{2}{3}$ "

7. 1848 cu. in. (Measure of the vol. = measure of area of end multiplied by measure of height).
 8. 55440 cu. in. = $32\frac{1}{2}$ cu. ft. 9. 20790 cu. in.
 10. 770 cu. ft. 11. 2079 cu. ft. 12. $962\frac{1}{2}$ cu. ft.
 13. 7 in. $\left(\text{Since vol.} = \pi r^2 h; \therefore r = \sqrt{\frac{\text{Vol.}}{\pi h}} \right)$.
 14. 11 in. 15. 7 ft. 16. $3\frac{1}{2}$ ft. 17. $10\frac{1}{2}$ ft.
 18. 14 ft.

Exercise 179. Page 189

1. 14 in. (Curved surface = $\pi d h$). 2. 66000 sq. ft.
 3. 6600. 4. \$24.75. 5. 1 ft. 4 in. (No. sq. ft. = 88 ;
 circum. = $\frac{88}{21}$ ft. ; dia = $\frac{88}{21} \times \frac{7}{2}$ ft.).
 6. $19\frac{1}{4}$ ft. [Vol. copper = $\frac{2}{7} \times \frac{7}{2} \times \frac{7}{2} \times 12$ cu. in. = 462 cu. in.
 Length = $\{462 \div (8 \times \frac{1}{4})\}$ in. = 231 in.]. 7. 6912.
 8. \$220. 9. 3019 $\frac{1}{2}$ lb. 10. 848 $\frac{1}{4}$ cu. ft.

Exercise 180. Page 189

1. $3\frac{3}{4}$ ft. board measure. (Average width = 9 in.).
 2. 7 sq. in. = $\left(\frac{3+4}{2} \right) \times 2$ sq. in. 3. $35\frac{1}{8}$ tons.
 4. 282 $\frac{6}{7}$ cu. ft. 5. 57042 $\frac{6}{7}$ cu. ft. (Dia. = 5 ch. = 20 rd. = 330 ft.).
 6. 12305 $\frac{7}{10}$ t. 7. \$303. 8. 186 $\frac{3}{8}$ $\frac{6}{9}$ $\frac{6}{7}$ bu. 9. 12031250 gal.
 10. 80 ft. (Area of triangle = $\frac{1}{2}$ area of rectangle of same base and height).
 11. 916.5 ... sq. rd. (Altitude = $\sqrt{(50)^2 - (20)^2}$ rd. = $\sqrt{2100}$ rd. = 45.825 ... rd.).
 12. 16.85 ... ft. = $\sqrt{(72)^2 - (70)^2}$ ft.
 13. 1452 sq. ft. (When the sides are 3 ft. and 4 ft., the diag. is 5 ft. ; \therefore sides are 33 ft. and 44 ft.).
 14. 7.07 ... in. (Diag. of sq. = 10 in. ; $2(\text{side})^2 = (10)^2$; \therefore side = $\sqrt{50}$ in.).
 15. 43.08 ... ft. = $\sqrt{(32)^2 + (24)^2 + (16)^2}$ ft.
 16. \$18. (Per. of sq. field = 320 rd. ; area = 40 ac. ; length of rect. field = 100 rd. ; width = 64 rd. ; per. = 328 rd.).

17. 3456. (Each shingle covers 72 sq. in.).
 18. 490 ft. board measure. 19. $894\frac{3}{4}\frac{9}{4}$ gal.
 20. \$87.50. Area = $\left(\frac{40+100}{2}\right) \times 75$ sq. ft. 21. $15\frac{5}{8}$ sq. ft.
 22. 75579.82 ... gal. 23. $37\frac{5}{7}$ in.; $\frac{11}{105}$ in. * 24. 18 ft.
 25. Area of sq. = $110\frac{1}{4}$ sq. ft.; of circle = $140\frac{7}{22}$ sq. ft.; \therefore circle by
 $30\frac{3}{4}$ sq. ft. 26. \$519.75.
 27. 229.25 ... mi. = $12\sqrt{(13)^2 + (14)^2}$ mi.
 28. (a) \$48. (b) \$57.60.
 29. 7 ft. (Value of scantling = \$6; \therefore No. ft. plank, board measure = 1680).
 30. \$56. (Additional cost is the cost of plank for 500 ft. in length and 2 ft. wide). 31. $36\frac{3}{4}$ sq. yd.
 32. (a) 1 hr. 20 min. (b) $2\frac{2}{3}\frac{3}{10}$ ac. = 2 ac. 106 sq. rd. 6 sq. yd. 7 sq. ft. 72 sq. in. (c) $462\frac{2}{3}$ ac. (24 rd. have been cut away around the field).
 33. \$24. 34. \$33. 35. \$62.40. 36. \$255.64.
 37. \$71.22. (No. posts = 40, cost = \$10; No. pickets = 440, cost = \$19.36; scantling = 440 ft., cost = \$11.88; base board = 165 ft., cost = \$4.45 $\frac{1}{2}$; rain board = 165 linear ft., cost = \$4.95; lumber = 660 ft., cost = \$17.82; nails, \$2.75; total = \$71.21 $\frac{1}{2}$).

Exercise 181. Page 193

1. 262144 cu. in. (Area of 1 face = $\frac{1}{6}$ of 24576 sq. in. = 4096 sq. in.; \therefore edge of cube = 64 in.).
 2. Watch must be "put on" 6 hr. 59 min. $33\frac{7}{15}$ sec. for exact solar time, but 7 hr. for standard time. 3. \$25.
 4. $99\frac{5}{8}$ yd. (No. strips = $\frac{64 \times 12}{32} = 24$; No. of patterns per strip = 10, and 6 in. waste per strip; 1st strip is 12 ft. long; the other 23 are each cut $12\frac{1}{2}$ ft. long; \therefore total length = $299\frac{1}{2}$ ft.).
 5. \$865.49. (Due Sept. 19; term of dis. = 73 da.).
 6. \$18600. 7. $8\frac{1}{3}\%$. 8. \$105. 9. 97.24 ...; 5.72.
 10. $9216 = 2^{10} \times 3^2$; sq. rt. = $2^5 \times 3 = 96$.
 11. $\$10653.66 = \$10920 \times \frac{100}{102\frac{1}{2}}$. 12. $45\frac{4}{5}\frac{15}{7}c$.

13. \$2.50. (No. strips = $\frac{54 \times 12}{18} = 36$; length of 1st strip = 8 ft., and of each of the other 35 strips cut $8\frac{1}{3}$ ft.; No. yd. = $99\frac{5}{6}$).
14. \$108.06. (No. strips = $\frac{14\frac{1}{2}}{1\frac{1}{2}} = 10$; 1st strip is cut 18 ft. long, and each of the other 9 is cut 18 ft. 7 in. Total length = $185\frac{1}{4}$ ft. = $61\frac{3}{4}$ yd.).
15. (a) 5 strips. (Carpet to run lengthwise); (b) 9 in.; (c) \$30.29, i.e., $20\frac{2}{3}$ yd. @ \$1.45).
16. \$6 loss. (Cost of 1st = \$168; of 2nd = \$216).
17. \$14 gain; 35% gain. S.p. = \$280; gain = \$60. Cost = \$123; gain = \$41. Cost = \$42; gain % = $33\frac{1}{3}$.
18. \$812.18 = \$800 $\times \frac{100}{98\frac{1}{2}}$. 19. $50\frac{1}{11}$ ac. (R. = $320 \times \frac{7}{44}$ rd.).
20. $4\frac{1}{2}\%$. 21. \$44000. 22. \$18000. (A's capital is $\frac{1}{2}$ of B's).
23. \$384.75. 24. $6\frac{1}{9}$ ft. = 6 ft. $3\frac{1}{9}$ in.

Exercise 182. Page 195

1. (a) 31c.; (b) 55c.; (c) 69c. 2. \$2.25. 3. \$26.60.
4. 24 da. 5. 45 mi. an hr. 6. 26 ft. 8 in. (1 cu. ft. = $6\frac{1}{4}$ gal. = $\frac{3}{2}$ bu., or 1 bu. = $\frac{2}{3}$ cu. ft.). 7. 1080 lb.
8. \$126.50. 9. \$580. 10. \$14.50, $20\frac{5}{8}\%$; \$15.90, 90c.; \$14, $32\frac{1}{7}\%$; \$17.28 $\frac{10}{107}$, \$1.21 $\frac{3}{107}$; \$310, \$322.40.
11. 12 ton. 12. (a) 75c.; (b) 75c.; (c) \$1.20.
13. $20\frac{1}{27}\%$. (Long ton = 2240 lb.).
14. (a) 77760 lb.; (b) \$2656.80; (c) 26.568%. 15. 250 men.
16. (a) $1\frac{7}{10}$ lb.; (b) 4050 lb.; (c) \$5872.50.
17. $6\frac{1}{4}$ mi. {To go and return 1 mi. requires ($\frac{1}{5} + \frac{2}{5}$) hr.}.
18. Canada, 1198.4 bu.; Great Britain, 1780.8 bu.; France, 1456 bu.; Germany, 1086.4 bu.; United States, 750 bu.; Argentina, 1041.6 bu.
19. (a) 400 ac. (b) 32 da. (c) \$1470. (d) \$4380.
20. $3\frac{1}{5}$ t. 21. (a) $10\frac{1}{2}$ t. (b) \$76.12 $\frac{1}{2}$.
22. 10 yr. (15 drains each 80 rd., cost \$396).
23. \$23.25. 24. 12130560 ac. 25. \$66.
26. \$3.60. (Butter fat increased 20 lb. daily).

Exercise 183. Page 198

1. 61.67 ... %.
2. 17.94 ... bu. per ac. in 1891 ; 9.33 ... bu. per ac. in 1901.
3. (a) 20.49 (nearly) cents per lb. for butter. (b) 7.04 ... c. is price of cream per lb. paid to patrons. *
4. (a) 1841-1851, 143 mi.; 1851-1861, 1987 mi.; 1861-1871, 549 mi.; 1871-1881, 4636 mi.; 1881-1891, 6507 mi.; 1891-1901, 4302 mi. (b) $893\frac{3}{4}$ % ; $1249\frac{100}{135}$ % ; 25.58 ... % ; 172.02 ... % ; 88.76 ... % ; 31.08 ... % . (c) 1851 to 1861.
5. (a) 34.81 ... % . (b) 43.18 ... % . 6. \$3903.82 ...
7. (a) \$7463.04 ... (b) Electric 1.91 ... times as expensive as steam, or \$3559.22 per mile more than steam.
8. \$7.43 ... 9. 1197.1 ; \$18.52 ...
10. (a) \$333794. (b) 8.606 ... % .
11. (a) In 1904, loss, 7.05 ... % ; in 1905, gain, 57.97 ... % (b) \$9219945. (c) 1.25 ... % .
12. (a) Percentage in increase of population : 1881-1891, 131.23 ... ; 1891-1901, 67.34 For occupiers of land the percentages are : 148.66 ... ; 43.96 Therefore the occupiers of land increased more rapidly during the first decade, and the population during the second decade. (b) 13.76 ... % ; 14.80 ... % ; 12.73 ... % .
13. .1199 ... engines, .05302 ... passenger cars, 2.3616 ... freight cars.
14. 12c. very nearly. (For 5 yr., total quantity = 138191108 lb., value = \$16558431).
15. (a) \$398.87 in 1891 ; \$367.87 ... in 1901. (b) \$31 decrease.
16. 1.4351 ... metres.
17. (a) \$68235090. (b) Timber and lumber, \$80129280. (c) \$343053480.
18. (a) 15.75 (nearly) bu. ; 9.63 (nearly) bu. (b) 365.92 ... % . (c) 184.75 ... % in total increase.
19. (a) $42\frac{5}{8}^\circ = 42.83^\circ$. (b) 58.7° ... 20. 56.42 ... % .
21. \$372.78 ... in 1901 ; \$331.22 ... in 1891 ; \$41.56 ... increase.
22. 84% .
23. \$15.74 ... per oz.

Exercise 184. Page 202

2. 6558 = $\bar{V}MDLVIII$; 244 = CCXLIV; 2683 = MMDCLXXXIII.
The dash over the symbol increases its value 1000 times.
4. 25%. 5. $7056 = 2^4 \times 3^2 \times 7^2$; \therefore sq. rt. = $2^2 \times 3 \times 7 = 84$.
6. 720 revolutions. 7. 7 ft. 8. $\frac{217}{30000}$; $\frac{1}{120}$.
9. $16 : 35$. ($9\frac{3}{7} : 20\frac{5}{8} = \frac{66}{7} : \frac{165}{8} = \frac{2}{7} : \frac{5}{8} = \frac{16}{56} : \frac{35}{56} = 16 : 35$).
10. $127.27 \dots$ ft. = $\sqrt{(90)^2 + (90)^2}$ ft.

Exercise 185. Page 202

1. 59520.4 . ($.0018 + .000106 + .84 + .0509$) \div .000015.
2. $80.2285 \dots$ lb. (1 bu. = 277.27×8 cu. in. = 2218.16 cu. in.).
3. 1st No. + 2nd No. = 100; 2 times 1st No. - 2nd No. = 10;
 \therefore 3 times 1st No. = 110; 1st No. = $36\frac{2}{3}$; 2nd No. = $63\frac{1}{3}$.
4. $\$128 = \$176 \times \frac{10}{11} \times \frac{4}{5}$. 5. $35\frac{7}{8}\%$.
6. $\$4901.96 = \$5000 \times \frac{100}{102}$. 7. $\$9500$.
8. 24; 32; 48. ($2\frac{1}{2} : 3\frac{1}{3} : 5 = 15 : 20 : 30 = 3 : 4 : 6$).
9. $2\frac{2}{5}$ ft. = 2 ft. $10\frac{4}{5}$ in. = $\frac{4275}{62\frac{1}{2} \times 7\frac{1}{2} \times 3\frac{1}{8}}$ ft.
10. $43\frac{1}{5}$ min. = $\frac{10 \times 1728}{25 \times 16}$ min. 11. 142 yd. = $\frac{35\frac{1}{2}}{36}$ of 144 yd.
12. 35.775 ft. 13. $\$62.40$. 14. $13\frac{3}{4}$ in.

Exercise 186. Page 204

1. 7.864 ... oz. 2. $172\frac{1}{8}$ sq. ft. = $19\frac{1}{8}$ sq. yd.
3. $16\sqrt{3}$ sq. in. = 27.7 ... sq. in. (Altitude = $\sqrt{8^2 - 4^2}$ in. = 6.929 ... in.).
4. $36\sqrt{3}$ sq. in. = 62.35 ... sq. in. (Altitude = $\sqrt{12^2 - 6^2}$ in. = 10.392 ... in.).
5. 5280 sq. ft. 6. 80. (One of each would cost \$45.50).
7. 6912. 8. 896 : 165. 9. 10 hr. 25 min.
10. $13794\frac{1}{2}$ sq. ft.
11. 144 sq. in. (Area of trapezoid = $\frac{2}{3}$ area of the original triangle).
12. 2940 lb. = $70 \times 35 \times 16 \times 62\frac{1}{2} \times .0012$ lb.
13. 3600 lb. = $240 \times 60 \times \frac{2.5}{100}$ lb.

Exercise 187. Page 207

1. 10 ; 100 ; 1000 ; 10 ; 100.
 2. $\frac{1}{10}$ or .1 ; $\frac{1}{100}$ or .01 ; $\frac{1}{1000}$ or .001.
 4. (a) 172.448 m. (b) 862.05 m. ; .00083 m. (c) 365.6 m. ;
 391.948 ... m.
 5. \$272.19 (\$272.1875). 6. \$1801325 = \$25000 \times 72.053.
 7. 7.64 mi. = $12.22 \times \frac{5}{8}$ mi. 8. 4800 km. (8 km. = 5 mi.).
 9. $13\frac{1}{3}$ m. per sec. 10. $\frac{3}{4000}$.
 11. 83711.7 m. = 83.7117 km. = (115020.7 - 31309) m.
 12. 257 fr. (.75 m. @ 4 fr. + .625 m. @ 8 fr. + 6 m. @ 12 fr. +
 7.08 m. @ 25 fr.).

Exercise 188. Page 208

1. 12000000 sq. m. 2. 8.35 sq. m.
 3. \$155163.648. 101.018 ares left. (He had 505.09 ares; he
 sold .8 of this, or 404.072 ares, @ \$384 an are).
 4. 12.4575 sq. m. 5. 2.92 sq. m. 6. 1000000 sq. m.
 7. 2352.25 sq. m. = (48.5 \times 48.5) sq. m.
 8. 110.152 sq. m. = (15.68 \times 7.025) sq. m.
 9. \$1055.60. (16.24 m. long and 7.85 m. wide ; No. strips =
 $\frac{7.85}{.628} = 13$). 10. 28 m. 8 dm. (Area = 43.20 ares =
 4320 centares = 4320 sq. m.). 11. 100 m.
 12. $4650000 = \frac{2480000 \times 240}{16 \times 8}$

Exercise 189. Page 209

1. .00514 cu. m. 2. 8.765345 cu. m.
 3. 1219.24940201 cu. m. = 1219249.40201 cu. dm.
 4. 175.5 steres. 5. \$35.75. (27.5 Hl. = 275 Dl.).
 6. 907.2 l. 7. 750 l. 8. \$1.008 = 6c. \times 2.4 \times 7.
 9. 809.6 cu. dm. 10. 100 phials.

Exercise 190. Page 210

- | | | |
|--|--------------|----------|
| 2. 84 l. | 3. 17.54 l. | 4. 2c. |
| 5. \$10.55 (\$10.546875). | | 6. 1000. |
| 7. $4\frac{3}{8}$ gal., nearly. (4 l. = 7 pt.). | | |
| 8. \$3.67 ... gain. (10 Hl. = 1000 l. = $\frac{17\frac{5}{8}}{64}$ bu.). | | |
| 9. 28210 l. | 10. 1136 Hl. | |

Exercise 191. Page 211

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|--|---------------|--------------|
| 1. 7018 g. | 2. 2.77 g. | 3. 12.021 g. |
| 4. \$72. (30 × 400 Kg. = 12000 Kg. = 12 tons). | 5. 31 grains. | |
| 6. 2.179 ... lb. Avoir. (28 grams = 1 oz. Avoir.). | | |
| 7. 4459 $\frac{1}{3}$ grams; 5419 $\frac{1}{3}$ grams. (1 lb. Troy = 5760 grains; 1 gram = 15 $\frac{1}{2}$ grains; 1 lb. Avoir. = 7000 grains). | | |
| 8. 320 $\frac{5}{18}$ grains, if 28 grams = 1 oz.; 321 $\frac{1}{4}$ grains, if 1 gram = 15 $\frac{1}{2}$ grains. | | |
| 9. 1.039 ... Kg. per sq. cm. { 2 $\frac{1}{5}$ lb. = 1 Kg.; ∴ 14 $\frac{3}{4}$ lb. = $\frac{29\frac{3}{4}}{4}$ Kg.
1 m. = 39.37 in.; ∴ 1 cm. = .3937 in.; ∴ 1 sq. cm. = (.3937) ²
sq. in. = .155 sq. in., nearly. If pressure on 1 sq. in. = $\frac{29\frac{3}{4}}{4}$
Kg., pressure on 1 sq. cm. = .155 × $\frac{29\frac{3}{4}}{4}$ Kg. } | 10. 2500 men. | |

Exercise 192. Page 211

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|--|---------------------------|-----------------|
| 1. 900 sq. dm. | 2. 3000 sq. cm. | 3. 28.8 sq. dm. |
| 4. 18 m. long; 12 m. broad; area is 216 sq. m. | | |
| 5. 1.1382 ac. { Area = (72.5 × 62.8) sq. m. = 4553 sq. m. = .4553
Ha. = (2 $\frac{1}{2}$ × .4553) acres } | | |
| 6. 47.61 Km. | 7. 80 l. for each person. | 8. 74 dm. |
| 9. 11 $\frac{1}{4}$ dm. (1080 Hl. = 108000 l. Depth = $\frac{108000}{120 \times 80}$ dm.) | | |
| 10. (a) 47.007008 cu. m.; (b) 57.019084 cu. m.; (c) 758.000078 cu. m. | | |
| 11. 8000 cu. m. (Area of one face = 400 sq. m.; ∴ edge of cube = 20 m.). | | |
| 12. 1.085 Dl. | | |

Exercise 193. Page 212

1. 6.2137 mi. (10 Km. = 393700 in.; 1 mi. = 63360 in.).
2. \$153.
3. \$64.94 = $\$4\frac{59}{80} \times 36.8$.
4. $61800 = 278100 \div 4\frac{1}{2}$.
5. $27\frac{7}{8}$ cm. (1 l. = 1 c.d.m. = 1000 c.c.).
6. 302400 Kg. (1 c. dm., or 1 l., water weighs 1 Kg.).
7. 38.4 Kg.
8. $1\frac{3}{4}$ times.
9. 1400 nickels.
10. 119.68 cu. m.

Exercise 194. Page 213

1. Rect. field is 450 m. long and 150 m. wide; \therefore area = 67500 sq. m.; area of sq. field = 62500 sq. m.; \therefore Rect. field = $\frac{27}{25}$ sq. field.
2. 1.2375 acres. (Area = 4950 sq. m. = 49.50 ares = .495 Ha. = $2\frac{1}{2} \times .495$ acres).
3. Circum. = 1166 cm. = 11.66 m. Area = 108146.5 sq. cm. = 10.81465 sq. m.
4. \$125.71 $\frac{3}{4}$.
5. (a) 24700 cu. dm.; (b) 18476.89 m.; (c) 87000 dg.; (d) 8400 sq.m.; (e) 580000 cg.; (f) 490000 sq. cm.
6. 19.68 l.
7. 2.76 l. (1 l. water weighs 1 Kg.).
8. $189\frac{7}{17} = 805 \div 4.25$.
9. 3.9 Kg. = (50 \times 4 \times 2.5 \times 7.8) g.
10. 375 Kg. (1 cu. m. water weighs 1000 Kg.).
11. 337500 Kg.