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A

KEY,

CONTAINING

SOLUTIONS OF ALL THE QUESTIONS

IN

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BY J. WALLACE.

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A

KEY

TO

GRAY'S INTRODUCTION

TO

ARITHMETIC.

NUMERATION.

To read any number expressed in figures.

1. Eighty-three thousand, and sixty-eight.—2. Nine hundred and seventy-six thousand, seven hundred and five.—3. Eight millions, sixty-seven thousand, and nine hundred.—4. Fourteen millions, sixty-five thousand, seven hundred and eight.—5. Nine hundred and eighty millions, six hundred and seventy-nine thousand, one hundred and twenty.—6. Eight hundred millions, eight hundred and fifty-four thousand, and twenty-nine.

To write any number in figures.

1. 1080.—2. 64090.—3. 70002010.—4. 100062811.

1. DCCCLXXIX.—2. MDCCCCLXXXVIII. or M.CM.IIXC.

SIMPLE ADDITION.

ANSWERS.

1. 227	3. 19102	5. 314819	7. 392993
2. 2092	4. 24613	6. 233428	8. 301871

9.
12
34
56
78
91
23
45
67
89
495

10.
234
567
891
234
567
892
345
678
906
5314

11.
9876
5432
1987
6543
2198
7654
3210
6786
4693
48379

12.
6408
3467
5986
7642
8569
2398
8675
21904
686
65735

13.
6845
2867
8490
684
1267
4681
20680
8045
53559

14.
5408
1467
4500
89
423
60456
8401
96
80840

15.
54936
789
45
3100
7093
84506
379
480
151328

16.
79685
37986
48798
76548
497634
56783
698796
49768
9873
1555871

17.
4869
75486
98743
486
97
54868
79633
976854
796877
2087913

18.
987548
69537
6548
898756
48687
796843
6854868
5487695
76854876
92005358

19.
283
476
3552
7684
27
876
2985
15883

20.
1761
69
1830

21.

B.	£30
C.	48
D.	120
E.	209
F.	44
G.	1340
Lent in all	£1791

22.

B.	£2359
C.	549
D.	875
E.	965
F.	1897
G.	1231
H.	2197
I.	978
K.	841
Owes in all	£11892

SIMPLE SUBTRACTION.

ANSWERS.

1. 462
2. 2913
3. 36922
4. 46092
5. 969859
6. 1697083

7. 6894 − 4086 = 2808

8. 1000 − 850 = 150

9. 1480 − 996 = 484

10. 5809 − 4080 = 1729

11. 846789 − 242316 = 604473

12. 6805389 − 950178 = 5855211

13. 4000000 − 2300681 = 1699319

14. 5400001 − 60081 = 5339917

15. 7654869 − 3976540 = 3678329

16. 25486974 − 19548796 = 5938178

17. 786278456 − 257564257 = 528714199

18. 10548796 − 7976540 = 2572256

19. 847684536 − 371547682 = 476136854

20. 643285 − 256742 = 386543

21. From the present year,
Take the year in which he was born, 1732,
And the remainder will be his age.

22. 73 Present age.
37 Age at the birth of his daughter.
36 Daughter's age.

SIMPLE MULTIPLICATION.

1. 68945734 × 2 = 137891468

2. 48096784 × 3 = 144290352

3. 48679048 × 6 = 292074288

4. 80670912 × 9 = 726038208

5. 98765432 × 12 = 1185185184

6. 4606870 × 18 = 82923660
   36854960
   4606870

7. 2345678 × 47 = 110246866
   16419746
   9382712

8. 8970681 × 96 = 861185376
   53824086
   80736129

9. 459068
185
2295340
3672544
459068
84927580

10. 7549636
345
37748180
30198544
22648908
2604624420

11. 3276894
672
6553788
22938258
19661364
2202072768

12. 9768458
894
39073832
87916122
78147664
8733001452

13. 7280473
289
65524257
58243784
14560946
2104056697

14. 809601
2400
323840400
1619202
1943042400

15. 601570
3068
4812560
3609420
1804710
1845616760

16. 406894
85237
2848258
1220682
813788
2034470
3255152
34682423878

17. 238906
216894
955624
2150154
1911248
1433436
238906
477812
51817277964

18. 54986304
729634
219945216
164958912
329917824
494876736
109972608
384904128
40119876932736

Rule II.

1. 68094568
4
272378272
6
1634269632

2. 4096731
6
24580386
6
147482316

3. 748695
6
4492170
8
35937360

4. 947658
6
5685948
9
51173532

5. 386909
9
3482181
9
31339629

6. 729654
4
2918616
4
11674464
7
81721248

7. 8976543
12
107718516
9
969466644

8. 52
5
260
9
2340

9. 549
5
2745
9
24705
9
222345

10. 53
4
212
8
1696

SIMPLE DIVISION.

1. 2)84667
42333½

2. 3)489764
163254⅔

3. 4)386457
96614¼

4. 5)490680
98136

5. 6)867059
144509⅚

6. 7)732845
104692⅐

7. 8)411678
51459⅜

8. 9)4912037
545781⅔

9. 14)8695340(621095$\frac{9}{14}$
29
15
134
80
10

10. 20)1234567(61728$\frac{7}{20}$
34
145
56
167
7

11. 38)7865432(206985 $\frac{2}{38}$

265
374
323
192
2

12. 46)75846972(1648847 $\frac{10}{46}$

298
224
406
389
217
332
10

13. 59)54906734(930622 $\frac{36}{59}$

180
367
133
154
36

14. 75)48372864(644971 $\frac{39}{75}$

337
372
728
536
114
39

15. 87)9876540(113523 $\frac{39}{87}$

117
306
455
204
300
39

16. 108)14680598(135931 $\frac{50}{108}$

388
640
1005
339
158
50

17. 384)81407910(21199 $\frac{214}{384}$

460
767
3839
3831
3750
294

18. 563)72986543(129638 $\frac{249}{563}$

1668
5426
3595
2174
4853
349

19.

747)987213472(1321570$\frac{682}{747}$
2402
1611
1173
4264
5297
682

21.

4726)729684786(154397
25708
20784
18807
46298
37646
4564

20. 1374)428638726(311964$\frac{190}{1374}$

1643
2698
13247
8812
5686
190

22.

1809)40608370(22447$\frac{1747}{1809}$
4428
8103
8677
14410
1747

23. 314689)51406745(163$\frac{112438}{314689}$
1993784
1056505
112438

Rule II.

1.

48 $\left\{\begin{array}{l}8)459323\\6)\ 57415\end{array}\right.$ .. 3

9569 .. $1 \times 8 + 3 = \frac{11}{48}$

2.

56 $\left\{\begin{array}{l}8)287536\\7)\ 35942\end{array}\right.$

5134$\frac{1}{7}$

3.

84 $\left\{\begin{array}{l}12)679195\\7)56599\end{array}\right.$ .. 7

8085 .. $4 \times 12 + 7 = \frac{55}{84}$

4. $96 \begin{cases} 8)7384675 \\ 12)923084 \\ \hline 76923 \end{cases}$ .. 3 .. $8 \times 8 + 3 = \frac{67}{88}$

5. $108 \begin{cases} 9)5498653 \\ 12)610961 \\ \hline 50913 \end{cases}$ .. 4 .. $5 \times 9 + 4 = \frac{49}{108}$

6. $121 \begin{cases} 11)8965437 \\ 11)\ 815039 \\ \hline 74094 \end{cases}$ .. 8 .. $5 \times 11 + 8 = \frac{63}{121}$

7. $112 \begin{cases} 4)3846973 \\ 4)\ 961743 \\ 7)\ 240435 \\ \hline 34347 \end{cases}$ .. 1 .. 3 .. $(6 \times 4 + 3) \times 4 + 1 = \frac{109}{112}$

8. $168 \begin{cases} 7)549657 \\ 6)\ 78522 \\ 4)\ 13087 \\ \hline 3271 \end{cases}$ .. 3 .. $3 \times 6 \times 7 + 3 = \frac{129}{168}$

Rule III.

1. 3,0)4128,5
   $1376\frac{5}{30}$

2. 1,00)724,00
   724

5. 73,000)39768,438($544\frac{5}{7}\frac{5}{3}\frac{4}{0}\frac{3}{0}\frac{8}{0}$
   326
   348
   56438

3. 24,0 $\begin{cases} 4)4597,3 \\ 6)1149 \\ \hline 191 \end{cases}$ .. 1 .. $3 \times 4 + 1 = \frac{13}{24}\frac{3}{0}$

4. 7,000)39,768
   $5\frac{4}{7}\frac{7}{0}\frac{6}{0}\frac{8}{0}$

6. $16 \begin{cases} 4)512 \\ 4)128 \\ \hline 32 \end{cases}$ feet.

SUPPLEMENT TO MULTIPLICATION AND DIVISION.

I. When the multiplier contains a fraction.

1. 7854769 × $9\frac{3}{4}$

4)23564307

5891076$\frac{3}{4}$
70692921
765839973$\frac{3}{4}$

2. 3768473 × $16\frac{3}{8}$

8)11305419

1413177$\frac{3}{8}$
22610838
3768473
61708745$\frac{3}{8}$

3. 2965197 × $26\frac{7}{9}$

9)20758479

2306497$\frac{6}{9}$
17792982
5930994
79409419$\frac{6}{9}$

4. 3864738 × $312\frac{6}{11}$

11)23188428

2108038$\frac{10}{11}$
7729476
3864738
11594214
1207906294$\frac{10}{11}$

5. 4)3846768 × $416\frac{1}{4}$

961692
23080608
3846768
15387072
1601217180

6. 2)7486742 × $98\frac{1}{2}$

3743371
59893936
67380678
737444087

II. When the divisor contains a fraction.

1. $9\frac{1}{4}$) 785476 (84916$\frac{2}{37}$

4 | 4

37)3141904(

181
339
60
234
12

2. $16\frac{2}{3}$) 3876549 (232592$\frac{17}{50}$

3 | 3

50)1162964,7

3. $21\frac{3}{5}$) 5469874
5 5
108 { 9)27349370
12) 3038818 .. 8
253234 .. $10 \times 9 + 8 = \frac{98}{108}$

4. $41\frac{7}{8}$) 7321095
8 8
335)58568760(174832 $\frac{40}{335}$
2506
1618
2787
1076
710
40

5. $29\frac{1}{2}$) 5486953
2 2
59)10973906(185998 $\frac{7}{59}$
507
353
589
580
496
24

6. $31\frac{11}{16}$)7654869
16 4
507 30619476
4
507)122477904(241573 $\frac{309}{507}$
2107
797
2909
3740
1914
393

REDUCTION.

1. 12s. $11\frac{1}{4}$d.
12
155 pence.
4
622 farthings.

2. 20s.
12
240d.
4
960f.

3.
4)7343 farth.
12)1835 $\frac{3}{4}$d.
20) 152s. $11\frac{3}{4}$d.
£7, 12s. $11\frac{3}{4}$d.

4.

£40, 10s. 6d.
810s.
9726d.
19452 halfp.
38904 farth.

5. 12s. 2½d.
146d.
293 halfp.

6. 900 gs.
18900s.
37800 sixp.
226800d.

7. £309, 15s. 10¾d.
6195s.
74350d.
297403 farth.

8. 4)912 farth.
12)228d.
19s.

9. 4)4089 farth.
12)1022¼d.
20)85s. 2¼d.
£4, 5s. 2¼d.

10.

2)4009 halfp.
12)2004½d.
20)167s. 0½d.
£8, 7s. 0½d.

11. 4)42336 far.
12)10584d.
21)882s.
Gs. 42

12. 4)7200 farth.
12)1800d.
5)150s.
Crowns 30

13.

£736, 17s. 11½d.
14737 shill.
176855 pence.
353711 halfp.

14.

£275, 10s. 10¾d.
5519 shill.
66130 pence.
264523 farth.

15.

£205, 16s. 2¼d.
4116 shill.
49394 pence.
197577 farth.

16.

£210, 10s. 6d.
4210 shill.
8421 sixp.

17.

£2000, 17s. 8d.
40017 shill.
120053 fourp.

18.

4)74867 farth.
12)18716¾ pence.
2,0)155,9s. 8¾d.
£77, 19s. 8¾d.

19.

2)650967 halfp.
12)325483½ pence.
21)27123s. 7½d.
Gs. 1291,12s.7½d.

20.

4)74894 threep.
2,0)1872,3s. 6d.
£936, 3s. 6d.

21. £7486

21 { 3)149720 shill.
7)49906 .. 2
Gs. 7129 .. 3×3+2=11s.

22.
A Crown = 240 farthings.
Half-Crown = 120
Sixpence = 24
Penny = 4
388)10864 far.
Of each 28

23. 40 guineas.
21
2,0)84,0s.
£42

24.
A Shill. = 2 six.
H. Cro. = 5
Crown = 10
17
£283, 9s. 6d.
5669 shill.
17)11339 sixp.
667 of each.

25. 842 crowns.
5
21)4210s.
200 gs. 10s.

26. 6 lb. 10 oz. 5 grs.
12
82 oz.
20
1640 dwt.
24
39365 grs.

27.
24 { 6)213212 grs.
4) 35535 .. 2
2,0)888,3 .. 3 } 20 grs.
12)444 oz. 3dwt. 20 grs.
37 lb. 3dwt. 20 grs.

28. 24)9120 grs.
10)380 dwt.
Ans. 38 spoons.

29. 2 lb. 10 oz. 10 dwt.
34 oz.
690 dwt.
16560 grs. in one ingot.
149040 grs. in nine.

30. 2 lb.
12
24 oz.
8
192 drs.
3
576 sc.
20
11520

31. 546 lb. 18 gr.
6552 oz.
52416 drs.
157248 sc.
3144978 grs.

32.
3)56789 sc.
8)18929 drs. 2 sc.
12)2366 oz. 1 dr. 2 sc.
197 lb. 2 oz. 1 dr. ? sc.

33. 6 cwt. 1 qr. 18 lbs.
4
25 qrs.
28
718 lbs.
16
11488 oz.
16
183808 drs.

34. 30 t. 18 c. 2 qrs. 20 lbs. 12 oz. 15 drs.
618 cwt.
2474 qrs.
69292 lbs.
1108684 oz.
17738959 drs.

35. 16)215040 oz.
28)13440 lbs.
4)480 qrs.
20)120 cwt.
6 tons.

36. 540 parcels.
$18\frac{1}{4}$ lbs.
28)9855 lbs.
4)351 qrs. 27 lbs.
87 cwt. 3 qrs. 27 lbs.

37. 2 weys.
$6\frac{1}{2}$
13 tods.
2
26 stones.
14
364 lbs.

38. 7)13104 lbs.
2)1872 cl.
2)936 st.
$6\frac{1}{2}$)468 t.
2 2
13) 936
2) 72 w.
12) 36 s.
3 lasts.

39. 8 lasts.
96 sacks.
192 weys.
1248 tods.
2496 st.

40. 2 loads.
36
72 tr.
36
2592 lbs.

41. 56)10080 lbs.
36)180 tr.
5 loads.

42. 3 ld. 30 tr. 42 lbs.
138 tr.
8322 lbs.

43. 400 yds.
1600 qrs.
6400 nls.

44. 4)500 nails.
4)125 qrs.
31 yds. 1 qr.

45. 764 ells Eng.
4)3820 qrs.
955 yds.

46. 20¼ yds.
6 pieces.
123 yds.
492 qrs.
1968 nls.
4428 in.

47. 1 mile.
8
8 f.
40
320 po.
5½
1760 yds.
3
5280 ft.
12
63360 inches.

48.
12)1362240 in.
3)113520 ft.
1760)37840 yds.
21 m. 880 yds. or
21½ miles.

49. 360 m. 4 f. 27 p. 2¼ y.
2884 furlongs.
115387 poles.
634631 yards.
1903893 feet.
22846716 inches.

50.
3)7486973 feet.
5½)2495657 yds. 2 ft.
2 2
11)4991314
4,0)45375,5 .. 9 = 4½ yds.
8)11343 fur. 35 poles.
1417m. 7f. 35p. 5y. 6 in.

51. 44 m.
77440 yds.
18½)232320 ft.
2 2
37) 464640
12557 3/37 times.

52. 360°
69
24840 m.
43718400 yds.
131155200 ft.
1573862400 in.

53. 6817 ml. 2 f. 7 p.
54538 furlongs.
2181527 poles.
11998398 yds. .. 1 foot 6 inch.
35995195 feet.
431942346 inches.

55. $30\frac{1}{4}$)172425 yds.
4 4
121) 689700
4,0)570,0 po.
4)142 ro. 20 po.
35 ac. 2 ro. 20 po.

54. 20 ac. 2 ro.
4
82 ro.
40
3280 poles.

56. 674 ac. 6 po.
2696 ro.
107846 po.
$3262341\frac{1}{2}$ yds.

57. 144 { 12)20047964 sq. in.
12)1670663 .. 8
9)139221 .. 11 } 140 inches.
$30\frac{1}{4}$)15469 yards.
4,0)51,1 per. .. 45 = $11\frac{1}{4}$ yds.
4)12 ro. 31 per.
3 ac. 31 per. 11 y. 3 f. 32 in.

58. 740 ac. $5\frac{1}{2}$ yds.
2960 roods.
118400 perches.
$3581605\frac{1}{2}$ yards.
$32234449\frac{1}{2}$ feet.

59. 9)7854796 square feet.
$30\frac{1}{4}$)872755 yds. 1 foot.
4,0)2885,1 per. .. 49 = $12\frac{1}{4}$ yds.
4)721 ro. 11 per.
180 ac. 1 ro. 11 per. 12 yds. $3\frac{1}{4}$ feet.

60. 52 yds.
27
1404 ft.
1728
2426112 in.

61. 1728)13856832 in.
27)8019 ft.
297 yds.

62. 840 qrs. 3 pks.
8
6720 bush.
4
26883 pks.

63. 47 qrs. 6 bush.
382 bush.
1528 pks.

64. 4)649 pks.
8)162 bush. 1 pk.
20 qrs. 2 bush. 1 pk.

65. 4)6750 pks.
8)1687 bush. 2 pks.
210 qrs. 7 bush. 2 pks.

66. 142 chal. × 12 = 1704 sacks × 3 = 5112 bush. × 4 = 20448 pecks.

67. 11808 pecks ÷ 4 = 2952 bush. ÷ 3 = 984 sks. ÷ 12 = 82 chal.

68. 32 chal. × 12 + 6 = 390 sks. × 3 + 2 = 1172 bush.

69. 15 gal. × 4 = 60 qts. × 2 = 120 pts.

70. 2 tuns × 2 = 4 pipes × 2 = 8 hhds. × 63 = 504 gal. × 4 = 2016 qts.

71. 3424 pts. ÷ 2 = 1712 qts. ÷ 4 = 428 gal. ÷ 63 = 6 hhds. 50 gal.

72. 23 tuns × 2 + 1 = 47 pipes × 2 + 1 = 95 hhds. × 63 + 14 = 5999 gal. × 4 = 23996 qts. × 2 = 47992 pts. × 4 = 191968 gills.

73. 20 bar. × 2 = 40 kil. × 2 = 80 fir. × 9 = 720 gal. × 4 = 2880 qts.

74. 36 hhds. × 1½ = 54 bar. × 2 = 108 kil. × 2 = 216 fir. × 9 = 1944 gal. × 4 = 7776 qts. × 2 = 15552 pts.

75. 3456 gal. ÷ 9 = 384 fir. ÷ 2 = 192 kil. ÷ 2 = 96 bar. ÷ 1½ = 64 hhds. ÷ 2 = 32 butts.

76. 4608 pts. ÷ 2 = 2304 qts. ÷ 4 = 576 gal. ÷ 9 = 64 fir. ÷ 2 = 32 kil. ÷ 2 = 16 bar.

77. 7 spin. × 4 = 28 sl. × 6 = 168 he. × 2 = 336 cuts.

78. 48960 th. ÷ 120 = 408 cuts ÷ 2 = 204 he. ÷ 6 = 34 slips.

79. 27 sp. × 4 = 108 sl. × 6 = 648 he. × 2 = 1296 cuts × 120 + 80 = 155600 th.

80. 71 sl. × 6 + 4 = 430 he. × 2 + 1 = 861 cuts × 120 + 64 = 103384 th. × 90 + 25 = 9304585 in.

81. 36° × 60 + 24 = 2184′ × 60 + 35 = 131075″.

82. 120836″ ÷ 60 = 2013′ : 56″ ÷ 60 = 33°, 33′, 56″ ÷ 30 = 1ˢ, 3°, 33′, 56″.

83. 4ˢ × 30 + 14 = 134° × 60 + 15 = 8055′ × 60 + 44″ = 483344″.

84. 365 days × 24 + 6 = 8766 hrs. × 60 = 525960 m. × 60 = 31557600 sec.

85. 1818 years × 365¼ = 664024½ days × 24 = 15936588 hours.

86. 365 days × 24 + 5 = 8765 hrs. × 60 + 48 = 525948 m. × 60 + 48 = 31556928 sec.

87. Mar. 22 + Ap. 30 + May 31 + June 30 + July 31 + Aug. 31 + Sept. 30 + Oct. 31 + Nov. 30 + Dec. 25 = 291 days and 291 × 24 = 6984 hrs.

88. 500000000 ÷ 100 = 5000000 m. ÷ 60 = 83333 hrs. 20 m. ÷ 24 = 3472 da. 5 ho. 20 m. ÷ 365 = 9 common yrs. 187 d. 5 h. 20 m.

89. 200 ÷ 18 = £11, 2s. 2⅔d.

90. 200 ÷ 12 = £16, 13s. 4d.

91. 9 ro. × 36 + 20 = 344 yds. × 9 = 3096 square feet.

92. 520 st. × 16 + 12 = 8332 lb. × 16 + 14 = 133326 ounces.

93. 4600 yds. × 36 = 165600 inches ÷ 37 = 4475⅖⅐ Scotch ells.

94. 50 ch. × 16 + 10 = 810 bo. × 4 + 2 = 3242 fir. × 4 + 1 = 12969 pk. × 4 + 2 = 51878 lippies.

95. 42 ac. × 4 + 3 = 171 ro. × 40 + 10 = 6850 falls × 36 = 246600 sq. ells.

96. 25 hhd. × 16 = 400 gal. × 4 = 1600 qt. × 2 = 3200 pts. × 2 = 6400 chopins × 2 = 12800 mu. × 4 = 51200 gills.

97. 218 × 17½ = 3815 oz. ÷ 22 = 173 lb. 9 oz.

98. 240 × 22 = 5280 oz. ÷ 16 = 330 lb. av.

COMPOUND ADDITION.

ANSWERS.

	£	s.	d.
1.	31	2	4
2.	220	9	8½

	£	s.	d.
3.	3830	0	8½
4.	362	3	2¾

	£	s.	d.
5.	2987	14	0¾
6.	2382	11	9¼

7. £	s.	d.
450	16	10
34	18	9
545	16	7¾
44	14	8½
300	9	10
84	14	0
£1461	10	9¼

8. £	s.	d.
326	12	3¼
274	15	4
432	16	5¾
376	19	8½
741	14	5¼
279	2	4
£2432	0	6¾

9. £	s.	d.
471	15	2¼
296	17	8½
1432	15	4¼
273	12	6
354	14	5¼
2471	13	4
£5301	8	6¼

10. £	s.	d.
28	12	5½
437	16	3
7328	12	5¼
456	14	10
3284	17	8¾
27	16	3
£11564	9	11½

11. £	s.	d.
246	14	3½
741	13	2¼
79	2	8
4284	16	2¼
456	15	3
36	8	4¾
2841	12	9
£8687	2	8¾

12. £	s.	d.
287	14	5½
742	9	4
28	17	5¼
4684	12	9½
356	14	6
3284	16	5¾
4721	15	2½
£14107	0	2½

13. £	s.	d.
38	14	6½
276	13	5
29	10	7¼
4324	17	9½
742	6	2¾
5426	15	3
45	4	10½
2143	14	5
£13027	17	1½

14.

£	s.	d.
1568	16	9¼
5769	17	10½
8769	19	4¾
7698	15	4
49987	17	6½
50987	14	7¾
97854	8	6½
9768	3	5¼
376	9	7½
88768	15	6¾
£321550	18	2¾

15.

£	s.	d.
100	10	0
0	18	6
1	18	0
0	12	8¾
£103	19	2¾

16.

£	s.	d.
0	10	10½
0	5	9½
0	15	6
0	0	5½
0	10	3
0	0	10¾
0	6	8
£2	10	5¼

17.

£	s.	d.
8	9	6¼
5	10	0
3	11	9½
12	10	8¾
20	8	4¼
£50	10	4¾

18. Ans. 369 tons, 4 cwt. 3 qrs.

19. Ans. 133 lbs. 15 oz. 9 dr.

20. Ans. 301 lbs. 4 oz. 7 dwt. 23 grs.

21.

lb.	oz.	dw.	gr.
50	11	14	20
40	10	15	—
62	8	—	20
34	8	14	—
36	4	10	19
54	—	—	15
279	7	16	2

22.

lb.	oz.	dr.	sc.	g.
45	6	5	1	14
23	8	6	—	12
31	4	3	2	—
27	10	2	—	—
—	—	3	1	15
2	5	7	2	10
131	—	4	2	11

23.

cwt.	qr.	lb.	oz.	dr.
—	3	4	12	4
—	1	15	10	—
4	1	6	14	—
5	3	—	—	—
2	2	26	10	12
13	3	25	15	—

24.

yds.	qr.	nls.
308	2	1
500	1	3
54	3	—
60	3	3
924	2	3

25.

m.	fu.	po.	yds.
5	1	8	—
19	—	18	—
—	6	18	4
5	—	36	4
30	1	1	2½

26.

tun.	hhd.	ga.	qt.
1	2	—	—
—	2	58	—
—	1	8	3
—	3	50	2
3	1	54	1

27.

ac.	ro.	po.	yds.	ft.
6	2	20	—	—
20	1	15	—	—
15	3	4	—	—
2	2	—	24	8
1	1	39	28	5
46	2	39	22¾	4

COMPOUND SUBTRACTION.

ANSWERS.

	£	s.	d.
1.	1	18	10
2.	5	16	$1\frac{3}{4}$

	£	s.	d.
3.	19	17	$4\frac{3}{4}$
4.	156	19	$11\frac{3}{4}$

	£	s.	d.
5.	647	0	$4\frac{1}{2}$

6.	£	s.	d.
	14	10	8
	10	11	$10\frac{1}{4}$
	3	18	$9\frac{3}{4}$

8.	£	s.	d.
	436	17	$4\frac{1}{2}$
	298	14	$6\frac{3}{4}$
	138	2	$9\frac{3}{4}$

10.	£	s.	d.
	3045	0	0
	3000	10	8
	44	9	4

7.	£	s.	d.
	40	16	0
	30	18	$6\frac{1}{4}$
	9	17	$5\frac{3}{4}$

9.	£	s.	d.
	978	5	$2\frac{1}{2}$
	284	16	$4\frac{3}{4}$
	693	8	$9\frac{3}{4}$

11.	£	s.	d.
	100	0	0
	48	16	$10\frac{3}{4}$
	51	3	$1\frac{1}{4}$

12.	£	s.	d.
	2843	12	$8\frac{1}{4}$
	1761	13	$4\frac{1}{2}$
	1081	19	$3\frac{3}{4}$

13.	£	s.	d.
	7846	0	$4\frac{1}{4}$
	471	12	$9\frac{1}{2}$
	7374	7	$6\frac{3}{4}$

14.	£	s.	d.	
	1000	8	9	owing.
	108	14	4	
	112	10	$6\frac{3}{4}$	
	258	8	$5\frac{1}{2}$	
	479	13	$4\frac{1}{4}$	rec. in all.
	520	15	$4\frac{3}{4}$	rem. due.

15.	£	s.	d.		£	s.	d.
	480	6	7		100	6	8
	3005	14	8		70	19	8
	788	10	$6\frac{3}{4}$		169	16	$10\frac{3}{4}$
	850	18	$9\frac{1}{4}$		341	3	$2\frac{3}{4}$
	5125	10	7	he has.			
	341	3	$2\frac{3}{4}$	he owes.			
	4784	7	$4\frac{1}{4}$	his stock.			

16.	£	s.	d.	
	30	5	$6\frac{1}{2}$	wages of the three.
	22	7	$6\frac{1}{4}$	wages of oldest woman and the man.
	7	18	$0\frac{1}{4}$	youngest woman's wages.
	21	3	5	youngest woman and the man.
	7	18	$0\frac{1}{4}$	youngest woman.
	13	5	$4\frac{3}{4}$	man's wages.
	22	7	$6\frac{1}{4}$	oldest woman and the man.
	13	5	$4\frac{3}{4}$	man's wages.
	9	2	$1\frac{1}{2}$	oldest woman's wages.

17. lb. oz. dw. g.
20 8 10 0
14 8 14 16
5 11 15 8

18. t. cw. qr. lb. oz.
4 6 1 — —
1 0 0 20 —
1 10 1 4 14
2 10 1 24 14
1 15 3 3 2

19. yds. qr. nl.
850 — —
500 2 1
349 1 3

20. m. fur. po. yd.
50 0 0 0
30 6 21 3
19 1 18 2½

21. qr. bu. p.
111 7 2
54 4 3
57 2 3

22. tu. hd. gal. qt.
4 0 0 0
— 2 40 2
3 1 22 2

23. ch. sks. bu. p.
32 7 2 3
21 4 1 2
11 3 1 1

24. £ s. d.
100 0 0
— — —¼
99 19 11¾

25.
Received 8 17 2½
Paid 8 13 4½
On hand — 3 10

COMPOUND MULTIPLICATION.

(1.) 1s. 4¼d.
2
2 8½

(2.) 2s. 8¾d.
3
8 2¼

(3.) — 9½d.
4
3 2

(4.) — 4s. 6d.
6
1 7 0

(5.) — 10¼d.
8
6 10

(6.) — 5½d.
10
4 7

(7.) — 4¼d.
12
4 3

(8.) — 3½d.
7
2 0½
2
4 1

(9.) — 5¾d.
4
1 11
4
7 8

(10.) 12s. 6d.
6
3 15 0
4
£15 0 0

(11.) 7s. 3½d.
7
2 11 0½
4
£10 4 2

(12.) 9½d.
6
4 9
5
£1 3 9

(13.) 8s. 4½d.
4
1 13 5
8
£13 7 4

(14.) 14s. 6¼d.
6
4 7 1½
6
£26 2 9

(15.) 16s. 3½d.
7
5 14 0½
8
£45 12 4

(16.) £1, 4s. 6d.

		10
12	5	0
		6
73	10	0

(19.) £1, 5s. 3d.

		9
11	7	3
		12
136	7	0

(22.) ac. ro. per. yd.

15	2	19	22½
			3
46	3	19	7
			9
421	3	13	2½

(17.) 3s. 6d.

		9
3	16	6
		8
£30	12	0

(20.) £4, 7s. 6d.

		10
43	15	0
		12
525	0	0

(23.) galls. qts. pts.

54	3	1½
		7
384	2	0½
		7
2691	3	1½

(18.) 1¾d.

	10
1	5½
	10
14s.	7d.

(21.) cwt. qrs. lbs.

14	2	17
		7
102	2	7
		5
512	3	7

(24.) lbs. oz. dw. gr.

0	2	11	17
			12
2	7	0	12
			5
12	11	2	12
5	11	17	0
18	10	19	12

lbs. oz. dw. gr.

0	0	19	23
			12
0	11	19	12
			6
5	11	17	0

(25.) 6s. 3d. × 1

		4
1	5	0
		4
5	0	0
	6	3
£5	6	3

(26.) 2s. 6d. × 1

		7
17	6	
		4
3	10	0
	2	6
£3	12	6

(27.) 4s. 4½d. × 1

		6
1	6	3
		6
7	17	6
	4	4½
£8	1	10½

28. £0, 10s. 6d. × 1

		9
4	14	6
		5
23	12	6
	10	6
24	3	0

29. £0, 14s. 8½d. × 2

		5
3	13	6½
		10
36	15	5
1	9	5
38	4	10

30. £0, 9s. 8¾d. × 2

		10
4	17	3½
		9
43	15	7½
	19	5½
44	15	1

31. £24, 6s. 2d. × 5

		10
243	1	8
		10
2430	16	8
121	10	10
2552	7	6

32. £0, 16s. 11¾d. × 2

		10
8	9	9½
		5
42	8	11½
1	13	11½
44	2	11 × 1
		4
176	11	8
		7
1236	1	8
44	2	11
1280	4	7

33. £15, 7s. 11¼d. × 1

		4
61	11	9
		10
615	17	6
15	7	11¼
600	9	6¾

34. £19, 17s. 9¾d. × 1

		2
39	15	7½
		11
437	11	10½
19	17	9¾
457	9	8¼

35. £0, 2s. 5¾d.

		6
0	14	10½
		3
2	4	7½
		7
15	12	4½
		9
140	11	4½

36. £0, 1s. 4½d. × 3

		10	
0	13	9	× 5
		10	
6	17	6	
		2	
13	15	0	
3	8	9	
0	4	1½	
17	7	10½	

37. £0, 19s. 1d. × 5

		10	
9	10	10	× 6
		10	
95	8	4	
		3	
286	5	0	
57	5	0	
4	15	5	

Take 348 5 5 spends yearly.
From 500 0 0 his income.
151 14 7 saves yearly.

38. £2, 13s. 4½d. × 6

		10	
26	13	9	× 8
		10	
266	17	6	
		4	
1067	10	0	
213	10	0	
16	0	3	
1297	0	3	

39. £0, 18s. 7¼d.

		10	
9	6	0½	× 8
		10	
93	0	5	× 8
		10	
930	4	2	
		4	
3720	16	8	
744	3	4	
74	8	4	
4539	8	4	

40. £3, 17s. 6¼d. × 9

		10	
38	15	2¼	× 8
		10	
387	12	1	× 7
		10	
3876	0	10	
		3	
11628	2	6	
2713	4	7	
310	1	8	
34	17	8¼	
14686	6	5¼	

41. £2, 11s. 2¾d. × 6

		10	
25	12	3½	× 8
		10	
256	2	11	× 7
		10	
2561	9	2	
1793	0	5	
204	18	4	
15	7	4½	
4574	15	3¼	

42. cwt. qr. lb.

14	1	20	× 5
		10	
144	1	4	× 4
		10	
1442	3	12	
		3	
4328	2	8	
577	0	16	
72	0	16	
4977	3	12	

43. st. cl. lbs.

3	1	5	
		10	
38	1	1	× 3
		10	
385	1	3	× 4
		10	
3857	0	2	
		2	
7714	0	4	
1542	1	5	
115	1	3	
9372	1	5	

44. hhd. ga. qts. pt.

3	54	2	1	× 1
			9	
34	50	2	1	
			5	
174	1	0	1	
3	54	2	1	
177	55	3	0	

45. qr. bu. pk.

2	3	3	× 5
		10	
24	5	2	× 6
		10	
246	7	0	
		3	
740	5	0	
148	1	0	
12	2	3	
901	0	3	

46. to. cw. qr. lb. oz.

0	4	1	18	12	
				10	
2	4	0	19	8	
				2	
4	8	1	11	0	

BILLS OF PARCELS.

1.

£	s.	d.
1	0	0
1	7	9
4	10	1½
2	17	3½
0	7	0
10	2	2

2.

£	s.	d.
21	0	0
13	1	0
22	12	0
66	5	0
3	16	0
3	10	2
130	4	2

3.

£	s.	d.
2	5	6
1	4	9
23	8	9
12	11	8½
1	16	8
2	13	10
44	1	2½

COMPOUND DIVISION.

1.
£	s.
2)3	10
1	15

2.
£	s.	d.
3)8	6	6
2	15	6

3.
£	s.	d.
4)9	10	10
2	7	8½

4.
£	s.	d.
5)18	16	9¼
3	15	4¼

5.
£	s.	d.
6)17	13	0
2	18	10

6.
£	s.	d.
7)20	6	7
2	18	1

7.
£	s.	d.
8)21	8	0
2	13	6

8.
£	s.	d.
9)271	1	2¼
30	2	4¼

9.
£	s.	d.
10)43	16	0½
4	7	7¼

10. 16 {
£	s.	d.
4)340	10	0
4)85	2	6
21	5	7½

11. 35 {
£	s.	d.
5)248	17	3½
7)49	15	5½
7	2	2½

12.
£	s.	d.
53)3590	12	6(£67
410		
39		
20		
53)792(14s.		
262		
50		
12		
53)606(11d.		
76		
23		
4		
53)92(¼		
39		

13. 96 {
£	s.	d.
12)5672	14	0
8)472	14	6
59	1	9¾

14.
£	s.	d.
365)630	7	8½(£1
265		
20		
5307(14s.		
1657		
197		
12		
2372(6d.		
182		
4		
730(½		

15.
£ s. d.
801)17843 18 10½(£22
1823
221
20
4438(5s.
433
12
5206(6d.
400
4
1602(½

16.
cwt. qr. lb.
11)345 1 8
31 1 16

17.
lb. oz. dwt.
7)47 2 13
6 8 19

18.
lb. oz. dr. sc. gr.
5)19 6 3 2 0
3 10 7 0 8

19.
tu. p. hhd. gal.
25 { 5)169 1 1 48
5)33 1 1 60
6 1 1 12

20.
yd. qr. nl.
28 { 7)540 3 1
4)77 1 0⅛
19 1 1⅛

21.
ac. ro. po.
51)51 1 11(1 ac.
0
4
1(0 ro.
40
51(1 pole.

22.
gal. qt. pt.
63 { 7)307 0 1
9)43 3 1
4 3 1

23.
t. cwt. q. lb.
7)2 7 3 14
0 6 3 10

24.
£ s. d.
6)1 7 0
0 4 6

25.
£ s. d.
9)1 8 10½
0 3 2½

26.
s. d.
12)4 3
0 4¼

27.
£ s. d.
24 { 6)16 15 6
4)2 15 11
0 13 11¾

28.
£ s. d.
29)5 2 1¼(£0
20
102(3s.
15
12
181(6d.
7
4
29(¼

29.
£ s. d.
45 { 9)113 12 6
5)12 12 6
2 10 6

30.

£	s.	d.
12)128	11	2
10	14	$3\frac{2}{12}$

31.

£	s.	d.
3)740	0	0
246	13	4

32.

	£	s.	d.
84 {	12)51	7	3
	7)4	5	$7\frac{1}{4}$
	0	12	$2\frac{3}{4}$

33.

£	£	s.	d.	
742)3850(	5	3	$9\frac{1}{4}$	$\frac{22}{371}$
140				
20				
2800(3s.				
574				
12				
6888(9d.				
210				
4				
840($\frac{1}{4}$				
98				

34. First, £560, 12s. ÷ 12 = £46 14s. 4d. a-month.
Secondly, £560, 12s. ÷ 52 = 10 15 $7\frac{1}{4}$ $\frac{8}{52}$ a-week.
Lastly, £560, 12s. ÷ 365 = 1 10 $8\frac{1}{2}$ $\frac{16}{365}$ a-day.

35. First £6, 12s. = 264 sixpences, and 5s. 6d. = 11 sixp. Then 264 ÷ 11 = 24 poor.

36. First £1152, 10s. 6d. = 46101 sixpences, and £9, 10s. 6d. = 381 sixp. Then 46101 ÷ 381 = 121 patients.

37. First £569, 16s. 3d. = 45585 threepences, and £1, 2s. 6d. = 90 threep. Then 45585 ÷ 90 = 506 ac. 2 ro.

38. First 1s. 4d. — $7\frac{1}{2}$d. = $8\frac{1}{2}$d. = 17 halfpence, saves daily; and £20, 17s. $2\frac{1}{2}$d. = 10013 halfpence. Then 10013 ÷ 17 = 589 days.

39.

£	s.	d.		£	s.	d.
0	14	$6\frac{1}{2}$		0	14	$6\frac{1}{2}$
		8				3
5	16	4	8)?	3	7$\frac{1}{2}$	
	5	$5\frac{1}{4}$ $\frac{3}{4}$		5	$5\frac{1}{4}$	$\frac{6}{8}$ or $\frac{3}{4}$
6	1	$9\frac{1}{4}$ $\frac{3}{4}$				

40.

£	s.	d.		s.	d.
0	6	2		6	2
		12			3
3	14	0	4)18	6	
	4	$7\frac{1}{2}$		4	$7\frac{1}{2}$
3	18	$7\frac{1}{2}$			

41.

s.	d.		s.	d.		£	s.	d.	
11	$9\frac{3}{4}$	× 5 ÷ 8 =	2	19	$0\frac{3}{4}$	÷ 8 =	0	7	$4\frac{1}{2}$ $\frac{3}{8}$
							8	12	$9\frac{3}{4}$ $\frac{3}{8}$

42. £0, 15s. $6\frac{3}{4}$d. × $1\frac{1}{3}$

		4	
3	2	3	
		7	
21	15	9	
0	15	$6\frac{3}{4}$	
0	5	$2\frac{1}{4}$	
22	16	6	

43. £0, 6s. $7\frac{3}{4}$d. × $1\frac{3}{8}$

		5	
1	3	$2\frac{3}{4}$	
		9	
14	19	$0\frac{3}{4}$	
	6	$7\frac{3}{4}$	
	2	$5\frac{3}{4}$	$\frac{5}{8}$
15	8	$2\frac{1}{4}$d.	$\frac{5}{8}$

44.
20 lb. 2 oz. 7 dwt. 21 grs. × 4 = 80 lb. 9 oz. 11 dwt. 12 grs.
20 lb. 2 oz. 7 dwt. 21 grs. × $\frac{3}{5}$ =
60 lb. 7 oz. 3 dwt. 15 grs. ÷ 5 = 12 lb. 1 oz. 8 dwt. $17\frac{2}{5}$ grs.
Ans. 92 lb. 11 oz. 0 dwt. $5\frac{2}{5}$ grs.

45.
24 cwt. 1 qr. 14 lb. 10 oz. × 8 = 195 cwt. 0 qr. 5 lb. 0 oz.
24 cwt. 1 qr. 14 lb. 10 oz. × $\frac{3}{7}$ =
48 cwt. 3 qr. 1 lb. 4 oz. ÷ 7 = 6 cwt. 3 qr. 24 lb. $2\frac{6}{7}$ oz.
Ans. 202 cwt. 0 qr. 1 lb. $2\frac{6}{7}$ oz.

46.
20 m. 3 fur. 30 po. 2 yd. × 9 = 184 m. 1 fur. 33 po. $1\frac{1}{2}$ yd.
20 m. 3 fur. 30 po. 2 yd. × $\frac{2}{3}$ =
40 m. 7 fur. 20 po. 4 yd. ÷ 3 = 13 m. 5 fur. 6 po. 5 yd.
Ans. 197 m. 7 fur. 0 po. 1 yd.

47.
120 yds. 2 qrs. 1 nl. × 10 = 1205 yds. 2 qrs. 2 nls.
120 yds. 2 qrs. 1 nl. × $\frac{4}{5}$ =
482 yds. 1 qr. 0 nl. ÷ 9 = 53 yds. 2 qrs. $1\frac{1}{5}$ nls.
Ans. 1259 yds. 0 qrs. $3\frac{1}{5}$ nls.

48. 40 ac. 3 ro. 30 po. × 11 = 450 ac. 1 ro. 10 po.
40 ac. 3 ro. 30 po. × $\frac{3}{7}$ =
122 ac. 2 ro. 10 po. ÷ 7 = 17 ac. 2 ro. $7\frac{1}{7}$ po.
Ans. 467 ac. 3 ro. $17\frac{1}{7}$ po.

49.

Tu.	p.	hhd.	ga.	qt.	pt.		Tu.	p.	hhd.	ga.	qt.	pt.
28	0	1	24	0	1	× 7 =	198	0	1	42	3	1
28	0	1	24	0	1	× $\frac{2}{3}$ =						
56	1	0	48	1	0	÷ 3 =	18	1	1	37	0	$0\frac{2}{3}$
						Ans.	217	0	1	16	3	$1\frac{2}{3}$

50.

	£	s.	d.
$17\frac{1}{4}$)	8	12	6
	4		4
69)	34	10	0 (£0, 10
	20		
	690		
	69		
	0		

51.

		£	s.	d.
$13\frac{1}{3}$)	£15	0	0	
	3	3		
40)	45	0	0	
	£1	2	6	

52.

		£	s.	d.
$22\frac{3}{4}$)	£12,	6s.	$8\frac{1}{2}$d.	
	4		4	
91)	49	6	10	(£0, 10s. $10\frac{1}{91}$d.
	20			
	986			
	91			
	76			
	12			
	922			
	91			
	12			

53. As the boy gets $\frac{2}{3}$ of a man's share, it is the same as dividing the sum among $5\frac{2}{3}$ men; wherefore $5 \times 3 + 2 = 17$ and £276, 16s. 8d. $\times$ 3 = £830, 10s., then £830, 10s. $\div$ 17 = £48, 17s. 0$\frac{10}{17}$d. $\frac{14}{17}$ a man's share, which $\times$ 2 and $\div$ 3 = £32, 11s. 4$\frac{4}{17}$d. $\frac{16}{17}$ boy's share.

54. $\frac{5}{8} \times 7 = \frac{35}{8} = 5\frac{5}{8} + 9 = 14\frac{5}{8}$.
£200, 14s. 6d. $\div$ $14\frac{5}{8}$ = £1204, 7s. $\div$ 89 =
13 10 $7\frac{1}{2}$ $\frac{66}{89}$ = a man's share, then
13 10 $7\frac{1}{2}$ $\frac{66}{89} \times 5 \div 6$ = £67, 13s. 2$\frac{1}{4}$d. $\frac{33}{89} \div 6$ =
11 5 $6\frac{1}{4}$ $\frac{55}{89}$ = a woman's share.

55. First, £114, 8s. 4d. $\times$ 5 $\div$ 8 = £572, 1s. 8d. $\div$ 8 = £71, 10s. 2$\frac{1}{2}$d. A's share; then £114, 8s. 4d. $\div$ 4 = £28, 12s. 1d. B's share; and £114, 8s. 4d. $\div$ 8 = £14, 6s. 0$\frac{1}{2}$d. C's share.

BILLS OF PARCELS.

4. £	s.	d.
1	1	0
0	18	$11\frac{1}{2}$
0	9	8
0	4	8
3	7	6
6	1	$9\frac{1}{2}$

5. £	s.	d.
6	11	10
0	19	$11\frac{1}{4}$
2	2	6
7	4	6
11	7	$7\frac{1}{2}$
14	13	4
42	19	$8\frac{3}{4}$

6. £	s.	d.
26	1	$9\frac{3}{4}$
8	8	$5\frac{1}{2}$ $\frac{7}{8}$
4	9	7
6	2	$0\frac{3}{4}$
0	14	$5\frac{1}{4}$
1	0	$7\frac{1}{2}$
46	16	$11\frac{3}{4}$ $\frac{7}{8}$

7. £	s.	d.
27	15	0
13	5	$1\frac{1}{2}$
3	8	$3\frac{1}{2}$
19	14	$7\frac{1}{2}$
64	3	$0\frac{1}{2}$

SIMPLE PROPORTION.

1. yds. yds. s. d.
2 : 16 :: 4 6
12
54
16
2)864
12)432
2,0)3,6
£1, 16s.

2. yds. yds. £ s.
16 : 2 :: 1 16
20
36
2
16 { 4)72
4)18
4s. 6d.

3. yds. yds. s. d.
$4\frac{1}{2}$ :: 20 : 12 $8\frac{1}{2}$
2 2 152d.
9 40 610f.
40
9)24400
4)2711 $\frac{1}{9}$
12)677 $\frac{3}{4}$ $\frac{1}{9}$
2,0)5,6s. 5d.
£2, 16s. $5\frac{3}{4}$d. $\frac{1}{9}$

4. yds. yds. £ s. d.
20 : $4\frac{1}{2}$ :: 2 16 $5\frac{3}{4}$ $\frac{1}{9}$
2 2 56s.
40 9 677d.
2711f.
9
4,0)2440,0
4)610
12)152 $\frac{1}{2}$
12s. $8\frac{1}{2}$d.

5. $1\frac{1}{4}$ yd. : $24\frac{1}{2}$ yds. :: 2s. 6d. = 5 qrs. : 98 qrs. :: 30d. = $\frac{30 \times 98}{5} = \frac{2940}{5}$ = 588d. = 49s. = £2, 9s.

6. $24\frac{1}{2}$ yds. : $1\frac{1}{4}$ yd. :: £2, 9s. = 98 qrs. : 5 qrs. :: 49s. = $\frac{49 \times 5}{98} = \frac{245}{98}$ = 2s. 6d.

7. 1 lb. : $1\frac{1}{2}$ cwt. :: $10\frac{1}{2}$d. = 1 lb. : 168 lb. :: 42f. = 42 × 168 = 7056f. = 1764d. = 147s. = £7, 7s.

8. $1\frac{1}{2}$ cwt. : 1 lb. :: £7, 7s. = 168 lb. : 1 lb. :: 1764d. = $\frac{1764}{168}$ = $10\frac{1}{2}$d.

9. $1\frac{1}{4}$ oz. : 24 lb. :: $6\frac{3}{4}$d. = 5 qr. oz. : 1536 qr. oz. :: 27f. = $\frac{27 \times 1536}{5} = \frac{41472}{5}$ = $8294\frac{2}{5}$f. = £8, 12s. $9\frac{1}{2}$d. $\frac{2}{5}$.

10. 24 lb. : $1\frac{1}{4}$ oz. :: £8, 12, $9\frac{1}{2}$d. $\frac{2}{5}$ = 1536 : 5 :: 41472 = $\frac{41472 \times 5}{1536 \times 5} = \frac{41472}{1536}$ = 27 f. = $6\frac{3}{4}$d.

11. 1 oz. : $2\frac{1}{2}$ cwt. :: $6\frac{1}{2}$d. = 1 oz. : 4480 oz. :: 26f. = 26 × 4480 = 116480f. = £121, 6s. 8d.

12. $2\frac{1}{2}$ cwt. : 1 oz. :: £121, 6s. 8d. = 4480 oz. : 1 oz. :: 29120d. = 29120 ÷ 4480 = $6\frac{1}{2}$d.

13. First $30\frac{1}{2}$ yds. × 3 = $91\frac{1}{2}$ yds. Then 3 qrs. : $91\frac{1}{2}$ yds. :: 3s. 6d. = 3 qrs. : 366 qrs. :: 42d. = $\frac{42 \times 366}{3}$ = $\frac{15372}{3}$ = 5124d. = £21, 7s.

14. $91\frac{1}{2}$ yds. : 3 qrs. :: £21, 7s. = 366 : 3 :: 427s. = $\frac{427 \times 3}{366} = \frac{1281}{366}$ = 3s. 6d.

15. 4 cwt. 1 qr. 14 lb. : 1 oz. :: £40, 16s. 8d. = 7840 oz. : 1 oz. :: 9800d. = 9800 ÷ 7840 = $1\frac{1}{4}$d.

16. 1 oz. : 4 cwt. 1 qr. 14 lb. :: $1\frac{1}{4}$d. = 1 : 7840 :: 5 = 5 × 7840 = 39200f. = £40, 16s. 8d.

17. $1\frac{1}{2}$ oz. : 5 cwt. 3 qrs. 18 lb. :: $2\frac{1}{2}$d. = 3 half-oz. : 21184 half-oz. :: 10f. = $\frac{21184 \times 10}{3}$ = 70613$\frac{1}{3}$f. = £73, 11s. $1\frac{1}{4}$d. $\frac{1}{3}$.

18. 5 cwt. 3 qrs. 18 lb. : $1\frac{1}{3}$ oz. :: £73, 11s. $1\frac{1}{4}$d. $\frac{1}{3}$ = 21184 half-oz. : 3 half-oz. :: 70613$\frac{1}{3}$f. = $\frac{70613\frac{1}{3} \times 3}{21184}$ = $\frac{211840}{21184}$ = 10f. = $2\frac{1}{2}$d.

19. $1\frac{1}{2}$ lb. : 2 t. :: $1\frac{1}{2}$d. = 3 half-lb. : 8960 half-lb. :: 6f. = $\frac{8960 \times 6}{3}$ = 17920f. = £18, 13s. 4d.

20. 1 gal. : 1 pipe :: 13s. 6d. = 1 gal. : 126 gal. :: 162d. : 20412d. = £85, 1s.

21. $3\frac{1}{2}$ cwt. : 1 lb. :: £8, 11s. 6d. = 392 lb. : 1 lb. :: 2058d. : $5\frac{1}{4}$d.

22. First $15\frac{1}{4}$ lb. × 10 = $152\frac{1}{2}$ lb. Then 1 lb. : $152\frac{1}{2}$ lb. :: $6\frac{3}{4}$d. = 2 : 305 :: 27f. = $\frac{27 \times 305}{2}$ = $\frac{8235}{2}$ = 4117$\frac{1}{2}$f. = £4, 5s. $9\frac{1}{4}$d. $\frac{1}{2}$.

23. 7 days : 365 :: £17, 13s. $9\frac{1}{2}$d. = 7 : 365 :: 16982f. = $\frac{16982 \times 365}{7}$ = $\frac{6198430}{7}$ = 885490f. = £922, 7s. $8\frac{1}{2}$d. spent yearly, and £922, 7s. $8\frac{1}{2}$d. + £500 = £1422, 7s. $8\frac{1}{2}$d. yearly income.

24. 1 day : $2\frac{1}{2}$ years : : £3240, 9s. $9\frac{1}{2}$d. = 1d. : $912\frac{1}{2}$d. : : 3110870f. : 2838668875f. = £2956946, 14s. $10\frac{3}{4}$d.

25. 4 qrs. : 5 qrs. : : 74d. = $\frac{74 \times 5}{4} = \frac{370}{4}$ = $92\frac{1}{2}$d. = 7s. $8\frac{1}{2}$d.

26. 1 t. : $2\frac{1}{2}$ lb. : : £23, 6s. 8d. = 2240 lb. : $2\frac{1}{2}$: : 5600d. = $\frac{5600 \times 2\frac{1}{2}}{2240} = \frac{14000}{2240} = 6\frac{1}{4}$d.

27. 1 day : 313 (number of days in a year, exclusive of Sundays) : : 74 f. : 23162f. = £24, 2s. $6\frac{1}{2}$d.

28. 1 ac. : 400 ac. $2\frac{1}{2}$ ro. : : £2, 2s. = 8 half-ro. : 3205 half-ro. : : 42s. = $\frac{42 \times 3205}{8} = \frac{134610}{8}$ = 16826s. 3d. = £841, 6s. 3d.

29. 1 qr. : 61 qrs. 7 bu. : : 18s. 8d. = 8 bu. : 495 bu. : : 224d. : 13860d. = £57, 15s.

30. £20, 9s. 4d. : 6s. $4\frac{3}{4}$d. : : 100 yds. = 19648f. : 307f. : : 100 = 30700 ÷ 19648 = 1 yd. 2 qrs. 1 nl.

31. 1 cwt. 2 qrs. 16 lb. × 4 = 6 cwt. 2 qrs. 8 lb. : 1 cwt. : : £23 = 736 lb. : 112 lb. : : £23 = 23 × 112 ÷ 736 = 2576 ÷ 736 = £3, 10s.

32. £1 : £900 : : 30d. : 27000d. = £112, 10s.

33. £1200 : £1 : : 750 = 750 × 20 ÷ 1200 = 12s. 6d.

34. 12s. 6d. : £750 : : £1 = 150d. : 180000d. : : £1 : £1200.

35. 20s. : 180010s. : : 186d. = 33481860 ÷ 20 = 1674093d. = £6975, 7s. 9d.

36. First $2\frac{1}{4}$ lb. × 6 = $13\frac{1}{2}$ lb. = 3240 dwt. Then 1 : 3240 : : 4s. : 12960s. = £648.

37. $1\frac{3}{4}$ oz. : $24\frac{1}{2}$ lb. : : 9s. $7\frac{1}{2}$d. = 7 : 1176 : : 462f. = 543312 ÷ 7 = 77616f. = £80, 17s.

38. 18 st. × 14 = 252 st. × 14 = 3528 lbs., and 3528 lb. : 1 lb. :: £109, 4s. = 3528 lb. : 1 lb. :: 26208d. : $7\frac{1}{4}$d. $\frac{5}{7}$.

39. 1 lb. : 100 lb. :: 66d. : 6600d. = £27, 10s. prime cost, from which deduct £2, 10s. leaves £25 selling price. Then 100 lb. = 1600 oz. : 1 oz. :: £25 = 6000d. : $3\frac{3}{4}$d.

40. 30 — $22\frac{1}{2}$ = $7\frac{1}{2}$ gal. = 15 h. g. (quantity in the cistern at the end of an hour) : 400 h. g. :: 1 h. : 26 hrs. 40 m.

41. To £8, 13s. 4d. (prime cost) add £2, 2s. (gain), the sum £10, 15s. 4d. is the selling price. Then 2 cwt. 2 qrs. 24 lb. = 304 lb. : 1 lb. :: £10, 15s. 4d. = 2584d. : $8\frac{1}{2}$d.

42. From 4 tuns or 1008 gal. take 48 gal. remain 960 gal. to be sold. Then 960 : 1 gal. :: £640 or 12800s. : 13s. 4d.

43. 1 ell : 240 yds. :: 16s. $10\frac{1}{2}$d. = 5 qrs. : 960 qrs. :: 810f. = 777600 ÷ 5 = 155520f. = £162.

44. £5840 : £1 :: £109, 10s. = 26280d. = 26280 ÷ 5840 = $4\frac{1}{2}$d.

45. $10\frac{1}{2}$ m. : 8 m. :: 14 oz. = 21 : 16 :: 14 = 14 × 16 ÷ 21 = 224 oz. ÷ 21 = 10 oz. $10\frac{2}{3}$ drs.

46. £100 : £47 :: £4, 10s. or 90s. = 47 × 90 ÷ 100 = 4230 ÷ 100 = 42s. $3\frac{1}{2}$d. $\frac{2}{5}$ = £2, 2s. $3\frac{1}{2}$d. $\frac{2}{5}$.

47. 24 m. : 14 m. :: 6 days, or 4 m. : 14 m. :: 1 d. = 14 ÷ 4 = 3 d. 5 h.

48. 24s. : 30s. :: 3 lb. = 90 ÷ 24 = 3 lb. 12 oz.

49. 1 g. : 50 pts. :: $3\frac{1}{2}$d., or 1 g. : 200 g. :: $3\frac{1}{2}$d. = 200 × $3\frac{1}{2}$d. = 700d. = £2, 18s. 4d.

50. 1 oz. : 4 cwt. 2 qrs. 20 lb. :: $3\frac{3}{4}$d. = 1 oz. : 8384 oz. :: 15f. : 125760f. = £131 selling price, from which subtract £113, 10s. 8d. prime cost, the remainder £17, 9s. 4d. is the gain.

51. $1\frac{1}{2}$ pks. : 8 ch. 10s. 2 bush. :: $10\frac{1}{2}$d., or 3 : 2560 :: $10\frac{1}{2}$d. = 2560 × $10\frac{1}{2}$ ÷ 3 = 26880 ÷ 3 = 8960d. = £37, 6s. 8d.

52. 1 sq. yd. : 900½ ac. : : 3f., or 2 : 8716840 : : 3 = 8716840 × 3 ÷ 2 = 26150520 ÷ 2 = 13075260f. = £136320, 1s. 3d.

53. £3, 2s. 6d. × 13½ cwt. = £42, 3s. 9d. And 6s. 8d. : £42, 3s. 9d. : : 1 yd. : 126 yds. 2 qrs. 1 nl.

54. 3 qrs. : 1½ yds. : : 3¾ yds., or 3 qrs. : 6 qrs. : : 15 qrs. = 15 × 6 ÷ 3 = 90 ÷ 3 = 30 qrs. = 7½ yds.

55.	£	s.	d.
Shalloon,	33	15	10¾ ½
Flannel, .	4	1	4½
Meal, .	14	10	10
Clover-seed,	3	17	3½
Iron, .	2	14	11¾
Train-oil,	37	19	6
Ans.	96	19	9¾ ½

56.	£	s.	d.
Sugar, .	65	12	0
Tea, . .	45	0	0
	110	12	0
Calico, .	20	1	0½
Diaper, .	17	3	9¼ ½
	37	4	9¾ ½
Ans.	73	7	2¾ ½

BOOK DEBTS.

8.	£	s.	d.
Salt, . .	38	3	9
Paper, . .	35	6	10½ ¾
Rum, . . .	273	0	0
Cheese, . .	1430	12	6
Sugar, .	80	11	9¾
Whisky, .	85	1	0
Meal, . .	83	11	8¼
Ans.	2026	7	7½ ¾

COMPOUND PROPORTION.

1. $\left\{\begin{matrix}£100 : £60 \\ 12m. : 9m.\end{matrix}\right\}$: : £5 : $\frac{60 \times 9 \times 5}{100 \times 12} = \frac{2700}{1200}$ = £2, 5s.

2. $\left\{\begin{matrix}£5 : £2, 5s. \\ 9m. : 12m.\end{matrix}\right\}$: : £100 : $\frac{45 \times 12 \times 100}{100 \times 9}$ = 5 × 12 = £60.

3. $\left\{\begin{matrix}£60 : £100 \\ £5 : £2, 5s.\end{matrix}\right\}$ :: 12m. : $\frac{100 \times 45 \times 12}{100 \times 60} = \frac{45}{5} =$ 9 months.

4. $\left\{\begin{matrix}£60 : 100 \\ 9m. : 12m.\end{matrix}\right\}$ :: £2, 5s. : $\frac{100 \times 12 \times 45}{60 \times 9} =$ $\frac{100 \times 12 \times 5}{60} = \frac{100 \times 60}{60} = 100s. = £5.$

5. $\left\{\begin{matrix}16m. : 48m. \\ 21d. : 84d.\end{matrix}\right\}$ :: 24 ac. : $\frac{48 \times 84 \times 24}{16 \times 21} = 3 \times 4 \times 24 = 228$ ac.

6. $\left\{\begin{matrix}3h. : 24h. \\ 1w. : 52w.\end{matrix}\right\}$ :: 14 pks. : $\frac{24 \times 52 \times 14}{3 \times 1} = 8 \times 52 \times 14 = 5824$ pks. $= 1456$ bush.

7. $\left\{\begin{matrix}12r. : 48r. \\ 6d. : 24d.\end{matrix}\right\}$ :: 14 ac. : $\frac{48 \times 24 \times 14}{12 \times 6} = 4 \times 4 \times 14 = 224$ ac.

8. $\left\{\begin{matrix}8m. : 64m. \\ 6d. : 32d.\end{matrix}\right\}$ :: £3, 10s. : $\frac{64 \times 32 \times 70}{8 \times 6} = \frac{8 \times 16 \times 70}{3}$ $= \frac{8960}{3} = 2986s.\ 8d. = £149, 6s.\ 8d.$

9. $\left\{\begin{matrix}2 \text{ horses} : 16 \text{ horses} \\ 6d. \times 8h. : 156d. \times 12\frac{1}{2}h.\end{matrix}\right\}$ :: $4\frac{1}{2}$ ac. : $\frac{16 \times 156 \times 12\frac{1}{2} \times 4\frac{1}{2}}{2 \times 6 \times 8} = 2 \times 26 \times 2\frac{1}{4} \times 12\frac{1}{2} = 1462$ ac. 2 ro.

10. $\left\{\begin{matrix}117 \text{ grs.} : 468 \text{ grs.} \\ 9\text{d.} : 45\text{d.}\end{matrix}\right\} :: 654\text{s.} : \frac{468 \times 45 \times 654}{117 \times 9} =$
$4 \times 5 \times 654 = 13080$ soldiers.

11. $\left\{\begin{matrix}4 \text{ m.} : 6 \text{ m.} \\ 12\text{ d.} \times 14\text{ h.} : 4\text{ d.} \times 8\text{ h.}\end{matrix}\right\} :: 20 \text{ ro } \frac{6 \times 4 \times 8 \times 20}{4 \times 12 \times 14}$
$= \frac{8 \times 20}{2 \times 14} = \frac{4 \times 10}{7} = \frac{40}{7} = 5$ ro. 25 yds. $6\frac{3}{7}$ ft.

12. $\left\{\begin{matrix}248 \text{ m.} : 62 \text{ m.} \\ 4 \text{ cwt.} : 8 \text{ cwt. } 3 \text{ qrs. } 14 \text{ lbs.}\end{matrix}\right\} :: £6,\ 8\text{s.} =$
$\left\{\begin{matrix}248 \text{ m} : 62 \text{ m.} \\ 448 \text{ lb.} : 994 \text{ lb.}\end{matrix}\right\} :: 128\text{s.} : \frac{62 \times 994 \times 128}{248 \times 448} = \frac{994 \times 2}{4 \times 7}$
$\frac{497}{7} = 71\text{s.} = £3,\ 11\text{s.}$

13. $\left\{\begin{matrix}50\text{ft.} \times 14\text{ft.} \times 2\text{ft.} : 500\text{ft.} \times 16\text{ft.} \times 4\text{ft.} \\ 60 \text{ m.} : 20 \text{ m.}\end{matrix}\right\} :: 12\text{d.} =$
$\left\{\begin{matrix}1400 \text{ sol. ft.} : 32000 \text{ s. ft.} \\ 60 \text{ m.} : 20 \text{ m.}\end{matrix}\right\} :: 12\text{d.} : \frac{32000 \times 20 \times 12}{1400 \times 60} =$
$\frac{320 \times 12}{14 \times 3} = \frac{160 \times 4}{7} = \frac{640}{7} = 91\frac{3}{7}$ days.

14. $\left\{\begin{matrix}1500 \text{ m.} : 1000 \text{ m.} \\ 8 \text{ w.} : 5 \text{ w.}\end{matrix}\right\} :: 16 \text{ oz.} : \frac{1000 \times 5 \times 16}{1500 \times 8} =$
$\frac{10 \times 5 \times 2}{15} = \frac{20}{3} = 6\frac{2}{3}$ oz.

15. $\left\{\begin{matrix}30 \text{ m} : 24 \text{ m.} \\ 660 \text{ yds.} : 1100 \text{ yds.}\end{matrix}\right\} :: \overset{\text{days.}}{30} : \frac{24 \times 1100 \times 30}{660 \times 30} =$
$\frac{24 \times 10}{6} = 4 \times 10 = 40$ days.

16. reapers. reapers. days.
$100 : 60 :: 20 : \frac{60 \times 20}{100} = 2 \times 6 = 12$

days, which, added to 10, gives 22 days, the time in which the whole was cut down. This question is only simple proportion.

17. $\left\{\begin{array}{l} 1 \text{ w.} : 6 \text{ w.} \\ 4 \text{ da.} : 20 \text{ da.} \end{array}\right\} :: 24 : \frac{6 \times 20 \times 24}{4} = 6 \times 20 \times 6 = 720$ men.

18. feet. feet.
$\left\{\begin{array}{l} 5 : 6 \\ 3 : 5 \\ 40 \text{ bolls} : 30 \text{ bolls} \end{array}\right\}$ :: feet. 12 : $\frac{6 \times 5 \times 30 \times 12}{5 \times 3 \times 40} = 2 \times 3 \times 3 = 18$ feet long.

PRACTICE.

1.

$\frac{1}{4}$d. = $\frac{1}{4}$d. 348 at $\frac{1}{4}$d.
12)87
7s. 3d.

$\frac{1}{2}$d. = $\frac{1}{2}$d. 348 at $\frac{1}{2}$d.
12)174.
14s. 6d.

$\frac{3}{4}$d. = $\frac{1}{16}$s. 348 at $\frac{3}{4}$d.
2,0)2,1 9
£1,1s.9d.

2.

1d. = $\frac{1}{12}$s. 560 at 1d.
2,0)4,6 8
£2. 6s. 8d.

2.

1d. = $\frac{1}{12}$s. 560 at 1$\frac{1}{4}$d.
$\frac{1}{4} = \frac{1}{4}$ 46 8
11 8
2,0)5,8 4
£2 18 4

1$\frac{1}{2}$d. = $\frac{1}{8}$s. 560 at 1$\frac{1}{2}$d.
2,0)7,0
£3 10

1$\frac{1}{2}$d. = $\frac{1}{8}$s. 560 at 1$\frac{3}{4}$d.
$\frac{1}{4} = \frac{1}{8}$ 70
11 8
2,0)8,1 8
£4 1 8

3.

$\frac{1}{6}$d. = $\frac{1}{6}$s. 430 at $\frac{1}{2}$
2,0)7,1 8
£3 11 8

2d. = $\frac{1}{6}$s. 430 at 2$\frac{1}{4}$d.
$\frac{1}{4} = \frac{1}{8}$ 71 8
8 11$\frac{1}{2}$
2,0)8,0 7$\frac{1}{2}$
£4 0 7$\frac{1}{2}$

2d. = $\frac{1}{6}$s. 430 at 2$\frac{1}{3}$d.
$\frac{1}{2} = \frac{1}{4}$ 71 8
17 11
2,0)8,9 7
£4 9 7

3.

2d. = $\frac{1}{8}$s. 430 at $2\frac{3}{4}$d.

$\frac{3}{4} = \frac{1}{1\,3}$ 71 8

26 $10\frac{1}{2}$

2,0)9.8 $6\frac{1}{2}$

£4 18 $6\frac{1}{2}$

4.

3d. = $\frac{1}{4}$s. 96 at 3d.

2,0)2,4

£1 4

3d. = $\frac{1}{4}$s. 96 at $3\frac{1}{4}$d.

$\frac{1}{4} = \frac{1}{1\,2}$ 24

2

2,0)2,6

£1 6

3d. = $\frac{1}{4}$s. 96 at $3\frac{1}{2}$d.

$\frac{1}{2} = \frac{1}{8}$ 24

4

2,0)2,8

£1 8

3d. = $\frac{1}{4}$s. 96 at $3\frac{3}{4}$d.

$\frac{3}{4} = \frac{1}{4}$ 24

6

2,0)3,0

£1 10

5.

4d. = $\frac{1}{3}$s. 84 at 4d.

2,0)2,8

£1 8

4d. = $\frac{1}{3}$s. 84 at $4\frac{1}{4}$d.

$\frac{1}{4} = \frac{1}{1\,2}$ 28

1 9

2,0)2,9 9

£1 9 9

5.

4d. = $\frac{1}{3}$s. 84 at $4\frac{1}{2}$d.

$\frac{1}{2} = \frac{1}{8}$ 28

3 6

2,0)3.1 6

£1 11 6

4d. = $\frac{1}{3}$s. 84 at $4\frac{3}{4}$d.

$\frac{3}{4} = \frac{1}{1\,2}$ 28

5 3

2,0)3,3 3

£1 13 3

6.

4d. = $\frac{1}{3}$s. 54 at 5d.

1 = $\frac{1}{4}$ 18

4 6

2,0)2,2 6

£1 2 6

4d. = $\frac{1}{3}$s. 54 at $5\frac{1}{4}$d.

1 = $\frac{1}{4}$ 18

$\frac{1}{4} = \frac{1}{4}$ 4 6

1 $1\frac{1}{2}$

2,0)2,3 $7\frac{1}{2}$

£1 3 $7\frac{1}{2}$

4d. = $\frac{1}{3}$s. 54 at $5\frac{1}{2}$d.

$1\frac{1}{2} = \frac{1}{8}$ 18

6 9

2,0)2.4 9

£1 4 9

4d. = $\frac{1}{3}$s. 54 at $5\frac{3}{4}$d.

$1\frac{1}{2} = \frac{1}{8}$ 18

$\frac{1}{4} = \frac{1}{6}$ 6 9

1 $1\frac{1}{2}$

2,0)2,5 $10\frac{1}{2}$

£1 5 $10\frac{1}{2}$

7.

6d. = $\frac{1}{2}$s. 45 at 6d.

2,0)2,2 6

£1 2 6

6d. = $\frac{1}{2}$s. 45 at $6\frac{1}{4}$d.

$\frac{1}{4} = \frac{1}{2\,4}$ 22 6

0 $11\frac{1}{4}$

2,0)2,3 $5\frac{1}{4}$

£1 3 $5\frac{1}{4}$

6d. = $\frac{1}{2}$s. 45 at $6\frac{1}{2}$d.

$\frac{1}{2} = \frac{1}{1\,2}$ 22 6

1 $10\frac{1}{2}$

2,0)2,4 $4\frac{1}{2}$

£1 4 $4\frac{1}{2}$

6d. = $\frac{1}{2}$s. 45 at $6\frac{3}{4}$d.

$\frac{3}{4} = \frac{1}{8}$ 22 6

2 $9\frac{3}{4}$

2,0)2,5 $3\frac{3}{4}$

£1 5 $3\frac{3}{4}$

8.

6d. = $\frac{1}{2}$s. 58 at 7d.

1 = $\frac{1}{8}$ 29

4 10

2,0)3,3 10

£1 13 10

6d. = $\frac{1}{2}$s. 58 at $7\frac{1}{4}$d.

1 = $\frac{1}{8}$ 29

$\frac{1}{4} = \frac{1}{4}$ 4 10

1 $2\frac{1}{2}$

2,0)3,5 $0\frac{1}{2}$

£1 15 $0\frac{1}{2}$

8.

6d. = ½s. 58 at 7½d.

1½ = ¼	29	
	7	3
2,0)	3.6	3
	£1	16 3

6d. = ½s. 58 at 7¾d.

1½ = ¼	29	
¼ = ⅛	7	3
	1	2½
2,0)	3,7	5½
	£1	17 5½

9.

6d. = ½s. 85 at 8d.

2 = ⅓	42	6
	14	2
2,0)	5,6	8
	£2	16 8

6d. = ½s 85 at 8¼d.

2 = ⅓	42	6
¼ = ⅛	14	2
	1	9¼
2,0)	5,8	5¼
	£2	18 5¼

6d. = ½s. 85 at 8½d.

2 = ⅓	42	6
½ = ¼	14	2
	3	6½
2,0)	6,0	2½
	£3	0 2½

9.

d. = ½s. 85 at 8¾d

2 = ⅓	42	6
½ = ¼	14	2
¼ = ½	3	6½
	1	9¼
2,0)	6.1	11¾
	£3	1 11¾

10.

6d. = ½s. 88 at 9d.

3 = ½	44	
	22	
2,0)	6,6	
	£3	6

6d. = ½s. 88 at 9¼d.

3 = ½	44	
¼ = 1/12	22	
	1	10
2,0)	,7	10
	£3	7 10

6d. = ½s. 88 at 9½d.

3 = ½	44	
½ = ⅙	22	
	3	8
2,0)	6,9	8
	£3	9 8

6d. = ½s. 88 at 9¾d.

3 = ½	44	
¾ = ¼	22	
	5	6
2,0)	7,1	6
	£3	11 6

11.

6d. = ½s. 57 at 10d.

4 = ⅓	28	6
	19	
2,0)	4 7	6
	£2	7 6

6d = ½s 57 at 10¼d.

4 = ⅓	28	6
¼ = 1/12	19	
	1	2¼
2,0)	4.8	8¼
	£2	8 8¼

6d. = ½s. 57 at 10½d.

4 = ⅓	28	6
½ = ⅛	19	
	2	4½
2,0)	4,9	10½
	£2	9 10½

6d. = ½s. 57 at 10¾d.

4 = ⅓	28	6
¾ = ⅛	19	
	3	6¾
2,0)	5 1	0¾
	£2	11 0¾

12.

6d. = ½s. 94 at 11d.

4 = ⅓	47	
1 = ¼	31	4
	7	10
2,0)	8,6	2
	£4	6 2

12.

6d. = ½s. 94 at 11¼d.
4 = ⅓ 47
1 = ¼ 31 4
¼ = ¼ 7 10
1 11½
2,0)8,8 1½
£4 8 1½

6d. = ½s. 94 at 11½d.
4 = ⅓ 47
1½ = ¼ 31 4
11 9
2,0)9,0 1
£4 10 1

6d. = ½s. 94 at 11¾d.
4 = ⅓ 47
1½ = ¼ 31 4
¼ = ⅙ 11 9
1 11½
2.0)9.2 0½
£4 12 0½

13.

1s. = £1/20 96 at 12d.
£4 16 0

1s. = £1/20 96 at 12¼d.
¼d. = 1/480 4 16
2
£4 18

1s. = £1/20 96 at 12½d.
½d. = 1/240 4 16
0 4
£5 0

13. 1s. = £1/20 96 at 12¾d.
¾d. = 1/160 4 16
6
£5 2

14.

1s. = £1/20 100 at 1s. 1¼d.
1d. = 1/120 5
¼ = ¼ 0 8 4
0 2 1
£5 10 5

15.

2s. = £1/10 200 at 2s. 2½d.
2d. = 1/120 20
½ = ¼ 1 13 4
0 8 4
£22 1 8

16.

2s. = £1/10 256 at 3s. 3¾d.
1s.3d. = 1/160 25 12
¾ = 1/320 16
0 16
£42 8

17. 4s. = £⅕ 40 at 4s. 4¼d.
4d. = 1/120 8
¼ = 1/480 0 13 4
0 0 10
£8 14 2

18. 5s. = £¼ 37 at 5s. 5½d.
5d. = 1/120 9 5
½ = 1/240 0 15 5
0 1 6½
£10 1 11½

19. 4s. = £$\frac{1}{5}$ 24 at 6s. 6¼d.

2s. 6d.	=	$\frac{1}{8}$	4	16
			3	0
¼	=	$\frac{1}{120}$	0	0 6
			£7	16 6

20.

5s. = £$\frac{1}{4}$ 19 at 7s. 7½d.

2s. 6d.	=	$\frac{1}{2}$	4	15
1½	=	$\frac{1}{20}$	2	7 6
			0	2 4½
			£7	4 10½

21.

6s. 8d. = £$\frac{1}{3}$ 12 at 8s. 8¾d.

2s.	=	$\frac{1}{10}$	4	
			1	4
¾d.	=	$\frac{1}{32}$	0	0 9
			£5	4 9

22. 5s. = £$\frac{1}{4}$ 18 at 9s. 9¼d.

4	=	$\frac{1}{5}$	4	10
6d.	=	$\frac{1}{8}$	3	12
3	=	$\frac{1}{2}$	0	9
¼	=	$\frac{1}{12}$	0	4 6
			0	0 4½
			£8	15 10½

23.

10s. = £$\frac{1}{2}$ 300 at 10s. 10½d.

10d.	=	$\frac{1}{12}$	150	
½	=	$\frac{1}{20}$	12	10
			0	12 6
			£163	2 6

24.

10s. = £$\frac{1}{2}$ 408 at 11s. 11¾d.

1s. 8d.	=	$\frac{1}{6}$	204	
3	=	$\frac{1}{40}$	34	
¾	=	¼	5	2
			1	5 6
			£244	7 6

25.

10s. = £$\frac{1}{2}$ 50 at 12s. 1¼d.

2	=	$\frac{1}{5}$	25	
1d.	=	$\frac{1}{240}$	5	
¼	=	¼	0	4 2
			0	1 0½
			£30	5 2½

26.

10s. = £$\frac{1}{2}$ 55 at 13s. 2½d.

2s. 6d.	=	¼	27	10
7½	=	¼	6	17 6
1	=	$\frac{1}{30}$	1	14 4½
			0	4 7
			£36	6 5½

27.

10s. = £$\frac{1}{2}$ 68 at 14s. 3¼d.

4	=	$\frac{1}{5}$	34	
3d.	=	$\frac{1}{16}$	13	12
¼	=	$\frac{1}{12}$	0	17
			0	1 5
			£48	10 5

28.

10s. = £$\frac{1}{2}$ 54 at 15s. 4½d.

5	=	¼	27	
3d.	=	$\frac{1}{20}$	13	10
1½	=	¼	0	13 6
			0	6 9
			£41	10 3

29.

10s. = £$\frac{1}{2}$ 490 at 16s. 5½d.

5	=	½	245	
1	=	$\frac{1}{5}$	122	10
5d.	=	$\frac{1}{12}$	24	10
¼	=	$\frac{1}{20}$	10	4 2
			0	10 2½
			£402	14 4½

30.

10s.	= £$\frac{1}{2}$	454 at 17s. 6$\frac{1}{2}$d.			
6s. 8d.	= $\frac{1}{3}$	227			
10	= $\frac{1}{3}$	151	6	8	
$\frac{1}{2}$	= $\frac{1}{20}$	18	18	4	
		0	18	11	
		£398	3	11	

31.

10s.	= £$\frac{1}{2}$	898 at 18s. 7$\frac{3}{4}$d.			
5s.	= $\frac{1}{2}$	449			
3s. 4d.	= $\frac{1}{3}$	224	10		
3	= $\frac{1}{20}$	149	13	4	
$\frac{3}{4}$	= $\frac{1}{4}$	11	4	6	
		2	16	1$\frac{1}{2}$	
		£837	3	11$\frac{1}{2}$	

32.

10s.	= £$\frac{1}{2}$	405 at 19s. 8$\frac{1}{4}$d.			
5	= $\frac{1}{2}$	202	10		
4	= $\frac{1}{5}$	101	5		
8d.	= $\frac{1}{6}$	81			
$\frac{1}{4}$	= $\frac{1}{32}$	13	10		
		0	8	5$\frac{1}{4}$	
		£398	13	5$\frac{1}{4}$	

33.

10s.	= £$\frac{1}{2}$	276 at £1, 14s.			
4	= $\frac{1}{5}$	138			
		55	4		
		£469	4		

34.

			£	s.	d.
10s.	= £$\frac{1}{2}$	358 at	3	18	4
		3			
5	= $\frac{1}{2}$	1074			
3s. 4d.	= $\frac{1}{3}$	179			
		89	10		
		59	13	4	
		£1402	3	4	

35.

			£	s.	d.
4s.	= £$\frac{1}{5}$	541 at	2	6	8$\frac{1}{4}$
		2			
		1082			
2	= $\frac{1}{2}$	108	4		
8d.	= $\frac{1}{3}$	54	2		
$\frac{1}{4}$	= $\frac{1}{32}$	18	0	8	
		0	11	3$\frac{1}{4}$	
		£1262	17	11$\frac{1}{4}$	

36.

			£	s.	d.
10s.	= £$\frac{1}{2}$	256 at	5	12	2$\frac{1}{2}$
		5			
		1280			
2	= $\frac{1}{5}$	128			
2d.	= $\frac{1}{12}$	25	12		
$\frac{1}{2}$	= $\frac{1}{4}$	2	2	8	
		0	10	8	
		£1436	5	4	

37.

			£	s.	d.
2s.	= £$\frac{1}{10}$	842 at	4	2	6$\frac{3}{4}$
		4			
		3368			
6d.	= $\frac{1}{4}$	84	4		
$\frac{3}{4}$	= $\frac{1}{8}$	21	1		
		2	12	7$\frac{1}{2}$	
		£3475	17	7$\frac{1}{2}$	

38.

5s.	= £$\frac{1}{4}$	273 at £1, 9s. 4d.			
4	= $\frac{1}{5}$	68	5		
4d.	= $\frac{1}{12}$	54	12		
		4	11		
	$\frac{1}{4}$ =	0	7	4	
		£400	15	4	

39.

		£	s.	d.
10s. = £½	751 at	2	17	10
	2			
	1502			
5 = ½	375	10		
2 = ⅕	187	15		
8d. = ⅓	75	2		
2 = ¼	25	0	8	
	6	5	2	
½ =	1	8	11	
	£2173	1	9	

40.

10s. = £½ £408 at 15s. 6d.

5 = ½	204		
6d. = 1/10	102		
	10	4	
¾ =	0	11	7½
	£316	15	7½

41.

		£	s.	d.
10s. = £½	762 at	1	12	6
2s. 6d. = ¼	381			
	95	5		
⅛ =		19	6	
	£1239	4	6	

42.

6s. 8d. = £⅓ 231 at 7s. 9½d.

1s. = 1/20	77			
1½d. = 1/8	11	11		
	1	8	10½	
⅛ =		4	10¼	¾
	£90	4	8¾	¾

43.

2 pks. = ½ bush. 14s. 6d.

			7
	5	1	6
1 pk. = ½		7	3
		3	7½
	£5	12	4½

44.

2 ro. = ½ ac. £2, 10s. 6d.

			6
	15	3	0
			5
	75	15	0
1 ro. = ⅛ ac.	1	5	3
20 po. = ½ ro.		12	7½
		6	3¾
	£77	19	2¼

45.

2 qts. = ½ gal. £2, 8s. 6d.

			4
	9	14	0
			5
	48	10	0
1 qt. = ½ gal.	1	4	3
1 pt. = ½ qt.		12	1½
		6	0¾
	£50	12	5¼

46. 2 qrs. = ½ cwt. £4, 5s. 8d.

			6
	25	14	0
			4
	102	16	0
14 lb. = ¼ of 2 qr.	2	2	10
	0	10	8½
	£105	9	6½

47.

2 qrs. = ½ cwt. £3, 18s. 6d.

8

	31	8	0	
1 qr. = ½	1	19	3	
14 lb. = ½ qr.		19	7½	
2 = ⅐		9	9¾	
		1	4¾	2/7
	£34	18	1¼	2/7

48.

1 qr. = ¼ cwt. £2, 16s. 10d.

16

	45	9	4	
14 lb. = ½	0	14	2½	
4 = ⅐		7	1¼	
		2	0¼	3/7
	£46	12	8¼	3/7

49. 2 qrs. = ½ £3, 18s. 4½d.

87

	340	18	7½	
1 qr. = ½	1	19	2¼	
16 lb. = ⅐	0	19	7¼	7/14
4 = ¼	0	11	2¼	6/14
	0	2	9½	5/14
	£344	11	4¾	2/7

50. 2 qrs. = ½ £4, 1s. 7½d.

129

	526	9	7½		
14 lb. = ¼	2	0	9¾		
7 = ⅛	0	10	2¼	4/5	2/8
4 = 1/14		5	1¼	4/5	2/8
2 = ⅛		2	10¾	5/5	2/8
		1	5¼	5/5	4/8
	£529	10	1¼	5/5	3/8

51. 4 oz. = ⅓ £3, 6s. 0d.

29

	95	14	0		
16 dwt. = ⅓	1	2	0		
	0	4	4¾	1/3	
	£97	0	4¾	1/3	

52. 6 oz. = ½ £0, 8s. 6d.

31

	13	3	6		
1 oz. = 1/16		4	3		
10 dwt. = ½		0	8½		
2 dwt. 12 gr. = ¼			4¼		
4 grs. = 1/124			1/4	1/4	
			0/4	1/80	
	£13	8	10¾	1/8	

53. 2 qrs. = ½ £1, 12s. 6½d.

6

	9	15	3		
			6		
	58	11	6		
1 qr. = ½	0	16	3¼		
1 nail = ¼		8	1½	1/2	
		2	0¼	5/8	
	£59	17	11¼	1/8	

54. 2 bu. = ¼ £3, 17s. 10½d.

59

	229	14	7½		
1 = ⅕	0	19	5½	1/2	
2 pks. = ½		9	8¾	1/4	
1 pk. = ½		4	10¼	6/8	
		2	5/4	1/8	
	£231	11	1½	3/8	

55.

2 ro.	= ½	£4,	15s.	6d.
				540
		2578	10	0
20 per.	= ¼	2	7	9
10	= ½	0	11	11¼
8	= 1/10		5	11½ ½
			4	9¼ ⅕
		£2582	0	5¼ 7/10

56.

3 ft.	= ⅓	£0,	15s.	6½d.
				784
		609	4	8
3	= ⅓		5	2¼ ⅔
			5	2¼ ⅔
36 in.	= 1/12		0	5¼ ⅛
		£609	15	5½ 1/18

57.

2 qrs.	= ½	£4,	18s.	6¾d.
				963
		4745	15	8¼
14 lb.	= ¼	2	9	3¼ ⅓
7	= ½	0	12	3¾ ⅜
4	= 1/14		6	1¾ 1/16
			3	6¼ 2/7
		£4749	6	11⅛ 5/112

58.

			£	s. d.
10s.	= ½	798 4/15 at	3	17 6
		3		
		2394		
5	= ½	399		
2s. 6d.	= ½	199	10	
		99	15	
		4/15 = 1	0	8
		£3093	5	8

59.

			£	s. d.
10s.	= ½	206 5/17 at	1	16 10
		1		
		206		
6s. 8d.	= ⅓	103		
2	= 1/40	68	13	4
			14	4
		5/17 = 1	10	10
		£379	18	6

60.

			£	s. d.
10s.	= ½	509 3/20 at	15	16 8
		15		
		2545		
		509		
		7635		
6s. 8d.	= ⅓	254	10	
		169	13	4
		3/20 = 2	7	6
		£8061	10	10

TARE AND TRET.

1. 2 cwt. 1 qr. 12 lb. gross.

		1	4
2		0	8
			3
6		0	24
			5
31		0	8 net weight.

2. 7 lb. = $\frac{1}{16}$ 95 cwt. 2 qrs. 8 lb. gross.

		5	3	25 tare.
4	= $\frac{1}{28}$	89	2	11 tare suttle.
		3	1	$21\frac{2}{7}$ tret.
2	= $\frac{1}{112}$	86	0	$17\frac{1}{28}$ tret suttle.
		0	2	$1\frac{6}{14}\frac{3}{56}$ cloff.
		85	2	$15\frac{8}{14}\frac{7}{56}\frac{9}{28}$ net weight.

3. 3 cwt. 1 qr. 5 lb. gross.

				7
14 lb.	= $\frac{1}{8}$ cwt.	23	0	7
		2	3	$14\frac{2}{3}\frac{8}{2}$
$3\frac{1}{2}$	= $\frac{1}{4}$		2	$24\frac{2}{3}\frac{3}{2}$
		3	2	$11\frac{1}{3}\frac{9}{2}$ tare.
$\frac{4}{112}$	= $\frac{1}{28}$	19	1	$23\frac{1}{3}\frac{3}{2}$ tare suttle.
			2	$27\frac{6}{8}\frac{8}{3}\frac{5}{2}$ tret.
		18	2	$23\frac{4}{8}\frac{8}{3}\frac{5}{2}$ net weight.

4. 15 cwt. 3 qrs. 14 lb. gross.

			1	14 tare.
		15	2	0 tare suttle.
				14
		217	0	0
$\frac{1}{28}$	=	8	1	$10\frac{1}{1}\frac{2}{3}$ tret.
		208	2	$17\frac{3}{1}\frac{3}{3}$ tret suttle.
$\frac{1}{112}$	=	1	0	$27\frac{4}{3}\frac{3}{3}$ cloff.
		207	1	$18\frac{5}{3}\frac{5}{3}$ net weight.

5. 1 cwt. 3 qrs. 10 lb.

19

	34	3	22	gross.
8 lb. = $\frac{1}{14}$ =	2	1	$27\frac{4}{7}$	tare.
	32	1	$22\frac{3}{7}$	tare suttle.
$\frac{1}{28}$ =	1	0	$27\frac{14}{28}\frac{3}{2}$	tret.
	31	0	$22\frac{3}{14}$	tret suttle.
$\frac{1}{28}$ =	0	0	$20\frac{18}{28}\frac{8}{5}\frac{5}{2}$	cloff.
	31	0	$1\frac{12}{28}\frac{9}{5}\frac{7}{2}$	net weight.

6. 8 cwt. 3 qrs. 16 lb.

30

	266	3	4	gross.
16 lb. = $\frac{1}{7}$ =	38	0	$12\frac{4}{7}$	
2 = $\frac{1}{8}$ =	4	3	$1\frac{4}{7}$	
	42	3	$14\frac{1}{7}$	tare.
	223	3	$17\frac{6}{7}$	tare suttle.
$\frac{1}{28}$ =	8	2	$12\frac{9}{14}\frac{7}{2}$	tret.
	215	1	$5\frac{5}{14}\frac{9}{2}$	tret suttle.
$\frac{1}{28}$ =	1	1	$3\frac{5}{10}\frac{4}{1}\frac{1}{3}\frac{9}{2}$	cloff.
	214	0	$1\frac{8}{10}\frac{0}{1}\frac{7}{3}\frac{7}{2}$	net weight.

7. 2 cwt. 2 qrs. 22 lb. gross.

0	0	3	tare.
2	2	19	tare suttle.

12

32	0	4	
$\frac{1}{28}$ = 1	0	26	tret.
30	3	6	tret suttle.
$\frac{1}{28}$ = 0	0	$20\frac{15}{28}$	cloff.
30	2	$13\frac{13}{28}$	net weight,

or 3429$\frac{13}{28}$ lbs. at 1s. 3¼d. = £217, 18s. 3¼d. $\frac{9}{28}$.

8. 16 lb. = $\frac{1}{7}$ cwt. 10 cwt. 1 qr. 11 lb. gross.

2 = $\frac{1}{8}$

1	1	$25\frac{4}{7}$
		$20\frac{3}{28}$
1	2	$18\frac{15}{28}$ tare.
8	2	$20\frac{4}{28}$ net weight of the oil, then

$7\frac{1}{2}$ lb : 8 cwt. 2 qrs $20\frac{1}{56}$ lbs. : : 1 g.

4	4
30	34
14	28
420	292
	68
	972
	56
	54473

54473 ÷ 420 = $129\frac{293}{420}$ gallons of oil.

PARTNERSHIP.

1. 1 + 2 + 3 = 6 : 1 : : £140 : £23, 6s. 8d.
6 : 2 : : 140 : 46 13 4
6 : 3 : : 140 : 70 0 0
£140 0 0 proof.

The 2d and 3d answers might have been found by multiplying the 1st by 2 and 3.

2. 30 + 40 + 56 = 126, then
126 : 30 : : £130 : £30, 19s. $0\frac{4}{7}$d. $\frac{5}{21}$ A's share.
126 : 40 : : 130 : 41 5 $4\frac{3}{4}$ $\frac{1}{21}$ B's share.
126 : 56 : : 130 : 57 15 $6\frac{1}{2}$ $\frac{14}{21}$ C's share.

3. 250 + 280 + 300 + £102, 10s. = £932, 10s.

				£	s.	d.	
£932, 10s. :	£250	: :	£600 :	160	17	$1\frac{3}{4}$ $\frac{22}{37}\frac{1}{3}$	B's.
932, 10s. :	280	: :	600 :	180	3	$2\frac{1}{2}$ $\frac{15}{37}\frac{8}{3}$	C's.
932, 10s. :	300	: :	600 :	193	0	7 $\frac{1}{37}\frac{6}{3}$	D's.
932, 10s. :	102, 10s.	: :	600 :	65	19	$0\frac{1}{4}$ $\frac{25}{37}\frac{1}{3}$	E's.

4. 300 + 350 + 200 = 850, then

£850 :	300	: :	200 :	70 ac.	2 ro.	$14\frac{2}{17}$ po. R's.
850 :	350	: :	200 :	82	1	$16\frac{8}{17}$ S's.
850 :	200	: :	200 :	47	0	$9\frac{7}{17}$ T's.

5. $3 + 5 + 8 = 16$, then

16 : 3 : :	£200 :	£37, 10s.	A's stock.
16 : 5 : :	200 :	62, 10s.	B's stock.
16 : 8 : :	200 :	100	C's stock.

6. C has 7 shares out of 84, which is equal to $\frac{1}{12}$, wherefore £21804, 16s. $0\frac{1}{2}$d. $\div$ 12 = £1817, 1s. $4\frac{0}{4}$d. $\frac{1}{8}$ C's share.

7. $(12 \times 3\frac{1}{2}) + (8 \times 8\frac{1}{2}) + (10 \times 5) = 42 + 68 + 50 = 160$, then

160 : 42 : :	£30, 10s. :	£8, 0s.	$1\frac{1}{2}$d.	A.
160 : 68 : :	30 10 :	12 19	3	B.
160 : 50 : :	30 10 :	9 10	$7\frac{1}{2}$	C.

8. First A's proportional part $= 250 \times 8 + (250 + 80) \times 8 = 2000 + 2640 = 4640$, and B's $= 360 \times 12 + (360 - 90) \times 4 = 4320 + 1080 = 5400$, and their sum is 10040, therefore

10040 : 4640 :	£510 :	£235,	13s.	$11\frac{1}{4}$d.	$\frac{81}{251}$	A's gain.
10040 : 5400 : :	510 :	274	6	$0\frac{1}{2}$	$\frac{170}{251}$	B's gain.

9. $500 \times 4 + (500 + 150) \times 2 + (650 - 350) \times 6 = 2000 + 1300 + 1800 = 5100$ A's proportional; $300 \times 6 + (300 + 400) \times 3 + (700 - 600) \times 3 = 1800 + 2100 + 300 = 4200$ B's proportional; and $200 \times 12 = 2400$ C's proportional; now $5100 + 4200 + 2400 = 11700$, and $500 - 150 = £350$, the sum to be divided among the three, whence

11700 : 5100 : : 350 :	£152,	11s.	$3\frac{6}{13}$d.		A's share of gain.
11700 : 4200 : : 350 :	125	12	$9\frac{11}{13}$		B's share of it.
11700 : 2400 : : 350 :	71	15	$10\frac{10}{13}$		C's proportional share, and this added to £150, gives £221, 15s. $10\frac{10}{13}$d. or what C receives altogether.

10. Since the values of the land allotted to each claimant are respectively 20s. 25s. 30s. 40s. 50s. and 60s. per

acre, it is evident, had their estates been equal in value, that he who got land at 20s. was entitled to 3 times as much as he who got land at 60s.; hence when the values of their estates are unequal, their shares must be as the values of their estates, divided by the value of the land which they receive, or as 75, 80, 100, 90, 80, and 80; now the sum of these is 505; therefore

		ac.	ro.	per.		ac.	ro.	per.	
505 :	75	: : 500	2	30	:	74	1	$17\frac{53}{101}$	share of the 1st.
505 :	80	: : 500	2	30	:	79	1	$10\frac{70}{101}$	share of 2, 5, & 6.
505 :	100	: : 500	2	30	:	99	0	$23\frac{37}{101}$	share of the 3d.
505 :	90	: : 500	2	30	:	89	0	$37\frac{30}{101}$	share of the 4th.

11. A pays $£\frac{8}{20} = 8$s. for one ox; B $£\frac{12}{6} = 9\frac{3}{5}$s. for one ox; C $£\frac{10}{16} = 12\frac{1}{2}$s. for one ox; and D $£\frac{10}{30} = 6\frac{2}{3}$s. for one ox; now $8 + 9\frac{3}{5} + 12\frac{1}{2} + 6\frac{2}{3} = 36\frac{23}{30}$s. paid for one ox in 6 months, whence

$36\frac{23}{30}$:	8	: : 6 :	$1_{11}^{3}{}_{10}^{3}{}_{3}^{7}$	months,	A's oxen continued.
$36\frac{23}{30}$:	$9\frac{3}{5}$	: : 6 :	$1_{11}^{6}{}_{10}^{2}{}_{3}^{5}$	months,	B's oxen continued.
$36\frac{23}{30}$:	$12\frac{1}{2}$	: : 6 :	$2_{11}^{4}{}_{10}^{4}{}_{3}$	months,	C's oxen continued.
$36\frac{23}{30}$:	$6\frac{2}{3}$	: : 6 :	$1_{11}^{8}{}_{10}^{7}{}_{3}$	months,	D's oxen continued.

SIMPLE INTEREST.

1. £85
5
4,25
20
5,00
Ans. £4, 5s.
or $5 = \frac{1}{20}$) £85
£4, 5s.

2. £108, 10s.
4
£4,34 0
20
6,80
12
9,60
4
$2,\frac{40}{100}$
Ans. £4, 6s. $9\frac{1}{2}$d. $\frac{2}{5}$.

3. £1000
$4\frac{1}{2}$
4000
500
£45,00

4. £40, 10s.
$3\frac{1}{2}$
121 10
20 5
100)141 15
£1 8 $4\frac{9}{4}$d. $\frac{4}{5}$ Int. for
3 a year.
4 5 $0\frac{1}{2}$ $\frac{2}{5}$ for 3 y.
40 10 0
£44 15 $0\frac{1}{2}$ $\frac{2}{5}$ amount.

5. 5)£119 1s. 8d.
23 16 4

6. $\frac{1}{5\,0}$ £450 8 6
$\frac{2}{4} = \frac{1}{2}$ 22 10 $5\frac{0}{4}$ $\frac{4}{1\,0}$
4
90 1 $8\frac{1}{4}$ $\frac{6}{1\,0}$
$\frac{1}{4} = \frac{1}{2}$ of $\frac{2}{4}$ 11 5 $2\frac{1}{2}$ $\frac{2}{1\,0}$
5 12 $7\frac{1}{4}$ $\frac{1}{1\,0}$
£106 19 $6\frac{0}{4}$ $\frac{9}{1\,0}$

7. $\frac{1}{4}$)£342 16 9
£85 14 $2\frac{1}{4}$

8. $\frac{1}{5\,0}$)£815 10 0
$\frac{1}{4}$)42 5 6
£10 11 $4\frac{1}{2}$

9. $\frac{1}{5\,0}$ £218 10 10
6 m. = $\frac{1}{2}$ y. 4 19 5
2 = $\frac{1}{3}$ 2 9 $8\frac{1}{2}$
0 16 $6\frac{3}{4}$ $\frac{1}{3}$
£3 6 $3\frac{1}{4}$ $\frac{1}{3}$

10. 345
$2\frac{1}{2}$
690
172 10
8,62 10
20
12,50
12
6,00
£8 12 6 Ans.

11. £295 8 4
3
8,86 5 0
20
17,25
12
3,00

now 6 m. = $\frac{1}{2}$ y. £8 17 3
4 = $\frac{1}{3}$ 4 8 $7\frac{1}{2}$
2 19 1
£7 7 $8\frac{1}{2}$

12. £360
$2\frac{1}{2}$
720
180
26 weeks = $\frac{1}{2}$ year.)9,00
£1, 10s.

13.

4s. = £$\frac{1}{5}$ £152

6d. = $\frac{1}{8}$ 30 8

3 16

34 4

20

6,84

12

10,08

4

$\frac{32}{100}$ = $\frac{8}{25}$ Ans. 6s. 10$\frac{8}{25}$d.

14. £240

4$\frac{1}{4}$ now 26 w. = $\frac{1}{2}$ y. £10, 4s.

960 2 = $\frac{1}{13}$ 5 2

60 7 10$\frac{2}{13}$

10,20 £5 9 10$\frac{2}{13}$

20

4,00

15. £195, 5s. × 10$\frac{1}{2}$ ÷ 100 = £2050, 2s. 6d. ÷ 100 = £20, 10s. 0$\frac{1}{4}$d. $\frac{1}{8}$.

16. £710 × 103$\frac{5}{8}$ ÷ 100 = £73573, 15s. ÷ 100 = £735, 14s. 9d.

17. £918, 14s. × 127$\frac{3}{4}$ ÷ 100 = 117363, 18s. 6d. ÷ 100 = £1173, 12s. 9$\frac{1}{4}$d. $\frac{17}{20}$.

18. £816 × 85$\frac{3}{8}$ ÷ 100 = £69666 ÷ 100 = £696, 13s. 2$\frac{1}{4}$d. $\frac{2}{3}$.

19. £2018, 15s. 6d. × 140$\frac{1}{4}$ ÷ 100 = £283133, 3s. 10$\frac{1}{2}$d. ÷ 100 = £2831, 6s. 7$\frac{1}{2}$d. $\frac{33}{50}$.

20. £8000 × 100 ÷ 213 = £3755, 17s. 4$\frac{1}{4}$d. $\frac{57}{71}$ stock.

21. £1000 × 100 ÷ 72$\frac{1}{4}$ = £1384, 1s. 7$\frac{3}{4}$d. $\frac{209}{289}$ stock.

22. £8500 × 100 ÷ 96$\frac{1}{2}$ = £8808, 5s. 9$\frac{1}{2}$d. $\frac{106}{193}$ stock.

23. £100 × 3 ÷ 63$\frac{1}{3}$ = £4$\frac{14}{19}$ per cent.

24. £100 × 4 ÷ $90\frac{3}{8}$ = £$4\frac{3}{7}\frac{0}{2}\frac{8}{3}$ per cent.

25. £100 × 4 ÷ 5 = £80 per cent.

26. £100 × 3 ÷ 5 = £60 per cent.

27. £1000, 10s. 6d. × 12 ÷ 7300 = £12006, 6s. ÷ 7300 = £1, 12s. $10\frac{1}{2}$d. $\frac{1}{1}\frac{6}{8}\frac{6}{2}\frac{2}{5}$.

28. £345 × 80 ÷ 7300 = £27600 ÷ 7300 = £3, 15s. $7\frac{1}{4}$d. $\frac{4}{7}\frac{3}{3}$.

29. £250, 10s. 6d. × 40 × 7 ÷ 73000 = 70147 ÷ 73000 = 19s. $2\frac{1}{2}$d. $\frac{8}{1}\frac{7}{8}\frac{8}{2}\frac{}{5}$ interest + £250, 10s. 6d. = £251, 9s. $8\frac{1}{2}$d. $\frac{8}{1}\frac{7}{8}\frac{8}{2}\frac{}{5}$ amount.

30. May 19 + June 30 + July 31 + Aug. 31 + Sept. 30 + Oct. 31 + Nov. 19 = 191 days, and 191 × £184 ÷ 7300 = 35144 ÷ 7300 = £4, 16s. $3\frac{1}{4}$d. $\frac{2}{3}\frac{4}{6}\frac{7}{5}$.

31. £408 × 60 × 8 ÷ 73000 = 195840 ÷ 73000 = £2, 13s. $7\frac{3}{4}$d. $\frac{1}{3}\frac{5}{6}\frac{7}{5}$.

32. £245, 16s. × $2\frac{1}{2}$ ÷ 100 = £614, 10s. ÷ 100 = £6, 2s. $10\frac{3}{4}$d. $\frac{1}{5}$, interest for 1 year, and since 73 days = $\frac{1}{5}$ of a year, £6, 2s. $10\frac{3}{4}$d. $\frac{1}{5}$ ÷ 5 = £1, 4s. $6\frac{3}{4}$d. $\frac{2}{5}\frac{1}{5}$.

33. March 26 + April 30 + May 31 + June 30 + July 31 + Aug. 6 = 154 days, and 154 × £351 × 9 ÷ 73000 = 486486 ÷ 73000 = £6, 13s. $3\frac{1}{4}$d. $\frac{1}{1}\frac{1}{8}\frac{3}{2}\frac{2}{5}$.

34.

Dates.		Sums.	Days.	Products.
April 20,	due	400	× 56	= 22400
June 15,	paid	110		
	bal.	290	× 50	= 14500
Aug. 4,	paid	28		
	bal.	262	× 59	= 15458
Oct. 2,	paid	262		

7300)52358(£7, 3s. $5\frac{1}{4}$d. $\frac{1}{3}\frac{5}{6}\frac{2}{5}$.

35.

Dates.		Sums.	Days.		Products.
Jan. 10,	due	£350	× 31	=	10850
Feb. 10,	paid	70			
	bal.	280	× 28	=	7840
Mar. 10,	paid	70			
	bal.	210	× 31	=	6510
Apr. 10,	paid	70			
	bal.	140	× 30	=	4200
May 10,	paid	70			
	bal.	70	× 31	=	2170
June 10,	paid	70			
					31570
					9

73,000)284,130

Interest, £3, 17s. 10d. $\frac{4}{73}$.

36.

Dates.		Sums.	Days.		Products.
April 4,	due	£1000	× 36	=	36000
May 10,	paid	150			
	bal.	850	× 63	=	53550
July 12,	paid	250			
	bal.	600	× 68	=	40800
Sept. 18,	paid	300			
	bal.	300	× 53	=	15900
Nov. 10,	paid	100			
	bal.	200	× 71	=	14200
Jan. 20,	paid	150			
	bal.	50	× 43	=	2150
	Int.	20	0 11		162600
March 4,	paid	70	0 11		9

73,000)1463,400

Interest, £20, 0s. 11$\frac{3}{73}$d.

37.

Dates.	Dr. or Cr.	Sums.	Days.	Dr. Prod.	Cr. Prod.
Jan. 8.	Dr.	100	37	3700	
Feb. 14	Dr.	114			
	Dr.	214	29	6206	
Mar. 15.	Cr.	250			
	Cr.	36	40		1440
April 24.	Dr.	400			
	Dr.	364	36	13104	
May 30	Cr	100			
	Dr.	264	19	5016	
June 18.	Dr.	70			
	Dr.	334	14	4676	
July 2.	Cr.	400			
	Cr.	66	28		1848
	Due to M. N.	32702			3288 due to B. D.
		8			10 double the rate.
		261616			32880
		32880			

73000)228736(£3, 2s. 8d. $\frac{16}{25}$ int. due to M. N.

9736

194720s.

48720

584640d.

640

73000 = $\frac{16}{25}$.

38.

Dates.	Dr. or Cr.	Sums.	Days.	Dr. Prod.	Cr. Prod.
April 3.	Dr.	£135	59	7965	
June 1.	Cr.	397			
	Cr.	262	45		11790
July 16.	Dr.	270			
	Dr.	8	54	432	
Sept. 8.	Cr.	214			
	Cr.	206	42		8652
Oct. 20.	Dr.	258			
	Dr.	52	24	1248	
Nov. 13.	Cr.	128			
	Cr.	76	32		2432
Dec. 15.	Dr.	460			
	Dr.	384	17	6528	
Jan. 1.	Dr.	231			
	Dr.	615	29	17835	
—— 30.	Cr.	296			
	Dr.	319	47	14993	
Mar. 18.	Cr.	374			
31.	Cr.	55	13		715
				49001	23589
				9	10
				441009	235890
				235890	
			73,000	205,119	

£2, 16s. 2¼d. $\frac{8191}{18250}$.

39.

		£	s.	d.
Jan. 1, 1824, Bond due, of		£500,	0s.	0d.
Add Interest at 5 per cent. for 498 days,		34	2	2¼
	Amount,	534	2	2¼
May 14, 1825, Paid in part,		100	0	0
	Balance,	434	2	2¼
Interest on do. for 331 days,		19	13	8
	Amount,	453	15	10¼
April 10, 1826, Paid in part,		200	0	0
	Balance,	253	15	10¼
Interest on do. for 417 days,		14	9	11½
	Amount,	268	5	9¾
Jan. 1, 1827, Paid in part,		150	0	0
	Balance,	118	5	9¾
Interest on it for 426 days,		6	18	0¾
Aug. 1, 1828, Paid the	Amount,	125	3	10½

40.

		£	s.	d.
May 14, 1825, Bor. on bond at 4½ per cent.		£700	0	0
Add Interest on it for 383 days,		33	1	0¾
	Amount,	733	1	0¾
June 1, 1826, Paid in part,		250	0	0
	Balance,	483	1	0¾
Interest on it for 394 days,		23	9	3½
	Amount,	506	10	4¼
June 30, 1827, Paid in part,		200	0	0
	Balance,	306	10	4¼
Interest on it for 375 days,		14	3	5
	Amount,	320	13	9¼
July 10, 1828, Paid in part,		200	0	0
	Balance,	120	13	9¼
Interest on it for 437 days,		6	10	0½
Sept. 20, 1829, Paid the	Amount,	127	3	9¾

DISCOUNT.

1. First 365da. : 100 da. : : £5 : £1, 7s. $4\frac{3}{4}$d. int. of £100 for 100 days. Then £101, 7s. $4\frac{3}{4}$d. : £100 : : £240 : £236, 15s. $1\frac{1}{2}$d. $\frac{1}{1}\frac{2}{9}\frac{5}{4}\frac{8}{6}\frac{2}{5}$, the present worth.

2. First 365 days : 48 da. : : £5 : 13s. $1\frac{3}{4}$d. int. of £100 for 48 days. Then £100, 13s. $1\frac{3}{4}$d. : £100 : : £560, 10s. : £556, 16s. $9\frac{1}{2}$d. $\frac{3}{8}\frac{2}{6}\frac{8}{6}\frac{5}{3}\frac{4}{1}$, the present worth.

3. First 365 da. : 70 da. : : £5 : 19s. 2d. int. of £100 for 70 days. Then £100, 19s. 2d. : 19s. 2d. : : £1000 : £9, 9s. 10d. $\frac{4}{5}\frac{0}{4}\frac{6}{2}\frac{}{3}$, the discount.

4. First 365 da. : 184 da. : : £3, 10s. : £1, 15s. $3\frac{1}{2}$d. Then £101, 15s. $3\frac{1}{2}$d. : £1, 15s. $3\frac{1}{2}$d. : : £284, 8s. 6d. : £4, 18s. $7\frac{1}{2}$d. $\frac{2}{4}\frac{3}{8}\frac{9}{8}\frac{5}{4}\frac{8}{7}$, the discount.

5. 365 da. : 350 da. : : £5 : £4, 15s. $10\frac{1}{2}$d. Then £104, 15s. $10\frac{1}{2}$d. : £100 : : £842, 5s. : £803, 14s. 5d. $\frac{5}{1}\frac{4}{8}\frac{1}{6}\frac{}{3}$, the present worth.

EQUATION OF PAYMENTS.

1. £100 × 50 = 5000
   130 × 40 = 5200
   230 × 140 = 32200
   460)42400(92$\frac{4}{2}\frac{}{3}$ days.

2. £60 × 40 = 2400
   180 × 96 = 17280
   50 × 200 = 10000
   190 × 410 = 77900
   480)107580(224$\frac{1}{8}$ days.

3. $\{(100 \times 60) + (200 \times 8) + (350 \times 180) + (500 \times 365)\} \div (100 + 200 + 350 + 500) = 267500$ and $267500 \div 1150 = 232\frac{1}{2}\frac{4}{3}$ days, the equated time.

COMPOUND INTEREST.

1. $\frac{1}{20}$ £200 — 1st year's principal
10 — interest add
$\frac{1}{20}$ 210 — 2d year's principal
10 10 — interest add
$\frac{1}{20}$ 220 10 — 3d year's principal
11 0 6 — interest add
231 10 6 — Amount.
200 0 0 — Principal.
£31, 10s. 6d. — Interest.

2. $\frac{1}{20}$ £300 — 1st year's principal
15 — interest add
$\frac{1}{20}$ 315 — 2d year's principal
15 15 — interest add
$\frac{1}{20}$ 330 15 — 3d year's principal
16 10 9 — interest add
$\frac{1}{20}$ 347 5 9 — 4th year's principal
17 7 $3\frac{1}{4}$ $\frac{4}{5}$ — interest add
£364, 13s. $0\frac{1}{4}$d. $\frac{4}{5}$ — Amount.

3. $\frac{1}{25}$ £500 — 1st year's principal
20 — interest add
$\frac{1}{25}$ 520 — 2d year's principal
20 16 — interest add
$\frac{1}{25}$ 540 16 — 3d year's principal
21 12 $7\frac{1}{2}$ $\frac{18}{25}$ — interest add
£562 8 $7\frac{1}{2}$ $\frac{18}{25}$ — Amount.
500 0 0 — Principal.
£62 8 $7\frac{1}{2}$ $\frac{18}{25}$ — Interest.

4. £240, 10s.

3

7,21 10

20

4,30

12

3,60

4

2,40

£240, 10s. 1st year's principal

7 4 3½d. interest add

24 11 3½ 2d year's principal

3

7,43 2 10½

20

8,62

12

7,54

4

2,18

£247, 14s. 3½d. 2d year's principal

7 8 7½ interest add

255 2 11 3d year's principal

3

7,65 8 9

20

13,08

12

1,05

2)£7, 13s. 1d.

3 16 6½ interest for ½ year

255 2 11 3d year's principal

£258 19 5½ Amount.

5. £129, 15s. 0d.

4½

519 0 0

64 17 6

£5,83 17 6

20

16,77

12

9,30

4

1,20

£129, 15s. 0d.

5 16 9¼

135 11 9¼

4½

542 7 1

67 15 10½

£6,10 2 11½

20

2,02

12

35

4

1,40

£135, 11s. 9¼d.

6 2 0¼

141 13 9¼

4½

566 14 2

70 16 10¾

6,37 11 0¾

20

7,51

12

6,12

£141, 13s. 9½d.
6 7 6
148 1 3½
4½
592 5 2
74 0 7¾
£6,66 5 9¾
20
13,25
12
3,09

6 m. = ½ year
3 m. = ¼
10 da. = ⅓

£6, 13s. 3d.
3 6 7½
1 13 3¾
0 3 8¼
5 3 7½
148 1 3½
£153 4 11 Amount.
129 15 0 Principal.
£23 9 11 Interest.

PROFIT AND LOSS.

Case I.

1. £63 — £50, 8s. = £12, 12s. gain per hhd. Then £50, 8s. : £12, 12s. :: 100 : £25, gain per cent.

2. 4s 10d. — 4s. 6d. = 4d. Then 4s. 6d. : 4d. :: £100 : £$7\frac{1}{2}\frac{1}{7}$.

3. 18s. 6d. — 15s. 4d. = 3s. 2d. loss per yard. Then 18s. 6d. : 3s. 2d. :: £100 : £$17\frac{1}{1}\frac{3}{1}$.

4. 1s. : 3½d. :: £100 : £$29\frac{1}{8}$.

Case II.

5. 100 : 125 :: £50, 8s. : £63, selling price.

6. 100 : $107\frac{1}{2}\frac{1}{7}$ :: 4s. 6d. : 4s. 10d.

7. 112 lb. : £3, 3s. :: 1 lb. : 6¾d. prime cost per lb. Then 100 : 112 : 6¾d. : 7½d. $\frac{6}{2}$.

8. 100 : $117\frac{1}{1}\frac{1}{7}$ :: 8½d. : 10d.

Case III.

9. $117\frac{1}{1}\frac{1}{7}$: 100 :: 10d. : 8½d. prime cost.

10. 92 : 100 : : 5s. 6d. : 5s. $11\frac{1}{2}$d. $\frac{2}{23}$.

11. £$134\frac{3}{7}$: £100 : : £5, 9s. 8d. : £4, 1s. 8d. and £4, 1s. 8d. ÷ 112 = $8\frac{3}{4}$d. prime cost per lb.

Case IV.

12. 5s. 9d. : 115 : : 6s. : 120, from which subtract 100, there remains £20 gain per cent.

13. 8s. : 112 : : 7s. : 98, which subtracted from 100 leaves £2 loss per cent.

14. 18s. 6d. : 112 : : 16s. 10d. : $102\frac{4}{5}\frac{6}{5}$ from which subtracting 100 we have £$2\frac{4}{5}\frac{6}{5}$ the gain per cent.

15. 5s. 10d. : 84 : : 6s. 3d. : 90 and 100 — 90 = £10, the loss per cent.

VULGAR FRACTIONS.

Reduction.—Problem I.

1. Common measure 60)120(2
   120
   60)$\frac{60}{120}$(= $\frac{1}{2}$.

2. 46)356(7
   34)46(1
   12)34(2
   10)12(1
   Common measure 2)10(5.

3. 2)$\frac{3}{1}\frac{4}{2}\frac{6}{0}$(= $\frac{6}{8}\frac{3}{2}\frac{3}{3}$.
4. 13)$\frac{8}{2}\frac{2}{7}\frac{5}{0}\frac{5}{5}$(= $\frac{2}{5}\frac{7}{0}\frac{5}{3}$.
5. 729)$\frac{7}{8}\frac{2}{2}\frac{9}{6}\frac{9}{1}$(= $\frac{1}{9}$.
6. 78625)$\frac{7}{9}\frac{8}{4}\frac{6}{3}\frac{2}{5}\frac{5}{0}\frac{0}{0}$(= $\frac{1}{12}$.

Problem II.

1. $\frac{5 \times 4 + 3}{4} = \frac{23}{4}$.
2. $\frac{7 \times 5 + 1}{5} = \frac{36}{5}$.

3. $\frac{6 \times 9 + 1}{9} = \frac{55}{9}$.

4. $\frac{8 \times 17 + 16}{17} = \frac{152}{17}$.

5. $\frac{19 \times 27 + 3}{27} = \frac{516}{27}$.

6. $\frac{29 \times 19 + 11}{19} = \frac{562}{19}$.

Problem III.

1. $^{1}\frac{0}{4}{}^{1} = 101 \div 4 = 25\frac{1}{4}$.

2. $146 \div 4 = 36\frac{1}{2}$.

3. $341 \div 14 = 24\frac{5}{14}$.

4. $1425 \div 24 = 59\frac{3}{8}$.

5. $7854 \div 27 = 290\frac{8}{9}$.

6. $54867 \div 371 = 147\frac{3}{3}\frac{3}{7}\frac{0}{1}$.

Problem IV.

1. $\frac{2 \times 3}{3 \times 4} = \frac{6}{12} = \frac{1}{2}$.

2. $\frac{5 \times 2}{3 \times 7} = \frac{10}{21}$.

3. $\frac{4 \times 10 \times 7}{5 \times 13 \times 12} = \frac{280}{780} = \frac{14}{39}$.

4. $\frac{11 \times 13 \times 16}{12 \times 14 \times 23} = \frac{2288}{3864} = \frac{286}{483}$.

5. $\frac{2 \times 4 \times 5 \times 9}{3 \times 7 \times 11 \times 2} = \frac{4 \times 5 \times 3}{7 \times 11} = \frac{60}{77}$.

6. $\frac{5 \times 4 \times 3 \times 106}{9 \times 11 \times 16 \times 13} = \frac{5 \times 53}{3 \times 11 \times 2 \times 13} = \frac{265}{858}$.

Problem V.

1. $\frac{2 \times 8}{5 \times 8}$ and $\frac{7 \times 5}{8 \times 5} = \frac{16}{40}$ and $\frac{35}{40}$, fractions required.

2. $\frac{5 \times 7}{6 \times 7}$ and $\frac{2 \times 6}{7 \times 6} = \frac{35}{42}$ and $\frac{12}{42}$, fractions required.

3. $\frac{1\times4\times9}{2\times4\times9}$, $\frac{2\times3\times9}{2\times4\times9}$, and $\frac{5\times4\times2}{2\times4\times9} = \frac{36}{72}$, $\frac{54}{72}$, and $\frac{40}{72}$, the fractions required.

4. $\frac{5\times9\times15\times21}{8\times9\times15\times21}$, $\frac{4\times8\times15\times21}{8\times9\times15\times21}$, $\frac{8\times8\times9\times21}{8\times9\times15\times21}$, and $\frac{11\times8\times9\times15}{8\times9\times15\times21} = \frac{14175}{22680}$, $\frac{10080}{22680}$, $\frac{12096}{22680}$, and $\frac{11880}{22680}$.

5. $\frac{1}{2}$ of $\frac{3}{4}$, $\frac{4}{5}$, $4\frac{1}{2}$, and $\frac{5}{7} = \frac{3}{8}$, $\frac{4}{5}$, $\frac{9}{2}$, $\frac{5}{7}$, which by the rule are $= \frac{3\times9\times2\times7}{8\times9\times2\times7}$, $\frac{8\times4\times2\times7}{8\times9\times2\times7}$, $\frac{8\times9\times9\times7}{8\times9\times2\times7}$, $\frac{8\times9\times2\times5}{8\times9\times2\times7}$, $= \frac{378}{1008}$, $\frac{448}{1008}$, $\frac{4536}{1008}$, $\frac{720}{1008}$.

6. $\frac{1}{3}$ of $\frac{3}{4}$ of $3\frac{1}{2}$, $\frac{7}{12}$, $\frac{11}{16}$, $7\frac{5}{8}$, and $\frac{1}{2}$ of $\frac{3}{4}$ of $7\frac{5}{8} = \frac{7}{8}$, $\frac{7}{12}$, $\frac{11}{16}$, $\frac{47}{64}$, and $\frac{183}{64} = \frac{7\times12\times16\times6\times64}{8\times12\times16\times6\times64}$, $\frac{7\times8\times16\times6\times64}{8\times12\times16\times6\times64}$, $\frac{11\times8\times12\times6\times64}{8\times12\times16\times6\times64}$, $\frac{47\times8\times12\times16\times64}{8\times12\times16\times6\times64}$, $\frac{183\times8\times12\times16\times6}{8\times12\times16\times6\times64}$, $= \frac{516096}{589824}$, $\frac{344064}{589824}$, $\frac{405504}{589824}$, $\frac{4620288}{589824}$, and $\frac{1686528}{589824} = \frac{168}{192}$, $\frac{112}{192}$, $\frac{132}{192}$, $\frac{1504}{192}$, and $\frac{549}{192}$.

Problem VI.

1. $\frac{5}{8}$ of $\frac{1}{4}$ of $\frac{1}{12}$ of $\frac{1}{20} = \frac{5}{8640} = \frac{1}{1728}$.

2. $\frac{1}{1728} \times \frac{20}{1} \times \frac{12}{1} \times \frac{4}{1} = \frac{960}{1728} = \frac{5}{9}$.

3. $\frac{2}{3} \times \frac{1}{12} \times \frac{1}{20} = \frac{2}{720} = \frac{1}{360}$.

4. $\frac{5}{8} \times \frac{1}{4} \times \frac{1}{12} \times \frac{1}{21} = \frac{5}{8064}$.

5. $\frac{3}{4} \times \frac{1}{4} = \frac{3}{16}$.

6. $\frac{4}{5} \times \frac{1}{4} \times \frac{1}{12} = \frac{4}{240} = \frac{1}{60}$.

7. $\frac{2}{7} \times \frac{20}{21} = \frac{40}{147}$.

8. $\frac{1}{3} \times \frac{1}{8} = \frac{1}{24}$.

9. $\frac{5}{6} \times \frac{1}{112} \times \frac{1}{20} = \frac{5}{13440} = \frac{1}{2688}$.

10. $\frac{3}{5} \times \frac{1}{20} \times \frac{1}{12} = \frac{3}{1200} = \frac{1}{400}$.

11. $\frac{6}{7} \times \frac{1}{16} \times \frac{1}{112} = \frac{6}{12544} = \frac{3}{6272}$.

12. $\frac{6}{11} \times \frac{1}{1760} = \frac{6}{19360} = \frac{3}{9680}$.

13. $\frac{1}{3360} \times \frac{20}{1} \times \frac{12}{1} = \frac{240}{3360} = \frac{2}{28}$.

14. $\frac{1}{44880} \times \frac{20}{1} \times \frac{112}{1} = \frac{2240}{44880} = \frac{1}{20}$.

1. 6s. 4d. = 76d. and £1 = 240d. hence $\frac{76}{240} = \frac{19}{60}$.

2. $2\frac{1}{4}$d. = 9 f. and 1s. = 48 f. hence $\frac{9}{48} = \frac{3}{16}$.

3. $8\frac{1}{2}$d. = 17 h. p. and a cr. = 120 h. p. hence $\frac{17}{120}$.

4. 2 ro. 15 po. = 95 po. and an ac. = 160 po. hence $\frac{95}{160} = \frac{19}{32}$.

5. 3 cwt. 14 lb. = 350 lb. and a ton = 2240 lb. hence $\frac{350}{2240} = \frac{5}{32}$.

6. $6\frac{3}{4}$ in. = 27 qr. in. and a foot = 48, hence $\frac{27}{48} = \frac{9}{16}$.

Problem VII.

1. 2 / 20 / 3)40s. / 13s. 4d.

2. 5 / 20 / 8)100s. / 12s. 6d.

3. 3 / 21 / 4)63s. / 15s. 9d.

4. 4 / $2\frac{1}{2}$ / 5)10s. / 2s.

5. 3 / 16 / 7)48 oz. / 6 oz. $13\frac{5}{7}$ drs.

6. 4
4
9)16
1 qr. 21 lb. 12 oz. 7⅛ dr.

7. 3
12
7)36 oz.
5 oz. 2 dwt. 20⅘ grs.

8. 3
5
8)15 qrs.
1 qr. 3⅜ nl.

9. 4
8
5)32 fu.
6 fu. 16 po.

10. 5
63
6)315 gal.
52 gal. 2 qts.

11. 3
4
8)12 ro.
1 ro. 20 po.

12. 3
24
5)72 ho.
14 ho. 24 min.

Addition.

1. $\frac{2}{5}+\frac{3}{4}=\frac{8+15}{20}=\frac{23}{20}=1\frac{3}{20}$.

2. $\frac{3}{8}+\frac{2}{3}=\frac{9}{24}+\frac{16}{24}=\frac{25}{24}=1\frac{1}{24}$.

3. $\frac{3}{4}+\frac{2}{5}+\frac{5}{6}=\frac{90+48+100}{120}=\frac{238}{120}=1\frac{59}{60}$.

4. $\frac{2}{3}+\frac{5}{6}+\frac{3}{5}=\frac{60+75+54}{90}=\frac{189}{90}=\frac{21}{10}=2\frac{1}{10}$.

5. $4\frac{1}{3}+6\frac{1}{3}=6+4+\frac{1}{3}+\frac{1}{3}=10+\frac{1}{3}+\frac{1}{3}=10+\frac{2}{13}+\frac{5}{13}=10+\frac{8}{13}=10\frac{8}{13}$.

6. $6\frac{1}{4}+2\frac{1}{2}+3\frac{3}{4}=6+2+3+\frac{1}{4}+\frac{1}{2}+\frac{3}{4}=11+\frac{1}{4}+\frac{2}{4}+\frac{3}{4}=11+\frac{6}{4}=12\frac{1}{2}$.

7. First $\frac{1}{2}+\frac{7}{9}+\frac{3}{4}=\frac{36+56+54}{72}=\frac{146}{72}=2\frac{1}{36}$; then $5+6+4+2\frac{1}{36}=17\frac{1}{36}$.

8. $\frac{2}{3} + 4\frac{1}{2} + \frac{1}{4}$ of $\frac{6}{7} = \frac{2}{3} + \frac{1}{2} + \frac{6}{28} + 4 = \frac{2}{3} + \frac{1}{2} + \frac{3}{14} + 4 = \frac{56 + 42 + 18}{84} + 4 = \frac{116}{84} + 4 = \frac{29}{21} + 4 = 1\frac{8}{21} + 4 = 5\frac{8}{21}$.

9. $\frac{2}{3}$s. + $\frac{2}{5}$d. = $\frac{2}{3} \times \frac{12}{1} + \frac{2}{5} = \frac{24}{3}$d. + $\frac{2}{5}$d. = 8d. + $\frac{2}{5}$d. = 8$\frac{1}{2}$d. $\frac{2}{5}$.

10. $\frac{£2}{3} \times \frac{20}{1} = \frac{40}{3}$s. and $\frac{5}{9} \times \frac{1}{12} = \frac{5}{108}$s.; then $\frac{40}{3} + \frac{3}{5} + \frac{5}{108} = \frac{21600 + 972 + 75}{1620} = \frac{22647}{1620}$s. = 13s. 11$\frac{3}{4}$d. $\frac{1}{4\,5}$.

11. $\frac{3}{8} \times \frac{21}{1} = \frac{63}{8}$s., $\frac{3}{4} \times \frac{5}{1} = \frac{15}{4}$s., and $\frac{4}{9} \times \frac{1}{17} = \frac{4}{153}$s. = $\frac{1}{38}$s.; then $\frac{63}{8}$s. + $\frac{15}{4}$s. + $\frac{3}{7}$s. + $\frac{1}{38}$s. = $\frac{47628 + 22680 + 2592 + 224}{6048} = \frac{73124}{6048}$s. = 12s. 1$\frac{9}{4}$d. $\frac{2}{63}$

12.

	yds.	ft.	in.
$\frac{3}{4}$ ft. =	—	—	9
$\frac{2}{3}$ yd. =	—	2	—
$\frac{7}{8}$ m. =	1540	—	—
	1540	2	9

13.

	yds.	qrs.	nl.
5$\frac{1}{2}$ yds. =	5	2	—
4$\frac{3}{5}$ E. E. =	5	3	—
$\frac{2}{5}$ nl. =	—	—	—$\frac{2}{5}$
	11	1	—$\frac{2}{5}$

14.

	cwt.	qr.	lb.	oz.
$\frac{5}{112}$ t. =	8	1	9	5$\frac{1}{3}$
$\frac{9}{11}$ cwt. =	—	3	7	10$\frac{2}{11}$
	9	0	16	15$\frac{17}{33}$

15.

	ho.	m.	sec.
$\frac{1}{3}$ day =	8	—	—
$\frac{5}{24}$ hour =	—	12	30
	8	12	30

Subtraction.

1. $\frac{3}{4} - \frac{5}{9} = \frac{27 - 20}{36} = \frac{7}{36}$.

2. $\frac{4}{5} - \frac{9}{20} = \frac{80 - 45}{100} = \frac{35}{100} = \frac{7}{20}$.

3. $\frac{2}{3}$ of $\frac{3}{4} - \frac{1}{3}$ of $\frac{3}{5} = \frac{6}{12} - \frac{3}{15} = \frac{1}{2} - \frac{1}{5} = \frac{5}{10} - \frac{2}{10} = \frac{3}{10}$.

4. $\frac{2}{5}$ of $\frac{9}{1} = \frac{18}{5}$; and $1\frac{1}{5} = \frac{10}{5}$; then $\frac{18}{5} - \frac{10}{5} = \frac{162 - 50}{45} = \frac{112}{45} = 2\frac{22}{45}$.

5. $16\frac{1}{4} = \frac{65}{4}$ and $\frac{2}{3}$ of $\frac{18}{1} = \frac{36}{3} = \frac{12}{1}$; then $\frac{5}{4} - \frac{12}{1} = \frac{65 - 48}{4} = \frac{17}{4} = 4\frac{1}{4}$.

6. $\frac{2}{5} \times \frac{1}{20} = \frac{2}{100} = £\frac{1}{50}$ and $\frac{3}{4} - \frac{1}{50} = \frac{150 - 4}{200} = £\frac{146}{200} = 14s.\ 7\frac{0}{4}d.\ \frac{4}{5}$.

7. $\frac{4}{7} \times \frac{21}{20} = £\frac{84}{140} = £\frac{21}{35}$ and $\frac{21}{35} - \frac{1}{3} = £\frac{63 - 35}{105} = £\frac{28}{105} = £\frac{4}{15} = 5s.\ 4d.$

8. $£\frac{7}{3} - \frac{1}{2}$ of $\frac{2}{3}s. = \frac{7}{3} \times \frac{20}{1} - \frac{1}{3}s. = \frac{140}{3}s. - \frac{1}{3}s. = \frac{35}{2} - \frac{1}{3} = \frac{105 - 2}{6}s. = \frac{103}{6}s. = 17s.\ 2d.$

9. $\frac{4}{5} \times \frac{20}{1} = \frac{80}{5}$ dwt. $= \frac{16}{1}$ and $\frac{16}{1} - \frac{3}{8} = \frac{128 - 3}{8} = \frac{125}{8}$ dwt. $= 15$ dwt. 15 grs.

10. $3\frac{1}{2} = \frac{7}{2}$ and $15\frac{9}{10}$ lb. $= \frac{159}{10} \times \frac{1}{112} = \frac{159}{1120}$ cwt.; then $\frac{7}{2} - \frac{159}{1120} = \frac{7840 - 318}{2240} = \frac{7522}{2240}$ cwt. $= 3$ cwt. 1 qr. $12\frac{1}{10}$ lb.

Multiplication of Vulgar Fractions.

1. $\frac{3}{4} \times \frac{4}{7} = \frac{12}{28} = \frac{3}{7}$.

2. $\frac{4}{9} \times \frac{3}{8} = \frac{12}{72} = \frac{1}{6}$.

3. $1\frac{3}{8} \times 1\frac{5}{11} = \frac{11}{8} \times \frac{15}{11} = \frac{165}{88} = \frac{5}{8}$.

4. $4\frac{7}{9} = \frac{43}{9}$ and $\frac{3}{5}$ of $\frac{3}{4} = \frac{9}{12} = \frac{3}{4}$; then $\frac{43}{9} \times \frac{3}{4} = \frac{129}{36} = 2\frac{17}{36}$.

5. $\frac{2}{3} \times \frac{3}{4} \times \frac{5}{6} = \frac{30}{72} = \frac{5}{12}$.

6. $48\frac{1}{4} \times 7 = \frac{193}{4} \times \frac{7}{1} = \frac{1351}{4} = 337\frac{3}{4}$.

7. $\frac{1}{2}$ of $9 \times \frac{3}{7} = \frac{9}{2} \times \frac{3}{7} = \frac{27}{14} = 1\frac{13}{14}$.

8. $\frac{3}{4}$ of $\frac{5}{7} \times \frac{1}{9}$ of $\frac{2}{5} = \frac{15}{28} \times \frac{2}{45} = \frac{30}{1260} = \frac{1}{42}$.

9. $\frac{2}{5}$ of $\frac{3}{4} = \frac{3}{10}$ and $\frac{5}{8}$ of $2\frac{1}{7} = \frac{75}{28}$, then $\frac{3}{10} \times \frac{75}{28} = \frac{225}{280} = \frac{5}{14}$.

10. $14\frac{1}{4} \times \frac{11}{40} = \frac{57}{4} \times \frac{11}{40} = £\frac{627}{160} = £3,\ 18s.\ 4\frac{1}{2}d.$

Division of Vulgar Fractions.

1. $\frac{4}{9} \div \frac{2}{3} = \frac{4}{9} \times \frac{3}{2} = \frac{12}{18} = \frac{2}{3}$.

2. $\frac{3}{4} \div \frac{1}{2} = \frac{3}{4} \times \frac{2}{1} = \frac{6}{4} = \frac{3}{2} = 1\frac{1}{2}$.

3. $1\frac{1}{2} \div \frac{5}{6} = \frac{11}{12} \times \frac{6}{5} = \frac{66}{60} = 1\frac{1}{10}$.

4. $18 \div \frac{3}{8} = \frac{18}{1} \times \frac{8}{3} = \frac{144}{3} = 48$.

5. $14\frac{3}{4} \div \frac{241}{305} = \frac{59}{4} \times \frac{305}{241} = \frac{17995}{964} = 18\frac{643}{964}$.

6. $456\frac{1}{7} \div 3\frac{1}{2} = \frac{3193}{7} \times \frac{2}{7} = \frac{6386}{49} = 130\frac{16}{49}$.

7. $\frac{2}{3}$ of $\frac{4}{7} \div \frac{4}{5} = \frac{8}{21} \times \frac{5}{4} = \frac{72}{84} = \frac{6}{7}$.

8. $8\frac{3}{4} \div \frac{1}{3}$ of $\frac{9}{11} = \frac{35}{4} \times \frac{11}{3} = \frac{385}{12} = 32\frac{1}{12}$.

9. $\frac{1}{3}$ of $4 \div \frac{2}{5}$ of $\frac{5}{6} = \frac{4}{3} \times \frac{3}{1} = 4$.

10. $£2450\frac{1}{8} \div 40\frac{2}{5} = \frac{19601}{8} \div \frac{202}{5} = \frac{19601}{8} \times \frac{5}{202} = £\frac{98005}{1616} = £60,\ 12s.\ 11\frac{20}{101}d.$

Proportion of Vulgar Fractions.

1. $5\frac{1}{4} = \frac{21}{4}$, then $\frac{3}{4}$ yd. : $\frac{21}{4}$ yd. : : $£\frac{7}{5} : \frac{4 \times 21 \times 7}{3 \times 4 \times 9} = £\frac{147}{27} = £5,\ 8s.\ 10\frac{1}{2}d.\ \frac{2}{3}$.

2. $\frac{5}{6}$ gal. $\times \frac{1}{63} \times \frac{1}{4} = \frac{5}{1512}$ tun : $\frac{5}{9}$ t. : : $£\frac{5}{8} : \frac{1512}{5} \times \frac{5}{9} \times \frac{5}{8} = £\frac{7560}{72} = £105$.

3. $£445,\ 15s. = \frac{8915}{20} = £\frac{1783}{4}$, then $\frac{1}{8} : \frac{7}{32}$: : $£\frac{1783}{4} : £\frac{99848}{128} = £780,\ 1s.\ 3d.$

4. $31\frac{1}{3} = 94$ qrs $= \frac{94}{4} = \frac{47}{2}$ yd., then $\frac{3}{4}$ yd. : $\frac{47}{2}$ yd. : : $£\frac{5}{8} : £\frac{940}{48} = £19,\ 11s.\ 8d.$

5. $1\frac{5}{7}$ lb. $= \frac{12}{7}$ lb., £$61\frac{5}{7}$ = £$\frac{432}{7}$, $\frac{2}{1}$ grs. × $\frac{1}{24}$ × $\frac{1}{28}$ × $\frac{1}{12}$ = $\frac{2}{57600}$ = $\frac{1}{28800}$ lb., then $\frac{12}{7}$ lb. : $\frac{1}{28800}$ lb. : : £$\frac{432}{7}$: £$\frac{432}{5600}$ = 3d.

6. $\frac{11}{12} : \frac{13}{16}$: : £$\frac{23412}{60} : \frac{21677}{80}$ = £345, 19s. 3d.

7. A in one day performs $\frac{1}{10}$ of the work, B $\frac{1}{12}$, and C. $\frac{1}{16}$; therefore $\frac{1}{10} + \frac{1}{12} + \frac{1}{16} = \frac{59}{240}$ of the work performed by the three in one day; and $\frac{59}{240} : 1 : : 1$ d. : $\frac{240}{59}$d. = $4\frac{44}{59}$ days.

8. A, B, and C, in one day perform $\frac{1}{12}$ of the work, and A and B $\frac{1}{18}$ of it; hence $\frac{1}{12} - \frac{1}{18} = \frac{1}{36}$, the part performed by C in one day, and $\frac{1}{36} : 1 : : 1$ d. : $\frac{36}{1}$ d. = 36 days, the time in which C alone could do it. Now, B and C perform $\frac{1}{18}$ of it in 1 day; therefore $\frac{1}{12} - \frac{1}{16} = \frac{1}{48}$, and $\frac{1}{48} : 1 : : 1$ d. : $\frac{48}{1}$ d. = 48 days, the time in which A alone could do it. Again, B and C do $\frac{1}{18}$ of it in one day, and C alone does $\frac{1}{36}$ of it; whence $\frac{1}{18} - \frac{1}{36} = \frac{1}{144}$, and $\frac{1}{144} : 1 : : 1$ d. : $\frac{144}{5}$ d. = $28\frac{4}{5}$ days, the time in which B alone could do it. Lastly, A does $\frac{1}{48}$ of it in one day, and C $\frac{1}{36}$ of it; consequently $\frac{1}{48} + \frac{1}{36} = \frac{7}{144}$, and $\frac{7}{144} : 1 : : 1$ d. : $\frac{144}{7}$ d. = $20\frac{4}{7}$ days, the time in which A and C could do it working together.

DECIMAL FRACTIONS.

Reduction.—Problem I.

1. 4)1·00 ·25 2)1·0 ·5 4)3·00 ·75

2. 5)3·0 ·6

3. 8)1·000 ·125

4. 8)3·000 ·375

5. 8)5·000 ·625

6. 12)7·000 ·583⁴

7. 44)15·000(·3409$\frac{4}{44}$ 180 400 4

8. 1264)12·4·0000(·0981$\frac{16}{1264}$ 10240 1280 16

Problem II.

1. 4)3·00
   12)6·75
   20)15·5625
   £·778125

2. 12)9·00
   20)·75
   £·0375

3. 12)6·0
   20)8·5
   £·425

4. 4)2·0
   12)8·5
   21)12·708333⅓
   Gs. ·605158$\frac{73}{96}$

5. 6½d. = 13 halfpence, and 1s. = 24 halfpence, then $\frac{13}{24}$ = ·5416$\frac{1}{6}$.

6. 8 oz. 12 dwt. 16 grs. = 4144 grs., and a lb. = 5760 grs. then $\frac{4144}{5760}$ = ·719444$\frac{256}{360}$.

7. 2 qrs. 16 lb. = 72 lb., and a cwt. = 112 lb., then $\frac{72}{112}$ = ·642857$\frac{1}{7}$.

8. 20 yds. 2 ft. 6 in = 750 in., and a mile = 63360 in. then $\frac{750}{63360}$ = ·0118371$\frac{1344}{5280}$.

9. 2 qrs. 2 nls. = 10 nls., and a yard = 16 nls., then $\frac{10}{16}$ = ·625.

10. 1 ro. 20 po. = 60 po., and an acre = 160 po., then $\frac{60}{160}$ = ·375.

11. 3 bush. 1 pk. = 13 pks., and a qr. = 32 pks., then $\frac{13}{32}$ = ·40625.

12. A tun = 252 gal., then $\frac{15}{252}$ = ·059523$\frac{24}{42}$.

13. 6¾ in. = 27 qr. in., and a foot = 48 qr. in., then $\frac{27}{48}$ = ·5625.

Problem III.

1. £·85
   20
   17·00s.

2. £·1875
   20
   3·7500s.
   12
   9·00d.

3. ·125s.
   12
   1·500d.
   4
   2·0f.

4. ·6845 cwt.
2·7380 qrs.
20·664 lb.
10 624 oz.
9·984 drs.

5. ·121
252
30·492 gall.
1·968 qts.
1·936 pts.

6. ·03125 bar.
36
1·12500 gall.
8
1·000 pt.

7. ·28 mile.
2·24 fur.
9·60 po.
3·30 yds.
·90 ft.
10·80 in.

Problem IV.

1. Half the number of shillings (6) gives 3 for the first decimal figure; and the number of farthings in the remainder (4½d.) gives 18 for the second and third figures. Then to complete the decimal, call these two last figures (18) pence, the farthings in them (72) increased by 3, because they amount to 72, give 75 for other two figures. The answer therefore is £ 31875.

2. Half the even number of shillings (8) gives 4 for the first decimal figure; and the number of farthings in the remainder (1s. 6¾d.) 75 increased by 3, because they amount to 72, give 78 for the next two figures. Call the excess of these two figures, above 75, pence, the farthings in the remainder (3) give 12 for the next two figures. Again, call these two last figures pence, the farthings in them (48) increased by 2, give 50 for the next two figures. The answer therefore is £·478125.

3. Half the number of shillings (10) gives 5 for the first decimal figure; the number of farthings in the remainder (8¼d.) 33 increased by 1, because they exceed 24, give 34 for the next two figures; call the excess of these two figures above 25 (9) pence, the farthings in them (36) increased by 1, give 37 for the next two figures. Again,

call the excess of these two figures above 25 (12) pence, the farthings in them (48) increased by 2, give 50 for the next two figures. The answer therefore is £·534375.

4. Half the number of shillings gives 6 for the first decimal place, and the number of farthings in 7¾d. increased by 1 as they exceed 24, give 32 for the next two places; then the excess of these two figures above 25 taken as pence and reduced into farthings, adding 1 since they exceed 24, give 29 for the next two figures; again, taking away 25 from these two figures, and multiplying the remainder by 4, we get 16 for the next two figures; and, since these do not amount to 25, we multiply them by 4; and, as the product exceeds 48, add 2, which gives 66 for the next two figures; lastly, taking away 50 from these, the remainder is again 16, which will give us the same figures as before; hence 66 will be continually repeated, and the answer is therefore £·6322916̇.

5. Half the number of shillings gives 8 for the first decimal place, and the number of farthings in 11¼d. increased by their 24th part, give $46\frac{2}{24}$ or 46875 as the remaining figures of the decimal. The answer is therefore £·846875.*

6. Half the even number of shillings gives 9 for the first decimal figure, and the remainder 1s. 11¾d. reduced into farthings, and increased by its 24th part, gives $98\frac{3}{24}$ or 989583̇ as the other figures of the decimal. The answer is therefore £·9989583̇.

Problem V.

1. Double the first figure (3) gives 6s.; the other two figures (18) are farthings = 4½d. The answer then is 6s. 4½d.

2. Double the first figure (4), to which add 1, because the next figure is above 5, gives 9s.; from the remainder

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* Instead of proceeding as directed by the rule, it is the same thing, and in many cases more compendious, to increase the farthings in the remainder by their 24th part, which at once gives the decimal.

(28) deduct 1, because it exceeds 25, and there remains 27 farthings = 6¾d. The answer then is 9s. 6¾d.

3. Double the first figure (5) gives 10s., from the next two figures (34) deduct 1, because they exceed 25, and there remains 33 farthings = 8¼d. The answer therefore is 10s. 8¼d.

4. Double the first figure + 1, as the second figure is above 5, gives 15s., and the remainder is 19 farthings = 4¾d. The answer is therefore 15s. 4¾d.

5. Double the first figure + 1 = 19s. and 34 — 1 = 33 farthings = 8¼d. Then the answer is 19s. 8¼d.

6. Double the first figure + 1 = 19s. and 44 — 1 = 43 farthings = 10¾d. Then the answer is 19s. 10¾d.

Addition and Subtraction.

1.
2·64
85·6
·945
14·8
5·3456
84·
193·3306

2.
785·1
84·35
1·654
·8956
·009
10·161
882·1696

3.
25·3
2·78
324·67
1·294
63·11
345·6
762·784

4.
325·7
63·451
275·34
6·473
25·68
287·435
984·079

5.
3285·64
287·458
4550·67
38·4526
324·578
4761·29
13248·0886

1. ·84060
·58975
·25085

3. 246·0006
·8154
245 1846

2. 84·9500
3·6954
81·2546

4. 20·78125
£14, 18s. 9d. = 14·93750
£5, 16s. 10½d. = 5·84375

5. 40 yds. 2 qrs. = 40·500
29 625
10 yds. 3 qrs. 2 nls. = 10·875

Multiplication.

1. 346·549
3·15
1732745
346519
1039647
1091·62935

2. 516·8945
44·89
46520505
41351560
20675780
20675780
23203·394105

3. ·84615
·065
423075
507690
·05499975

4. ·346809
·00546
2080854
1387236
1734045
·00189357714

5. £·83125
365
415625
498750
249375
£303·40625
20
8·12500s.
12
1·500d.
4
2·0f.

Division.

1. 6)176·4
4)29·4
7·35

2. 3·68)45·3496(12·32
854
1189
856
120

3. ·45)24·694(54·8$\frac{34}{45}$
219
394
34

6. ·075)·80468(10·72$\frac{68}{75}$
546
218
68

4. ·546)8496(15560$\frac{240}{546}$
3036
3060
3300
240

7. 25)8·4567(·3382$\frac{17}{25}$
95
206
67
17

5. 2·5)·21468(·0858$\frac{18}{25}$
146
218
18

8. 215)·06548(·00030$\frac{98}{215}$
98

9. 100)216·4
2·164

10. £3·85 ÷ 112 = £·034375 = 8¼d. prime cost per lb.; then 8¼d. + 1½d. = 9¾d. is the selling price per lb.

Proportion.

1. 1·25 yd. : 30·75 yd. : : £·625 = 30·75 × ·625 ÷ 1·25 = 19·21875 ÷ 1·25 = £15·375 = £15, 7s. 6d.

2. 1st : 50·5 st. : : £·33125 : £16·728125 = £16, 14s. 6¾d.

3. ·25 lb. : 20·5 lb. : : £·425 : (8·7125 ÷ ·25) = £34·85 = £34, 17s.

4. 1 lb. : 378 lbs. : : £·034375 : £12·99375 prime cost of the whole, which deduct from the selling price £16·5375 the remainder £3·54375 = £3, 10s. 10⅛d. is the gain upon the whole. Then £12·99375 : £3·54375 : : £100 : £27$\frac{3}{11}$ gain per cent.

INTERMINATE DECIMALS.

Reduction.—Rule I.

1. $\dot{5} = \frac{5}{9}$; $\dot{7} = \frac{7}{9}$; $\dot{3}\dot{7} = \frac{37}{99}$; $\dot{4}\dot{5} = \frac{45}{99} = \frac{5}{11}$; $\dot{3}\dot{2}\dot{7} = \frac{327}{999} = \frac{109}{333}$; $\dot{7}14285 = \frac{714285}{999999} = \frac{5}{7}$.

2. $\cdot 27\dot{6} = \frac{276-27}{900} = \frac{249}{900} = \frac{83}{300}$; $\cdot 38\dot{4} = \frac{384-38}{900} = \frac{346}{900} = \frac{173}{450}$; $\cdot 3\dot{4}\dot{5} = \frac{345-3}{990} = \frac{342}{990} = \frac{19}{55}$; $\cdot 9\dot{7}142857 = \frac{97142857-97}{99999900} = \frac{97142760}{99999900} = \frac{34}{35}$.

Rule II.

1. £·756
15·133s.
1·6d.
2·4 far.
Ans. 15s. $1\frac{1}{2}$d. $\frac{2}{5}$

2. ·479 cwt.
1·920 qrs.
25·76 lbs.
12·16 oz.
Ans. 1 qr. 25 lb. $12\frac{4}{25}$ oz.

3. ·876 acres.
3·506 roods.
20·26 perches.
Ans. 3 ro. $20\frac{4}{13}$ per.

4. £3634
7·269s.
3·231d.
Ans. 7s. $3\frac{77}{333}$d.

5. ·5307 guineas.
11·1453 shil.
1·7441 pence.
2·9765 farth.
Ans. 11s. $1\frac{1}{2}$d. $\frac{51}{55}\frac{3}{5}$

6. ·7386 cwt.
2·9547 qrs.
26·7329 lbs.
11·7268 oz.
11·6298 drs.

Rule III.

1. ·436363636
·573689689

2. ·729999999
·548618648
·736545454

3. $\cdot\dot{7}5\dot{4}5\dot{4}5\dot{4}5\dot{4}5\dot{1}5\dot{4}5\dot{4}5\dot{4}5\dot{4}5\dot{4}5\dot{4}5\dot{4}5\dot{4}$
$\cdot\dot{3}3333333333333333333333333333\dot{3}$
$\cdot\dot{7}2\dot{9}8298298298298298298298298\dot{2}\dot{9}\dot{8}$
$\cdot\dot{7}\dot{4}8697486974869748697486974869\dot{7}$

Addition.

1. $\cdot4712\dot{}$
$3\cdot7777\dot{}$
$\cdot5466\dot{}$
$\cdot3333\dot{}$
$5\cdot1290\dot{}$

2. $4\cdot78333\dot{}$
$54\cdot72111\dot{}$
$7\cdot66666\dot{}$
$\cdot33333\dot{}$
$\cdot54769\dot{}$
$68\cdot05214\dot{}$

3. $16\frac{1}{9} = 16\cdot111\dot{1}111\dot{1}$
$24\frac{1}{7} = 24\cdot142\dot{8}57142\dot{}$
$3\frac{1}{6} = 3\cdot166\dot{6}66666\dot{}$
$5\frac{11}{24} = 5\cdot458\dot{3}33333\dot{}$
$256\frac{7}{118} = 256\cdot388\dot{8}88888\dot{}$
$305\cdot267857142\dot{}$

4. $\cdot718618618\dot{}$
$34\cdot673473473\dot{}$
$\cdot218938938\dot{}$
$25\cdot712\dot{6}36636\dot{}$
$61\cdot323667394\dot{}$

5. $\frac{25}{28} = \cdot89285714\dot{}$
$3\frac{11}{14} = 3\cdot78571428\dot{}$
$56\frac{10}{11} = 56\cdot90\dot{9}09090\dot{}$
$49\frac{8}{9} = 49\cdot88888888\dot{}$
$257\frac{23}{52} = 257\cdot94230769\dot{}$
$369\cdot41885891\dot{}$

Subtraction.

1. $74\cdot5283\dot{}$
$5\cdot6666\dot{}$
$68\cdot8616\dot{}$

2. $21\cdot5462\dot{}$
$18\cdot7555\dot{}$
$2\cdot7906\dot{}$

3. $27.38\dot{3}6\dot{3}6\dot{3}6$
$7.1\dot{8}6\dot{9}8\dot{6}9\dot{8}$
$20.19\dot{6}6\dot{4}9\dot{3}7$

4. $1.8726\dot{3}6\dot{3}6\dot{3}6\dot{3}$
$.754\dot{2}87\dot{5}\dot{4}28\dot{7}5\dot{4}$
$1.11\dot{8}3\dot{4}8\dot{8}20\dot{7}6\dot{0}9$

Multiplication.

1. $74.7\dot{3}8\dot{6}$
258
$5979\dot{0}9\dot{3}$
$3736\dot{9}3\dot{3}\dot{3}$
$14947\dot{3}3\dot{3}$
19282.5760

2. $38.5\dot{4}3\dot{6}$
29
$3468\dot{9}2\dot{7}$
$7708\dot{7}2\dot{7}$
$1117.76\dot{5}\dot{4}$

3. $384.\dot{5}7\dot{6}3$
47.5
$19228\dot{8}17$
$2692\dot{0}3\dot{4}50$
$153830\dot{5}430$
$18267.3\dot{7}6\dot{9}\dot{8}$

4. $3)7.38\dot{4}\dot{6}$
$2\frac{1}{3}$
$2.4\dot{6}154\dot{8}\dot{8}\dot{2}$
$14.7\dot{6}9\dot{2}9\dot{2}9\dot{2}$
$17.2\dot{3}0\dot{8}4\dot{1}7\dot{5}$

5. $5.4\dot{7}6\dot{3}$
239
$492\dot{8}\dot{7}0$
$164\dot{2}900$
$1095\dot{2}666$
$11)1308.\dot{8}\dot{4}3\dot{6}$
$118.9\dot{8}5\dot{7}\dot{8}$

6. $38.7\dot{2}\dot{9}$
500
$11)19364.\dot{6}\dot{4}$
1760.4224, &c.

Division.

1. $21)\ 7.38\dot{4}6\dot{7}$
$999 \qquad 999$
$20979)7377.29000$
$\cdot 35165_{\frac{2}{3}\frac{4}{0}\frac{6}{8}\frac{6}{7}\frac{7}{3}}$

2. $15\dot{3})\ 3\cdot48\dot{6}$
$3 \quad\quad 3$
$46\ )10\cdot64$
$\cdot22739\frac{3}{5}\frac{3}{3}$

3. $16\cdot\dot{6})27\cdot65\dot{4}$
$3 \quad\quad 3$
$50\ )82\cdot96\dot{3}$
$1\cdot65926\dot{}$

4. $\cdot\dot{9}\dot{3})\ 8\cdot\dot{1}$
$99 \quad\quad 99$
$93\cdot00)803\cdot0$
$8\cdot6344\frac{8}{9}\frac{8}{3}$

5. $2\cdot\dot{7}\dot{6})27\cdot\dot{3}$
$3 \quad\quad 3$
$8\cdot30)82\cdot0$
$9\cdot879518\frac{6}{8}\frac{6}{3}$

6. $82\cdot7\dot{3})\ 4\cdot7\dot{3}\dot{6}$
$99 \quad\quad 99$
$8190\cdot6\ )648\cdot9$
$\cdot05724855_{1}\frac{43}{38}\frac{95}{51}$

EXTRACTION OF THE SQUARE ROOT.

1. $1,44(12$
1
$22)\ 44$
44

2. $17,28(41\cdot5$
16
$81)128$
81
$825)4700$
4125
575

3. $4,08,04(202$
4
$402)804$
804

4. $5,31,11,81,16(23046$
4
$43)131$
129
$4604)21181$
18416
$46086)276516$
276516

5. $56,08,51,21(7489$
49
$144)708$
576
$1488)13251$
11904
$14969)134721$
134721

6. $1,00,04,00,04(10002$
1
$20002)40004$
40004

7. 1,02,03,04,03,02,01(101010
1
201)203
201
20201)20403
20201
2020201)2020201
2020201

8. ·00,00,22,09(·0047
16
87)609
609

9. ·29,16(·54
25
104)416
416

10. 42·16,85(6·49
36
124)616
496
1289)12085
11601
484

11. $\sqrt{289} = 17$, and $\sqrt{576} = 24$; then $\frac{17}{24}$ the root.

12. $\sqrt{51\frac{25}{36}} = \sqrt{\frac{1861}{36}} = \sqrt{1296} \div \sqrt{25} = \frac{36}{5} = 7\frac{1}{5}$.

13. $\sqrt{(16 \times 9)} = \sqrt{144} = 12$ mean proportional.

14. $\sqrt{(64 \times 9)} = \sqrt{576} = 24$ mean proportional.

15. $\sqrt{505521} = 711$, the number of trees in the side, then $711 \times 6 = 4266$ feet, length of the side.

16. The fields together contain 15 ac. 1 po. = 2401 po. whence $\sqrt{2401} = 49$ poles, the side of the square.

17. $200 \times 200 \times 3 = 120000$ and $\sqrt{120000} = 346{\cdot}4\frac{704}{}$ feet, the diameter.

18. $14^2 = 196$ and $196 + \frac{4}{5}$ of $196 = 352{\cdot}8$, then $\sqrt{352{\cdot}8} = 18{\cdot}78$ feet, the diameter.

19. $\sqrt{(48^2 + 36^2)} = \sqrt{(2304 + 1296)} = \sqrt{3600} = 60$ feet, the length of the ladder.

20. $\sqrt{(205^2 - 140^2)} = \sqrt{(42025 - 19600)} = \sqrt{22425} = 149{\cdot}75$ feet, the height of the steeple.

EXTRACTION OF THE CUBE ROOT.

1.

1,728(12 root.
1
) 728

$1^2 \times 300 = 300$
$1 \times 2 \times 30 = 60$
$2^2 = 4$
$364 \times 2 = 728$

2.

54,872(38 root.
27
)27872

$3^2 \times 300 = 2700$
$3 \times 8 \times 30 = 720$
$8^2 = 64$
$3484 \times 8 = 27872$

3.

48,228,544(364
27
)21228

$3^2 \times 300 = 2700$
$3 \times 6 \times 30 = 540$
$6^2 = 36$
$3276 \times 6 = 19656$
)1572544

$36^2 \times 300 = 388800$
$36 \times 4 \times 30 = 4320$
$4^2 = 16$
$393136 \times 4 = 1572544$

4.

41,063,625(345
27
)14063

$3^2 \times 300 = 2700$
$3 \times 4 \times 30 = 360$
$4^2 = 16$
$3076 \times 4 = 12304$
)1759625

$34^2 \times 300 = 346800$
$34 \times 5 \times 30 = 5100$
$5^2 = 25$
$351925 \times 5 = 1759625$

5. 40,107,047,967(3423

27

)13107

$3^2 \times 300 = 2700$

$3 \times 4 \times 30 = 360$

$4^2 = 16$

$3076 \times 4 = 12304$

$34^2 \times 300 = 346800$) 803047

$34 \times 2 \times 30 = 2040$

$2^2 = 4$

$348844 \times 2 = 697688$

$342^2 \times 300 = 35089200$)105359967

$342 \times 3 \times 30 = 30780$

$3^2 = 9$

$35119989 \times 3 = 105359967$

6. 12,821,119,155,125(23405

8

)4821

$2^2 \times 300 = 1200$

$2 \times 3 \times 30 = 180$

$3^2 = 9$

$1389 \times 3 = 4167$

$23^2 \times 300 = 158700$) 651119

$23 \times 4 \times 30 = 2760$

$4^2 = 16$

$161476 \times 4 = 645904$

$234^2 \times 300 = 16426800$) 8215155125

$2340^2 \times 300 = 1642680000$

$2340 \times 5 \times 30 = 351000$

$5^2 = 25$

$1643031025 \times 5 = 8215155125$

7. 14,706·125(24·5

8

)6706

$2^2 \times 300 = 1200$

$2 \times 4 \times 30 = 240$

$4^2 = 16$

$1456 \times 4 = 5824$

Carried over, 172800) 882125

Brought over, 172800)882125(·5

$24 \times 5 \times 30 = 3600$

$5^2 = 25$

$176425 \times 5 = 882125$

8. 51·064,811(3·71

27

$3^2 \times 300 = 2700$)24064

$3 \times 7 \times 30 = 630$

$7^2 = 49$

$3379 \times 7 = 23653$

$37^2 \times 300 = 410700$) 411811

$37 \times 1 \times 30 = 1110$

$1^2 = 1$

$411811 \times 1 = 411811$

9. $\sqrt[3]{13824} = 24$ and $\sqrt[3]{42875} = 35$, whence $\frac{24}{35}$ is the root.

10. $\sqrt[3]{91\frac{1}{8}} = \sqrt[3]{\frac{729}{8}} = \frac{9}{2} = 4\frac{1}{2}$ the root.

11. $\sqrt[3]{32768} = 32$ feet, side of equal cube.

12. $840 \times 340 \times 500 = 142800000$ cubic feet solidity, and $\sqrt[3]{142800000} = 522{\cdot}68$ feet, side of equal cube.

13. $\sqrt[3]{(277{\cdot}27384 \times 100)} = \sqrt[3]{27727{\cdot}384} = 30{\cdot}267$ in. side of the vessel.

14. $12^3 : 18^3 :: 30 : 101\frac{1}{4}$ lb. the weight.

15. $\sqrt[3]{(16^3 \times 6)} = \sqrt[3]{24576} = 29{\cdot}07$ inches diameter.

16. $\sqrt[3]{(10^3 \times 6)} = \sqrt[3]{6000} = 18{\cdot}17$ feet, the length.

$\sqrt[3]{(4{\cdot}5^3 \times 6)} = \sqrt[3]{546{\cdot}75} = 8{\cdot}177$ feet, the breadth

$\sqrt[3]{(3^3 \times 6)} = 3 \times \sqrt[3]{6} = 3 \times 1{\cdot}81712 = 5{\cdot}45136$ ft the thickness.

DUODECIMALS.

1. 6ft. 3in.

3	2	
18	9	
1	0	6″
19	9	6

2. 4ft. 5in.

3	6	
13	3	
2	2	6″
15	5	6

3. 5ft. 6in.

4	3	
22	0	
1	4	6″
23	4	6

4. 6ft. 6in.

3	8
19	6
4	4
23	10

5. 24ft. 3in.

16	7	
388	0	
14	1	9″
402	1	9

6. 48ft. 7in.

36	6	
1749	0	
24	3	6″
1773	3	6

7. 6ft. 4in. 3″

4	3	6		
25	5	0		
1	7	0	9‴	
	3	2	1	6⁗
27	3	2	10	6

8. 56ft. 1in. 4″

48	3	6	
2693	4	0	
14	0	4	
2	4	0	8‴
2709	8	4	8

9. 68ft. 8in.

9	10	11″	
618	0		
57	2	8	
5	2	11	4‴
680	5	7	4

MENSURATION.

Problem I.

10. 12ft. 0in.

0	8	6″
8	6	0

11. 16ft. 6in.

1	2	
16	6	
2	9	
19	3	

12. 15ft. 6in.

0	10		6″
12	11		
	7	9	
13	6	9	

13. 20ft. 9in.

1	0		6″
20	9	4	
	10	4	6‴
21	7	4	6

14. 10ft. 4in.

0	8	3″
6	10	8
	2	7
7	1	3

15. 1ft. 3in.

	0	10	
2)2		1	
	1	0	6″
12		9	
13	3	4	6‴

Problem II.

16. 1ft. 2in.

1	2		
1	2		
	2	4	″
1	4	4	
		2	
2	8	8	
		8	
21	9	4	

17. 0ft. 10in. 6″

0	10	6		
0	8	9		
		5	3	‴
0	9	2	3	
			2	
1	6	4	6	
			7	
10	8	7	6	

18. 1ft. 8in.

1	8		
1	8		
1	1	4	″
2	9	4	
24	6		
66	8	0	
1	4	8	
68	0	8	

19. 1ft. 2in.

0	9		
0	10	6	″
18	6		
15	9	0	
	5	3	
16	2	3	

20. 1ft. 6in.

0	10	
1	3	
	2	
2	6	
	9	
22	6	

21. 1ft. 3in.

0	4	6″		
0	5			
	0	7	6‴	
0	5	7	6	
15	3			
7	0	4	6	
	1	4	10	6⁗
7	1	9	4	6

22. 2ft. 6in.

1	10		
2	6		
2	1		
4	7		
38	9		
174	2		
3	5	3″	
177	7	3	

23. 4)3ft. 9in.

0	11	3″		
0	11	3		
0	10	3	9‴	
		2	9	9⁗
0	10	6	6	9
				5
4	4	8	9	9
				5
21	11	8	0	9

24. 4)3ft. 6in.

0	10	6″		
0	10	6		
0	8	9		
		5	3‴	
0	9	2	3	
			3	
2	3	6	9	
			10	
22	11	7	6	

25. 4ft. 0in.

3	6			
3	0			
3)10	6			
4)3	6			
0	10	6″		
0	10	6		
0	8	9		
		5	3‴	
0	9	2	3	
28	6			
21	5	3	0	
	4	7	1	6′″
21	9	10	1	6

26. 5)8 feet.

1·6
1·6
96
16
2·56
48 feet.
2048
1024
122 88 feet.

27. 9·43 feet.
7·92
6·15
4·74
3·16
5)31·40
5)6·28
1·256
1·256
7536
6280
2512
1256
1·577536
34·5 feet.
7887680
6310144
4732608
54·4249920 feet.

BOARD OR SUPERFICIAL MEASURE.

28. 14ft. 0in.
1 6
21 0

29. 9ft. 0in.
1 5 6″
13 1 6

30. 11ft. 3in.
0 7 9″
6 6 9
0 8 5 3‴
7 3 2 3

31. 9ft. 9in.
1 1 3″
9 9
9 9
2 5 3‴
10 9 2 3

32. 8ft. 3in.
1 10
8 3
6 10 6″
15 1 6

33. 14ft. 6in.

1	8	
14	6	
9	8	
24	2	

34. 18ft. 6in.

1	2	
18	6	
3	1	
21	7	

35. 24ft. 9in.

1	9	3″	
24	9		
18	6	9	
	6	2	3‴
43	9	11	3

36. 12ft. 3in.

0	9	
9	2	3″

37. 30ft. 0in.

1	10
55	0

EQUAL-SIDED, OR ROUND TIMBER.

38. 1ft. 3in.

1	3	
1	3	
0	3	9″
1	6	9
18	0	
28	1	6

39. 1ft. 4in.

1	4	
1	4	
	5	4″
1	9	4
14	0	
24	10	8

40. 16ft. 3in.

0	9½			
12	2	3″		
	8	1	6‴	
12	10	4	6	
0	9½			
9	7	9	4	6⁗
	6	5	2	3
10	2	2	6	9

41. 18ft. 0in.

0	8	
12	0	
0	8	
8	0	

42. 1ft. 3in.

1	3	
1	3	
0	3	9″
1	6	9
12		
18	9	0

43. 0ft. 8in. 6″

0	8	6	
0	5	8	
0	0	4	3‴
0	6	0	3
22	0		
11	0	5	6

44. 27ft. 6in.

	1	7		
27	6			
16	0	6″		
43	6	6		
	1	7		
43	6	6		
25	4	9	6‴	
68	11	3	6	

45. 6ft. 9in.

1	10	3″			
6	9				
5	7	6			
	1	8	3‴		
12	6	2	3		
1	10	3			
12	6	2	3		
10	5	1	10	6⁗	
	3	1	6	6	9⁗′
23	2	5	8	0	9

46. 2ft. 6in. 9″

2	6	9			
5	1	6			
1	3	4	6‴		
	1	11	0	9⁗′	
6	6	9	6	9	
24	6				
157	7	1	6	0	
3	3	4	9	4	6⁗′
160	10	6	3	4	6

47. 34ft. 0in.

0	6½			
17	0			
1	5			
18	5			
0	6½			
9	2	6″		
	9	2	6‴	
9	11	8	6	

48. 1ft. 2in.

1	2		
1	2		
0	2	4″	
1	4	4	
9			
12	3	0	

49. 1ft. 4in.

1	4		
1	4		
	5	4″	
1	9	4	
4			
7	1	4	

50. 1ft. 5in.

1	5		
1	5		
	7	1″	
2	0	1	
13			
26	1	1	

51. 1ft. 6in. 6″

1	6	6			
1	6	6			
	9	3			
		9	3‴		
2	4	6	3		
15	6				
35	7	9	9		
1	2	3	1	6⁗	
36	10	0	10	6	

52. 1ft. 1in.

1	1		
1	1		
	1	1″	
1	2	1	
17			
19	11	5	

53. 2ft. 4in.

2	4		
4	8		
	9	4″	
5	5	4	
19	6		
103	5	4	
2	8	8	
106	2	0	

54. 2ft. 8in. 3″

2	8	3			
5	4	6			
1	9	6			
		8	0‴	9⁗	
7	2	8	0	9	
24					
173	4	1	6	0	

55. 2ft. 7in.

2	7			
5	2			
1	6	1″		
6	8	1		
29	3			
193	6	5		
1	8	0	3‴	
195	2	5	3	

56. 40ft. 9in.

1	7			
40	9			
23	9	3″		
64	6	3		
1	7			
64	6	3		
37	7	7	9‴	
102	1	10	9	

UNEQUAL-SIDED TIMBER OR STONE.

57. 2ft. 8in.

1	6
2	8
1	4
4	0
14	6
58	0

58. 1ft. 1in.

0	10		
0	10	10″	
18			
16	3	0	

59. 14ft.

0	7½in.			
8	2			
0	7			
8	9			
0	8½			
5	10			
	4	4″	6‴	
6	2	4	6	

60. 1ft. 2in.

0	11½		
1	0	10″	
0	0	7	
1	1	5	
9			
10	0	9	

61. 1ft. 7in.

0	8	9″		
1	0	8		
	1	2	3‴	
1	1	10	3	
24				
27	8	6	0	

62. 1ft. 3in. 6″

0	3	3			
0	3	10	6‴		
0	0	3	10	6⁗	
0	4	2	4	6	
16					
5	7	2	0	0	

63. 16ft. 0in.

0	9		
12	0		
0	11		
11	0		

64. 41ft. 0in.

1	5		
58	1		
0	11		
53	2	11″	

65. 18ft. 9in.

1	7			
18	9			
10	11	3″		
29	8	3		
2	6			
59	4	6		
14	10	1	6‴	
74	2	7	6	

A CARPENTER'S ACCOUNT.

753 yds. 3 ft. 8 in. flooring, .	£131,	16s.	11d.
151 yds. 9 in. painting, . .	4	14	5
158 yds. 1 ft. 3 in. plastering, .	2	19	3½
1737 ft. timber, . . .	133	17	10½
6 ro. 6 yds. 6 ft. slating, . .	4	9	8
196 ft. 10 in. 6″ sawing, . .	0	8	2¼
154 ft. deals, ...	1	12	1
83 ft. 4 in. 11″ 5‴ 3⁗ Memel logs,	6	19	0
	£286	17	5¼

66. $\frac{34 + 20}{2}$ = 27 in. = 2 ft. 3 in. and $\frac{17 + 10}{2}$ = $13\frac{1}{2}$ in. = 1ft. 1 in. 6″, then 1 ft. 1 in. 6″ × 2 ft. 3 in. × 24 ft. 9 in. = 2 ft. 6 in. 4″ 6‴ × 24 ft. 9 in. = 62 ft. 7 in. 9″ 4‴ 6⁗.

67. 50 + 50 + 18 + 18 = 136 ft. circumference of the house, and 136 ft. × 15 ft. = 2040 ft. = walls, then 50 × 18 = 900 ft. = floor or roof. Therefore 2040 + 900 + 900 = 3840 ft.

68. $24\frac{1}{2} \times 2 \times 1\frac{1}{4} = 61\frac{1}{4}$ ft. content of the plank, and $61\frac{1}{4} \times 25$ lb. = $1531\frac{1}{4}$ lb.

69. 1 ft. : $61\frac{1}{4}$ ft. :: 1s. 2d. : £3, 11s. $5\frac{1}{2}$d. and 1 lb. : $1531\frac{1}{4}$ lb. :: $\frac{1}{2}$d. : £3, 3s. $9\frac{1}{2}$d. $\frac{1}{4}$.

70. 68 ft. 4 in. × 60 ft. 6 in. = 4134 ft. 2 in., and 9 ft. : 4134 ft. 2 in. :: $3\frac{1}{4}$d. : £6, 4s. $4\frac{3}{4}$d. $\frac{3}{5}\frac{1}{4}$.

71. 5 ft. 6 in. + 5 ft. 3 in. + 4 ft. 9 in. = 15 ft. 6 in. and 15 ft. 6 in. × 2 ft. 6 in. × 5 = 38 ft. 9 in. × 5 = 193 ft. 9 in., then 1 ft. : 193 ft. 9 in. :: $9\frac{1}{2}$d. : £7, 13s. $4\frac{1}{2}$d. $\frac{1}{2}$.

72. 60 × 30 × 4 = 1800 × 4 = 7200 content of the 4 floors, and 12 ft. 4 in. × 8 ft. 6 in. × 4 = 104 ft. 10 in. × 4 = 419 ft. 4 in. content of the whole staircase, then 7200 ft. — 419 ft. 4 in. = 6780 ft. 8 in. = 753 yds. 3 ft. 8 in. Lastly, 9 ft. : 6780 ft. 8 in. :: 3s. 6d. = 180 in. : 81368 in. :: 42d. : $31643\frac{1}{3}$d. = £131, 16s. $11\frac{1}{3}$d.

73. (40 ft. 6 in. + 24 ft. 3 in.) × 2 × 10 ft. 6 in. = 64 ft. 9 in. × 2 × 10 ft. 6 in. = 129 ft. 6 in. × 10 ft. 6 in. = 1359 ft. 9 in. = 151 yds. 9 in., then 9 ft. : 1359 ft. 9 in. :: $7\frac{1}{2}$d. : £4, 14s. $5\frac{0}{4}$d. $\frac{1}{2}$.

74. (32 ft. 6 in. + 16 ft. 6 in.) × 2 × 9 ft. 3 in. = 98 ft. × 9 ft. 3 in. = 906 ft. 6 in., then 6 ft. 6 in. × 3 ft. = 19 ft. 6 in. door, whence 906 ft. 6 in. — 19 ft. 6 in. = 887 ft. walls, again 32 ft. 6 in. × 16 ft. 6 in. = 536 ft. 3 in. roof. Therefore 887 ft. + 536 ft. 3 in. = 1423 ft. 3 in. = 158 yds. 1 ft. 3 in. content of the whole, and 1 yd. : 158 yds. 1 ft. 3 in. :: $4\frac{1}{2}$d. : £2, 19s. $3\frac{1}{2}$d. $\frac{1}{2}$.

75. 12 ft. 6 in. × 1 ft. 9 in. × 9 = 21 ft. 10 in. 6″ × 9 = 196 ft. 10 in. 6″, and 1 ft. : 196 ft. 10 in. 6″ :: ½d. : 8s. 2¼d. ¾.

76. 12 ft. 6 in. × 8½ in. = 8 ft. 10 in. 3″ = 1275″ and 50 ft. × 16 ft. = 800 ft. = 115200″, then 115200 ÷ 1275 = $90\frac{6}{17}$ deals.

77. 50 ft. 6 in. × 24 ft. 3 in. = 1224 ft. 7 in. 6″ = 136 yds. 7 in. 6″ = 3 ro. 28 yds. 7½ in., then 324 sq. ft. (1 rood) : 1224 ft. 7½ in. :: £2 : £7, 11s. 2¼d. $\frac{1}{2}\frac{1}{7}$.

78. 64 ft. × 20 ft. = 1280 ft. to reduce which to standard measure, multiply by 3, and divide by 2, or add ½ of it to itself, the result is 1920 ft., therefore 324 ft. : 1920 ft. :: £2 : £11, 17s. 0¼d. $\frac{7}{9}$.

79. 48 ft. × 28 ft. = 1344 ft. which reduced to standard measure by × 5, and ÷ 3 is = 2240 ft. = 248 yds. 8 ft.

80.

	ft.	in.	″	‴
Side-walls, 41 ft. × 19 ft. 9 in. × 2 =	1619	6	0	0
End-walls, 20 ft. 9 in. × 18 ft. 9 in. × 2 = 778 ft. 1 in. 6″ to which add ¼ of itself for the thickness, the result is = ...	972	7	10	6
Gables above end-walls, $\frac{20\text{ ft. }9\text{ in.}+4\text{ ft.}}{2}$ = 12 ft. 4 in 6″, and 12 ft. 4 in. 6″ × 8 ft. 6 in. × 2 = 210 ft. 4 in. 6″ to which add ¼ of itself for thickness =	262	11	7	6
Chimney-stacks, 4 feet + 2 feet 6 in. = 6 ft. 6 in. × 5 ft 1 in. × 2 =	66	1		
	9)2921	2	6	
	36)324	5	2	6

Content of the building = 9 r. 5 ft. 2½ in.

Now, 1 rood : 9 ro 5 ft. 2¼ in. :: 30s. : £13, 10s. 5¾d. $\frac{4}{1}\frac{}{7}$ expense of building.

BROACHED HEWN WORK.

Skews, 11 ft 6 in. × 1 ft. 7 in. × 4	=	72 ft.	10 in.
Corners, 18 ft. 9 in. × 2 ft. 6 in. × 4	=	187	6
Chimney-stacks, 13 ft. × 5 ft. 3 in. × 2	=	136	6
		396 ft.	10 in.

Then 1 ft. : 396 ft. 10 in. : : 4d. : £6, 12s. $3\frac{1}{4}$d. $\frac{1}{3}$

DROVED HEWN WORK.

13 ft. 11 in. × 1 ft. 3 in. × 6	= 104 ft.	4 in.	6″
3 ft. 11 in. × 1 ft. 7 in. × 6	37	2	6
9 ft. 3 in. × 1 ft. 3 in. .	11	6	9
3 ft. 3 in. × 1 ft. 7 in. . .	5	1	9
19 ft. 3 in. × 1 ft. 3 in. .	24	0	9
4 ft. 3 in. × 1 ft. 7 in. . .	6	8	9
6 ft. × 2 ft. × 3	36	0	0
4 ft. 5 in. × 1 ft. 3 in. × 3	16	6	9
3 ft. 1 in. × 1 ft. 6 in. × 3	13	10	6
3 ft. 8 in. × 1 ft. 8 in. × 3	18	4	0
8 ft. 8 in. × 2 ft. 3 in. .	19	6	0
5 ft. 8 in. × 1 ft. 3 in. . .	7	1	0
4 ft. × 1 ft. 9 in. . .	7	0	0
	307 ft.	5 in.	3″

Then 1 ft. : 307 ft. 5 in. 3″ : : 5d. : £6, 8s. $1\frac{9}{4}$d. $\frac{3}{4}$, and 1 ft. : $106\frac{1}{2}$ ft. : : 6d. : £2, 13s. 3d. vents.

Now expenses for building,	= £13,	10s.	$5\frac{3}{4}$d.	$\frac{4}{27}$
Broached work,	= 6	12	$3\frac{1}{4}$	$\frac{1}{3}$
Droved work,	= 6	8	$1\frac{9}{4}$	$\frac{3}{4}$
Vents,	= 2	13	3	
Whole expense,	£29	4	$1\frac{1}{4}$	$\frac{25}{108}$

81. 46 ft. 6 in. + 1 ft. 6 in. (the two eaves) = 48 ft. and 48 ft. × 41 ft. 9 in. = 2004 ft. = 222 yds. 6 ft. = 6 ro. 6 yds. 6 ft. Now 324 ft. : 2004 ft. : : 14s 6d. : £4, 9s. $8\frac{1}{2}$d.

MISCELLANEOUS QUESTIONS.

1. £2573, 3s. $11\frac{3}{4}$d. — £689, 18s. $2\frac{1}{4}$d. = £1883, 5s $9\frac{1}{2}$d. net estate.

2. £2851, 4s. ÷ 16 = £178, 4s. captain's share. Then £2851, 4s. — £178, 4s. = £2673 and £2673 ÷ 32 = £83, 10s. $7\frac{1}{2}$d. each officer's share, which × 6 = £501, 3s. 9d. sum of the officers' shares. Again £2673 — £501, 3s. 9d. = £2171, 16s. 3d. and £2171, 16s. 3d. ÷ 45 = £48, 5s. 3d. each private man's share.

3. Captain $1\frac{1}{2}$ + men 4 + boy $\frac{1}{3}$ = $5\frac{5}{6}$ shares. Wherefore £212, 14s. 7d. ÷ $5\frac{5}{6}$ = £36, 9s. $4\frac{1}{7}$d. $\frac{1}{7}$ one share, consequently a man's share, which multiplied by $1\frac{1}{2}$ = £54, 14s. $0\frac{1}{4}$d. $\frac{6}{7}$ captain's share, and ÷ 3 = £12, 3s. $1\frac{1}{4}$d. $\frac{2}{7}$ the boy's share.

4. $60\frac{1}{2}$ ft. × $33\frac{1}{2}$ ft. = $2026\frac{3}{4}$ ft., and 15 ft. × $1\frac{1}{4}$ ft. = $18\frac{3}{4}$ ft. Whence $2026\frac{3}{4}$ ÷ $18\frac{3}{4}$ = 8107 ÷ 75 = $108\frac{7}{75}$ planks.

5. First 1603 — 70 = 1533, year in which she was born. Again 1603 — 1558 = 44 yrs. and from Nov. 17 to March 24 (both days included) is 128 days. Then 44 yrs. × $365\frac{1}{4}$ = 16071 days, to which add 128, the sum is 16199 days = 2314 w. 1 da. = 578 m. 2 w. 1 da. reigned.

6. First $\frac{3}{8}$ of 11s. = 4s. $1\frac{1}{2}$d. gain by the first price, which taken from 11s. leaves 6s. $10\frac{1}{2}$d. prime cost. Then 13s. 6d. — 6s. $10\frac{1}{2}$d. = 6s. $7\frac{1}{2}$d. gain by the second price. Whence 6s. $10\frac{1}{2}$d. : 6s. $7\frac{1}{2}$d. :: 100 : £96, 7s. $3\frac{1}{4}$d. $\frac{1}{11}$.

7. 1 cwt. : 17 cwt. 3 qrs. 14 lb. :: £2, 6s. 8d. : £41, 14s. 2d. and 1 lb. : 18 cwt. 1 qr. 21 lb. :: $4\frac{1}{2}$d. : £38, 14s. $4\frac{1}{2}$d. Then 17 cwt. 3 qrs. 14 lb. + 18 cwt. 1 qr. 21 lb. = 36 cwt. 1 qr. 7 lb. and £41, 14s. 2d. + £38, 14s. $4\frac{1}{2}$d. = £80, 8s. $6\frac{1}{2}$d. Therefore 36 cwt. 1 qr. 7 lb. : 1 cwt. :: £80, 8s. $6\frac{1}{2}$d. : £2, 4s. $3\frac{1}{2}$d. $\frac{1}{40}\frac{0}{8}\frac{7}{7}\frac{8}{7}$.

8. Stockings, £316, 5s. + stuff, £26, 16s. 8d. = £343, 1s. 8d. and sugar, £57, 5s. $4\frac{1}{2}$d. + indigo, £183, 3s. 4d. = £240, 8s. $8\frac{1}{2}$d. Then £343, 1s. 8d. — £240, 8s $8\frac{1}{2}$d. = £102, 12s. $11\frac{1}{2}$d.

9. £100 : £560, 10s. : : £2, 10s. : £14, 0s. 3d.

10. 1s. 2d. + 7½d. + 3½d. + 3d. = 2s. 4d. = 28d. and £14 = 3360d. Then 3360 ÷ 28 = 120.

11. 3s. 6d. + 2s. 6d. + 1s. 6d. + 1s. = 8s. 6d., and the fourth part of the seats, 600 at 8s. 6d. = £255. Then £255 — £120 = £135 annual surplus. Whence £1600 : £100 : : £135 : £$8\frac{7}{16}$ per cent.

12. From 5th March to 4th Nov. are 244 days, from which take 34 Sundays, there remain 210 work days. Then 1 da. : 210 da. : : 14d. : £12, 5s. Again, from 4th Nov. to 5th March, are 104 work days. Wherefore 1 da. : 104 da. : : 11½d. : £4, 19s. 8d. Lastly, £12, 5s. + £4, 19s. 8d. = £17, 4s. 8d.

13. $6 \times 40 \times 4 = 240 \times 4 = 960$
$6 \times 30 \times 12 = 180 \times 12 = 2160$
$3 \times 22 \times 110 = 66 \times 110 = 7260$

Then 960 + 2160 + 7260 = 10380, whence

10380 : 240 : : £1000 : £23, 2s. 5d. $\frac{92}{173}$ Officer's.
10380 : 180 : : 1000 : 17 6 9¾ $\frac{69}{173}$ Midshipman's.
10380 : 66 : : 1000 : 6 7 2 $\frac{8}{173}$ Sailor's.

14. 73726 yds. × 3 × 60 × 10 = 132706800 yds. in a day, and 132706800 × (365 — 63) = 40077453600 yds. in a year.

15. 1300 × 47 × 15½s. = 947050s. price of the cloth; the half of which is 473525. Then £65 : 473525s. : : 1 t. : 364 t. 1 hhd. of wine; and 70s. : 473525s. : : 1 chest : $6764\frac{9}{14}$ chests of oranges.

16. 608 + 1200 + 1500 = 3308, then
3308 : 608 : : £12, 10s. : £2, 5s. 11¼d. $\frac{455}{827}$ A pays.
3308 : 1200 : : 12 10 : 4 10 8¼ $\frac{669}{827}$ B pays.
3308 : 1500 : : 12 10 : 5 13 4¼ $\frac{293}{827}$ C pays.

17. £3, 10s. × $14\frac{3}{4}$ = £51, 12s. 6d. = 12390d. price of the sugar, and 12390d. ÷ 66d. = 187 yd 2 qr. $3\frac{7}{11}$ nails.

18. 144 ells : 5760 ells (an acre) : : 1 lip. : 40 lip. = 10 pks., and 1 lip. : 40 : : 1s. $5\frac{1}{2}$d. : £2, 18s. 4d.

19. 5760 ells ÷ 100 = 57 pks. $2\frac{2}{5}$ lip. = 14 fir. 1 pk. $2\frac{2}{5}$ lip. = 3 bo. 2 fir. 1 pk. $2\frac{2}{5}$ lip.

20. $\frac{1}{2}$ mark = 6s. 8d. = 80d. : 60d. (5s.) : : 4 oz. ($\frac{1}{4}$ lb.) : 3 ounces.

21. $\left.\begin{matrix}1 \text{ sol.} : 750 \text{ sol.} \\ 8 \text{ da.} : 365 \text{ da.}\end{matrix}\right\}$: : 12 lb. : $\frac{12 \times 750 \times 365}{8}$

= 3 × 375 × 365 = 410625 lb. = 183 tons, 6 cwt. 1 qr. 5 lb.

22. First $\frac{1}{4} + \frac{3}{8} + \frac{1}{8} = \frac{6}{8}$ and $1 - \frac{6}{8} = \frac{2}{8} = \frac{1}{4}$ W's share; then £120, 14s. ÷ 4 = £30, 3s. 6d. S or W; £120, 14s. × 3 ÷ 8 = £362, 2s. ÷ 8 = £45, 5s. 3d. T; and £120, 14s. ÷ 8 = £15, 1s. 9d. V.

23.

2oz.	5dr.	0sc.	0gr.
3	4	0	0
0	5	2	15
4	3	1	8
11	2	1	3

24. 1 po. : 12000$\frac{1}{2}$ ac. : : 15 f. : £30001, 5s. yearly income. And £30001, 5s. ÷ 365 = £82, 3s $10\frac{3}{4}$d. $\frac{2}{7}\frac{3}{3}$ daily income.

25. 390 ft. 9 in. (sum of the 5 circumferences) × 10 ft. 8 in. = 4168 ft. = 100032 half-inches, and 100032 h. in. ÷ 65 (32$\frac{1}{2}$ in.) = 1538 ft. $11\frac{2}{6}\frac{3}{5}$ inches = 512 yards, $35\frac{2}{6}\frac{3}{5}$ inches.

26. 17 lb. $10\frac{1}{2}$ oz. × 73 = 4520 drs. × 73 = 329960 drs. in the whole, and 329960 ÷ 126 drs. (7 oz. 14 drs.) = $2618\frac{1}{6}\frac{6}{3}$.

27. 110 : 100 : : £350 : £318, 3s. $7\frac{1}{2}$d. $\frac{6}{11}$ principal. And 110 : 10 : : £350 : £31, 16s. $4\frac{1}{4}$d. $\frac{5}{11}$ gain; or £350 — £318, 3s. $7\frac{1}{2}$d. $\frac{6}{11}$ = £31, 16s. $4\frac{1}{4}$d. $\frac{5}{11}$ gain.

28. 13 = (8 + 5) : £154 : : (8 — 5) : £35, 10s. $9\frac{9}{13}$d. $\frac{12}{13}$.

29. $10\frac{1}{2}$d. + 5s. 9d. + 1s. $8\frac{1}{2}$d. = 8s. 4d. = 25 fourpences, and £704, 3s 4d. = 42250 fourpences; therefore 42250 ÷ 25 = 1690 lb. of each sort.

30. 650 × 10 × $3\frac{1}{2}$d. = 6500 lb. × $3\frac{1}{2}$d. = 22750d. = £94, 15s. 10d. selling price of the whole, from which take 80 guineas or £84, there remains £10, 15s. 10d. gain.

31. 11 cwt. 3 qrs. × 20 = 235 cwt. and 235 cwt. × £$7\frac{1}{2}$ = £1762, 10s. selling price of the whole, from which subtract 1500gs. or £1575, the balance is £187, 10s.

32. £519, 10s. 6d. + £33, 12s. + £61, 1s. + £17, 6s. 6d. = £661, 10s. Then 126 × 18 = 2268 gal. : 1 gal. : : £661, 10s. : 5s. 10d. per gallon.

33. 70 bars of steel × 8 lb. = 560 lb. = 5 cwt. and 560 × 5d. = 2800d. = £11, 13s. 4d. price of the steel, which taken from £29, 3s. 4d. leaves £17, 10s. price of the iron. Then 2240 lb. (a ton) — 560 lb. = 1680 lb. = 15 cwt. of iron. Now £17, 10s. ÷ 1680 = $2\frac{1}{2}$d. price of the iron per lb. Lastly, 130 bars — 70 = 60 bars of iron and 1680 ÷ 60 = 28 lb. weight of each bar of iron.

34. 1000 Flem. ells : 5 qrs. (an Eng ell) : : £100 = (90 + 10) : 2s. 4d. per English ell.

35. 32 pks. (a qr.) : 24 pks. : : 18s. : 13s. 6d. price of the oats, and 1s. 4d × 20 = £1, 6s. 8d. price of the hay. Therefore £10, 16s. + 13s 6d. + £1, 6s. 8d = £12, 16s. 2d. whole cost of the ox. Now 36 st. × 14 = 504 lb. × $5\frac{1}{2}$d. = 2772d. = £11, 11s. price of the beef, and 6 st. × 14 = 84 lb. × 7d. = 588d. = £2, 9s. price of the tallow. Then £11, 11s. + £2, 9s. + £1, 5s. = £15, 15s. whole sum received for the ox, from which deduct the prime cost, £12, 16s. 2d., and there remains £2, 8s. 10d. gain.

36. 5 × 365 × 8d. = 14600d. = £60, 16s. 8d. expense of maintenance. £3 × 3 years = 9 and 9 + 5 + 8 = £22 allowed for clothes. Then £60, 16s. 8d. + £22 =

£82, 16s. 8d. whole expense. Now £6 + 12 + 18 + 24 = £60 value of his work, to which add £25 apprentice-fee = £85; therefore £85 — £82, 16s. 8d. = £2, 3s. 4d. gain.

37. 100 : $91\frac{2}{3}$ = (100 — $8\frac{1}{3}$) : : 5s. 6d. : 5s. $0\frac{1}{2}$d. money remitted home, from which take 3s. $11\frac{1}{2}$d. (cost price including freight, &c.), there remains 1s. 1d. gain. Then 3s. $11\frac{1}{2}$d. : 1s. 1d. : : £100 : £27, 7s. $4\frac{1}{4}$d. $\frac{1}{19}$ gain per cent.

38. 7 men × 5 ÷ 3 = $11\frac{2}{3}$ women and $11\frac{2}{3}$ + 9 = $20\frac{2}{3}$; then $20\frac{2}{3}$ × 7 ÷ 6 = $24\frac{1}{9}$ boys, and $24\frac{1}{9}$ + 3 = $27\frac{1}{9}$; consequently the sum is to be divided among $27\frac{1}{9}$ boys; wherefore £43, 12s. 9d. ÷ $27\frac{1}{9}$ = £1, 12s. $2\frac{1}{4}$d. $\frac{24}{1292}$, a boy's share; which × 7 ÷ 6 = £1, 17s. $6\frac{1}{2}$d. $\frac{89}{1292}$, a woman's share; and this × 5 and ÷ 3 = £3, 2s. 7d. $\frac{67}{1292}$, a man's share.

Otherwise, if a boy get 18 shares, it is obvious that a woman will get 21, and a man 35; therefore 35 × 7 = 245, 21 × 9 = 189, and 18 × 3 = 54; now 245 + 189 + 54 = 488; hence 488 : 35 : : £43, 12s. 9d. : £3, 2s. 7d. $\frac{67}{1292}$, a man's share; 488 : 21 : : £43, 12s. 9d. : £1, 17s. $6\frac{1}{2}$d. $\frac{89}{1292}$, a woman's; and 488 : 18 : : £43, 12s. 9d. : £1, 12s. $2\frac{1}{4}$d. $\frac{24}{1292}$, a boy's.

39. Find the value of the whole court at 3s. per yard, and the footpath at 6d., the sum of these values will be the whole cost. Thus, 68 ft. 6 in. × 42 ft. 9 in. = 2928 ft. 4 in. 6″ = area of the whole court; 68 ft. 6 in. × 5 ft. 6 in. = 376 ft. 9 in. = area of the footpath. Then 9 ft. : 2928 ft. 4 in. 6″ : : 3s. : £48, 16s. $1\frac{1}{2}$d = price of the whole court at 3s.; and 9 ft. : 376 ft. 9 in. : : 6d. : £1, 0s. $11\frac{2}{4}$d. $\frac{2}{3}$ = price of the footpath at 6d. Lastly, £48, 16s. $1\frac{1}{2}$d. + £1, 0s. $11\frac{2}{4}$d. $\frac{2}{3}$ = £49, 17s. $0\frac{1}{2}$d. $\frac{2}{3}$ whole cost.

40. £2 + $\frac{3}{8}$ of $\frac{1}{3}$ = $\frac{2}{1}$ + $\frac{1}{8}$ = $\frac{16+1}{8}$ = £$\frac{17}{8}$, and 3 yds. + $\frac{2}{3}$ of $\frac{3}{5}$ = $\frac{3}{1}$ + $\frac{2}{5}$ = $\frac{15+2}{5}$ = $\frac{17}{5}$ yds. Then $\frac{17}{5}$ yds. : $\frac{3}{4}$ yd. : : £$\frac{17}{8}$: $\frac{5 \times 17 \times 3}{17 \times 8 \times 4}$ = $\frac{5 \times 3}{8 \times 4}$ = £$\frac{15}{32}$ = 9s. $4\frac{1}{2}$d.

41. First $\sqrt{(40^2 - 33^2)} = \sqrt{(1600 - 1089)} = \sqrt{511} = 22{\cdot}605$. Then $\sqrt{(40^2 - 21^2)} = \sqrt{(1600 - 441)} = \sqrt{1159} = 34{\cdot}044$. Consequently $22{\cdot}605 + 34{\cdot}044 = 56{\cdot}649$ ft. = 56 ft. 7·788 inches the breadth of the street.

42. $\left.\begin{matrix} 36 \text{ ox.} : 21 \text{ ox.} \\ 4 \text{ we.} : 9 \text{ we.} \end{matrix}\right\}$: : 10 : $13\frac{1}{8}$, hence $13\frac{1}{8} - 10 = 3\frac{1}{8}$ ac. the increase of the grass upon 10 ac. for 5 weeks, now 5 weeks : 14 weeks : : $3\frac{1}{8}$ ac. : $8\frac{3}{4}$ ac. the increase in 14 weeks, consequently $\left.\begin{matrix} 10 \text{ ac.} : 18\frac{3}{4} \text{ ac.} \\ 18 \text{ we.} : 4 \text{ we.} \end{matrix}\right\}$: : 36 oxen : 15 oxen, the number required.

43. £3179, 11s. 8d. + £100 ÷ 4 = £3204, 11s. 8d. and £3204, 11s. 8d. — $\frac{1}{13}$ of it = £2958, 1s. $6\frac{1}{2}$d. his worth at the end of 3 years, then £2958, 1s. $6\frac{1}{2}$d. + £100 = £3058, 1s. $6\frac{1}{2}$d. and £3058, 1s. $6\frac{1}{2}$d. — $\frac{1}{4}$ of it = £2293, 11s. 2d. worth at the end of 2 years; again, £2293, 11s. 2d. + £100 = £2393, 11s. 2d., and this — $\frac{1}{4}$ of itself is = £1795, 3s. $4\frac{1}{2}$d. worth at the end of 1 year; now £1795, 3s. $4\frac{1}{2}$d. + 100 = £1895, 3s. $4\frac{1}{2}$d. and this — $\frac{1}{4}$ of itself is = £1421, 7s. $6\frac{1}{2}$d. what he had at the beginning.

44. $\frac{1}{30} - \frac{1}{39} = \frac{1}{1170} = £540$, 10s. the difference of the legacies; hence 411 : 1170 : : £540, 10s. : £1538, 12s. $11\frac{3}{4}$d. $\frac{2}{4}\frac{6}{1}\frac{7}{1}$, the sum left.

45. As the minute-hand goes round the whole circumference, while the hour-hand only goes over the $\frac{1}{12}$ part of it, therefore the minute-hand gains $\frac{1}{11}$ upon the other in one hour; and when the minute-hand is at 12, the other is at 4; now since the next time the former overtakes the latter, it must have gone over 4 parts of the 12 more than the other; hence 11 : 4 : : 60 : $21\frac{9}{11}$ min. past 4, the time required.

46. Here 3 : 4 : : 4 : $5\frac{1}{3}$, and $5\frac{1}{3} - 5 = \frac{1}{3}$ of a leap gained upon every 4 leaps of the hare, whence $\frac{1}{3}$: 100 : : 4 : 1200 leaps.

47. Here A and B perform $\frac{1}{8}$ of the work in a day, A and C $\frac{1}{8}$ of it, and B and C $\frac{1}{12}$ of it, hence $\frac{1}{8} + \frac{1}{8} + \frac{1}{12} = \frac{9}{24}$ of it done by the 3 together in 2 days, since each has been taken twice, and $\frac{9}{48}$ the part done by them in 1 day. Now $\frac{9}{48} - \frac{1}{12} = \frac{5}{48}$ of it done by A in 1 day, and $\frac{5}{48}$: 1 :: 1d. : $9\frac{3}{5}$ days A takes. $\frac{9}{48} - \frac{1}{8} = \frac{3}{48} = \frac{1}{16}$ of it done by B in 1 day, and $\frac{1}{16}$: 1 :: 1d. : 16 days B takes. $\frac{9}{48} - \frac{1}{8} = \frac{1}{48}$ of it done by C in 1 day, and $\frac{1}{48}$: 1 :: 1d. : 48 days C takes.

48. $\sqrt{(86^2 - 76^2)} = \sqrt{(7396 - 5776)} = \sqrt{1620} = 40{\cdot}2492$, and $50 - 40{\cdot}2492 = 9{\cdot}7508$ height of the statue; then $64 - 9{\cdot}7508 = 54{\cdot}2492$ height of the higher column above the top of the statue; again, $\sqrt{(97^2 - 54{\cdot}2492^2)} = \sqrt{(9409 - 2942{\cdot}97570064)} = \sqrt{6466{\cdot}02429936} = 80{\cdot}4116$ distance between the statue and the higher column, then $80{\cdot}4116 + 76 = 156{\cdot}4116$ distance between the columns; whence $\sqrt{\{156{\cdot}4116^2 + (64 - 50)^2\}} = \sqrt{(24464\ 58861456 + 196)} = \sqrt{24660{\cdot}58861456} = 157{\cdot}0369$ feet, the distance between the tops of the columns.

49. $19 \times 4 \div 5 = 15{\cdot}2$s. prime cost per yard; then 100 : 102·5 :: 15·2 : 15·58; also, 100 : 105 :: 15·58 : 16·359; lastly, 100 : 125 :: 16·359 : 20·44875s. = £1, 0s. $5\frac{1}{4}$d. $\frac{7}{8}$ selling price per yard.

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