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THE 'STANDARD' MANUAL

OF

ARITHMETIC,

(THEORETICAL AND PRACTICAL).

EDITED BY

J. S. LAURIE,

One of Her Majesty's Inspectors of Schools; editor of the "Standard Reading Books," the "Standard Writing-Exercise Books," &c.

"It is indispensable that we reflect upon, and know the reason of, what we are doing." *De Morgan.*

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*** *The Editor has to express his obligations to Messrs. Box, Marshall Dalton, and Beard. He has also to record his particular obligations to Mr. Drage, for numerous services ably and courteously rendered.*

PREFACE.

The object of the present Manual is two-fold, viz. :—to give a brief and concise explanation of the principles of the science of Arithmetic, together with a sufficient number of exercises. In reference to the first point, the editor has been guided by the conviction that, as far as the teacher is concerned, elaborate expositions are superfluous, while they are, at the same time, confusing to the beginner; and, on the other hand, that the bare statement of mechanical rules is neither suggestive of method to the teacher, nor of *permanent* service to the pupil. The exercises are, in certain respects, peculiar: they are characterised by shortness, because sums of an unreasonable length answer no practical end; and, when an error is committed, the labour of retracing the ground produces discouragement. The earlier exercises are simplified by being put in the concrete form, while the later miscellaneous questions are made to bear directly on the practical wants of daily life. These are unusually numerous, and their *forms* are as varied as possible.

Great stress has been laid on the *first four rules*, on the principle that, if these are once thoroughly understood, the primary condition of real progress is secured. To avoid the difficulties which the development of principles might otherwise throw in the way of beginners, a new expedient has been adopted. The respective rules

are not expounded *continuously*: each is first divided into sections; the chain is then disconnected and linked to a section of another rule, for which the way has been paved. For example, the sections on the addition of tens and hundreds are succeeded by one on subtraction of tens, without "borrowing," as it is termed. Then comes the multiplication of easy numbers, such as 1×2; 2×2; 3×2, &c.; next, addition of thousands is resumed; after that, more difficult multiplication to the end of the usual table. This is again followed by division, so far as the multiplication table can be applied to it; next, a complete section on subtraction, illustrative of, so-called, "borrowing," and so forth. Thus, *theory* is postponed until *practice* has prepared the mind for its reception, and the pupil becomes gradually familiarised with those cardinal elements of which the higher rules are nothing but so many complications.

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PARTS I. AND II.

PART III.

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PART VII.

STANDARD' MANUAL

OF

PRACTICAL ARITHMETIC.

PARTS I. and II.

(Corresponding to Standards I. and II.

FIGURES.

1 ... One	6 ... Six	11 ... Eleven	16 ... Sixteen
2 ... Two	7 ... Seven	12 ... Twelve	17 ... Seventeen
3 ... Three	8 ... Eight	13 ... Thirteen	18 ... Eighteen
4 ... Four	9 ... Nine	14 ... Fourteen	19 ... Nineteen
5 ... Five	10 ... Ten	15 ... Fifteen	20 ... Twenty

Write out (in words) the names of the following :—

1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20.

---

21 ... Twenty-one	24 ... Twenty-four	27 ... Twenty-seven
22 ... Twenty-two	25 ... Twenty-five	28 ... Twenty-eight
23 ... Twenty-three	26 ... Twenty-six	29 ... Twenty-nine

Write out (in words) the names of the following :—

23, 26, 20, 27, 24, 21, 25, 28, 22, 29.

10 ... Ten	40 ... Forty	70 ... Seventy
20 ... Twenty	50 ... Fifty	80 ... Eighty
30 ... Thirty	60 ... Sixty	90 ... Ninety

Write out (in words) the names of the following :—

40, 70, 10, 50, 20, 80, 90, 30, 60, 43, 75, 18, 58, 29, 84, 96, 33, 62.

Section I.

SIMPLE ADDITION (Ones or Units).

Each section should always be preceded by a collective *oral* lesson, and varied with preliminary or supplementary exercises, of corresponding character, written on the blackboard.

Definition. *Addition means counting, or adding numbers together: when we say "one, two," we add one to one; when we say "two, three," we add one to two.* One figure may stand for several *ones* added together, thus 4 stands for 1 & 1 & 1 & 1; and so on from 2 to 9.

Numbers to be added together must always refer to the same things. We cannot add numbers of *different* things together:—2 apples and 2 pears could not make 4 *apples* or 4 *pears*, 4 horses and 5 chairs could not make 9 horses or 9 chairs. You may only call the 4 and the 9 *articles*.

Position. **A figure in the first place stands for so many ones, or single things, or units.***

Boys.	Girls.	Caps.	Hats.	Men.	Women.	Children.
2	3	3	1	3	5	1
3	4	1	2	5	2	4
1	2	3	4	1	2	3

Horses.	Cows.	Calves.	Sheep.	Asses.	Goats.
7	1	4	3	7	5
2	7	5	8	6	2
3	8	2	5	3	9
5	3	6	4	2	3

* The usual word column, for *place*, should be strictly avoided. *Ones* should also be used instead of "units." Concrete numbers should be employed at the earlier stages. All the essential objects of laying a sound foundation will be facilitated by the employment of the "Calculator Box."

Tigers.	Lions.	Wolves.	Whales.	Serpents.	Elephants.
7	3	8	6	3	7
3	4	3	5	4	3
2	5	2	4	9	4
1	6	4	2	1	8

Chairs.	Tables.	Cups.	Saucers.	Spoons.	Plates.
7	3	8	7	4	3
2	5	4	6	5	4
1	4	3	5	6	8
3	7	9	1	7	9

Pins.	Needles.	Dogs.	Hounds.	Nuts.	Balls.
4	7	3	8	7	5
5	3	2	6	8	4
6	8	4	9	4	6
4	4	7	3	8	2

Add the following:—Pins, 5, 7, 8, 4, 3; Books, 9, 4, 3, 7, 9; Slates, 9, 4, 7, 8, 3; Maps, 9, 3, 0, 4, 7; Carts, 8, 4, 7, 9, 6; Pigs, 5, 7, 8, 4, 3; Sheep, 8, 7, 5, 9, 4, 6; Pence, 8, 4, 7, 9, 4, 6; Pounds, 9, 7, 5, 8, 4, 3; Bricks, 9, 9, 8, 4, 7, 5; Tops, 8, 9, 7, 5, 4, 6; Marbles, 9, 8, 5, 4, 9, 6.

*** When numbers are added together, the amount is called the *sum*.

Find the *sum* of the following:—Books, 9, 5, 4, 6, 4, 3; Men, 9, 7, 5, 4, 6, 3; Days, 7, 4, 9, 6, 8, 4; Balls, 5, 9, 8, 4, 7, 3; Kites, 9, 3, 2, 0, 7, 5; Hours, 6, 9, 7, 4, 5, 6; Shillings, 9, 7, 5, 4, 6, 9, 3; Tons, 7, 3, 4, 8, 9, 4, 6; Miles, 8, 4, 7, 5, 6, 9, 3, 6; Pence, 8, 7, 5, 4, 6, 9, 2, 3; Farthings, 6, 3, 4, 2, 8, 9.

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

The sign of addition is +, which means *and*. When placed between two numbers, it means that those two numbers are to be added together, as 4 + 2 are 6.

7 + 4 + 3 + 7 + 5; 8 + 4 + 7 + 9 + 4; 8 + 4 + 7 + 5 + 9
6 + 5 + 4 + 5 + 9; 7 + 3 + 9 + 4 + 3; 9 + 4 + 7 + 3 + 8
7 + 8 + 4 + 7 + 9; 3 + 4 + 7 + 6 + 5; 8 + 4 + 7 + 5 + 6
3 + 9 + 4 + 7 + 8; 5 + 3 + 6 + 2 + 8; 7 + 4 + 3 + 5 + 8

Add up also each of the above columns.

John has 4 oranges, Charles 7, and William 9: how many in all?

Tom has 5 buttons on his coat, 4 on his trousers, and 2 on his cap: how many in all?

A man gave one son 4 plums, another 7, another 3, another 5: how many plums did he give away?

A boy had to walk four miles to school; how many miles did he walk in two days?

Edward has 4 marbles, Alfred 6, John 7, Tom 9: how many in all?

Five boys bought apples: one 7, another 9, another 7, the other two 5 each: how many were bought?

If in a farm-yard there are 5 chickens, 4 ducks, 2 peacocks, and 4 turkeys: how many fowls are there?

I have 7 birds, John has 6, Willie 5, and James 9: how many birds have we altogether?

Section II.

SIMPLE ADDITION (Tens).

20	Twenty	60	Sixty
30	Thirty	70	Seventy
40	Forty	80	Eighty
50	Fifty	90	Ninety

☞ The ending *ty* means *tens*, as seven-*ty* or seven *tens*.

Position and Value.—A figure in the second place stands for so many tens of things.*

Note. *The second place is the second from the right, thus:*—12 *pears,*—2 *is in the first place, and therefore means two single pears;* 1 *is in the second place, and therefore means* 10 *pears. Reverse:*—21, *twenty-one, or two tens of pears, and one pear,* (20 + 1). By moving the 2 one place to the *left*, you have made it 2 tens.

---

* The teacher should frequently make use of tables like the following, written on the black-board.

tens.	ones.
3	2
2	1
5	3

tens.	ones.
7	5
1	6
9	1

As a *mechanical* mode of setting down figures in Addition, none is preferable to that of writing them backwards or from right to left. e.g 5+24: set down the 5, then the 4 under it, and the 2 necessarily falls into the second place. In the case of large numbers, they can first be written in a corner of the slate, and then copied backwards as suggested.

The following test will also be found a practical mode of ascertaining whether the *value* of the respective figures is understood:—

3	2
4	4
	5

Books.

	Answers.
1. Write down the value of 3. - - - - - - - - - - - - - - -	3 | 0
Why should 3 be put in the second place? Because it means 3 parcels of books, 10 in each parcel, or 3 tens of books.	
2. Put under it the value of the *first* 4 - - - - - - - - - - -	0 | 4
Why should this 4 be placed under the 0, and not under the 3?	
3. Set down the other 4 - - - - - - - - - - - - - - - - -	4 | 0
Why should this 4 be put in a different place from the first 4? What is the difference between them?	
4. Set down 5 and 2 in their respective places - - - - - - -	5 | 2
	8 1

The next step should be, to mark with a cross any pair or set of figures, such as 3 and 5 in the above example, and to ask how many apples they stand for. Ans. 3 tens of apples and 5 apples, or 30 and 5, or 35. In such exercises, both the *value* and the *name* should be required to be repeated.

The same principle of questioning when applied to larger sums will be found to increase in importance and interest. It may be applied to subtraction, as, by asking the difference between the 2 and the 3 (28), the 5 and the *second* 4 (35), &c.; and it furnishes the best exercise on the *tables*—e. g. (£1 12s)—1s. and 1s. =30s or £1 10s.; (£2 27s. 12d.) — (£2 20s. 10d.) = 7s. 2d. Similarly with reference to other tables.

EXERCISES:—Reverse 38, 19, 47, 13, 36, 28; and write the number of each in words. Thus,—38, thirty-eight, 83, eighty-three, &c.

☞ *Caution. Ones (or units) must be put under ones, tens under tens; because ones (or units) require to be added to units, and tens to tens. Therefore when one or more tens can be got out of the first column, they must be added, or carried, to the next column of tens, thus:—*

(1.)

tens.	ones.
2	4
	6
3	0

That is, 6 and 4 being ten, the 10 is added to the 2 tens, which will make 3 tens or 30.

(2.)

tens.	ones.
5	8
3	6
9	4

That is, 6 and 8 are fourteen; set down the 4 odd *ones*, and carry the 10. Then 1 ten and 3 tens make 4 tens, and 5 tens make 9 tens or 90.

Question. Why does the 9 of 94 mean 90? Because it is in the second place.

Add, or find the sums of, the following.

(1)	(2)	(3)	(4)	(5)	(6)
31	5	4	57	61	8
17	47	12	6	8	11
18	9	55	25	31	63
9	23	42	1	42	24

(7)	(8)	(9)	(10)	(11)	(12)
17	11	23	34	48	7
2	12	24	35	49	31
49	13	25	36	50	24
62	14	26	37	51	33

(13)	(14)	(15)	(16)	(17)	(18)
21	25	23	82	7	94
22	26	30	71	81	1
23	27	31	36	9	76
24	28	57	50	35	80

	Men.		Boys.		Trees.		Pence.		Feet.		Slates.
(19)	73	(20)	96	(21)	7	(22)	13	(23)	29	(24)	63
	82		13		12		24		38		79
	15		4		56		27		42		88
	6		95		82		39		56		92

(25)	16	(26)	19	(27)	81	(28)	2	(29)	4	(30)	97
	3		7		7		11		10		13
	27		29		50		84		83		4

Bricks, 94, 70, 56, 83; Coats, 54, 70, 9, 18; Chairs, 84, 60, 7, 5; Sacks, 83, 70, 15, 94; Sheep, 37, 59, 63, 70; Knives, 86, 70, 15, 4. Slates: 94, 60, 15, 73; Shillings: 94, 71, 13, 6; Dogs: 5, 19, 77, 8. Books: 53, 17, 94, 73; Ships: 19, 7, 54, 17; Sheep: 7, 1, 18, 10, 2. Pigs: 54, 16, 98, 17; Sacks: 54, 9, 87, 37, 42.

(Questions 31 to 44).

94+75+86+70+7; 57+80+9+17+5; 54+ 7+ 8+19+10.
37+17+84+9+17; 36+19+7+54+8; 16+18+77+ 5+ 7.
37+5+94+9+84; 39+84+15+7+9; 17+18+73+ 9+ 4.
87+9+17+54+99; 18+7+25+3+28; 6+13+31+ 4+53.

(Questions 45 to 56).

Also add up each of the above columns. (Quest. 57—70).

(71) Seventeen, ninety-five, eighty, sixty-four, fifty-six, seven.

(72) Eighteen, seventy-nine, sixty-four, seventy-eight, ninety-seven.

(73) Seventy-four, fifty, ninety-five, eighty-six, seven, twenty-seven.

(74) Ninety-four, eighty-five, sixty-two, fifteen, eighty-eight.

(75) Sixty, sixty-four, seventy-five, ninety-nine, eight.

(76) Fifty, twenty, seventy-eight, thirty-one, ninety-seven.

(77) Twenty-two, thirty-three, fifteen, twenty-eight.

(78) Ninety-five, twenty-four, thirty-five, seventy-two, nine.

(79) Eighty-four, nineteen, twenty-four, seventeen, sixty-nine.

(80) Seventy-eight, twenty-nine, sixty, sixty-nine, fifty-four.

(81) A boy bought 25 marbles, won 18, had 19 given him, and found 4: how many had he in all?

(82) On Monday, 16 ships sailed up the Thames to London, Tuesday, 27, Wednesday, 64, Thursday, 15, Friday, 39, Saturday, 8, Sunday, 9: how many sailed to London during the week?

(83) On Monday, 7 ships sailed from London, Tuesday, 14, Wednesday, 28, Thursday, 6, Friday, 0, Saturday, 25, Sunday, 1: how many left London during the week?

(84) Five droves of sheep came to market; 1st drove, 84, (2nd), 27, (3rd), 96, (4th), 85, (5th), 78: how many entered the market?

(85) At a cattle-show, there were 27 oxen, 68 cows, 75 horses, 14 calves, 7 bulls, and 19 ponies: how many animals were shown?

(86) In Clayton there are 4 schools, (1st), 87 boys, (2nd), 60 boys, (3rd), 97 boys, (4th), 78 boys: how many boys are there at school in Clayton?

(87) A gardener sent to market 96 baskets of apples, 27 baskets of cherries, 84 of pears, 60 of plums, 3 of peaches: how many basketsful of fruit did he send?

(88) From London to Croydon, 10 miles, Croydon to Dorking, 13 miles, Dorking to Horsham, 13 miles, Horsham to Brighton, 21 miles: how many miles from London to Brighton?

Section III.

SIMPLE SUBTRACTION (up to 20).

Definition.—**Subtraction means taking away a certain number of things from a larger number of the same things.**

Example:—

James has	8	apples	
He gives Jane	5	,,	
so	3	,,	are left.*

* Children should be practised in subtracting from 10 to 20, just as from 2 to 9. Marbles, or pieces of cork or wood, &c., should, *at first*, be employed in all the operations.

	Caps.	Hats.	Shoes.	Capes.	Coats.	Shirts.	Pins.	Needles.
From ...	7	6	7	3	10	11	10	11
take ...	2	2	4	1	5	7	3	5
	—,	—,	—,	—,	—,	—,	—,	—
From ...	5	8	7	9	12	13	14	12
take ...	2	3	2	3	6	4	6	8
From ...	9	7	8	5	16	17	18	19
take ...	5	5	1	3	5	4	6	7
	—,	—,	—,	—,	—,	—,	—,	—
From ...	7	10	7	9	11	13	17	20
take ...	2	4	5	3	7	4	5	8

Apples: 5 from 9; 7 from 10; 3 from 7: 3 from 8; 2 from 7.
Balls: 9 from 12; 3 from 12; 8 from 19; 7 from 15; 6 from 13.
Plums: 8 from 12; 9 from 13; 7 from 13; 5 from 12; 8 from 17.
Books: 9 from 17; 7 from 15; 6 from 17; 8 from 16; 5 from 12.

From the *first* of the following numbers take each of the others.

EXAMPLE.—From 8 take 5, then from 8 take 3, and so on.

8: 5, 3, 4, 2, 1, 6.
7: 5, 4, 3, 6, 2.
5: 2, 3, 1, 4.
9: 4, 7, 5, 3, 6, 8.
6: 3, 2, 4, 3, 5.
4: 2, 3, 0, 1.
11: 3, 9, 7, 5, 8, 4.
10: 3, 7, 5, 4, 6.
12: 7, 9, 6, 4, 8, 9.
13: 7, 9, 8, 4, 3, 10.
15: 7, 9, 8, 6, 5.
14: 7, 3, 4, 7, 9, 6, 8.
16: 9, 8, 1, 3, 7, 6.
17: 9, 1, 3, 4, 5.
18: 6, 7, 9, 8, 7, 5.
19: 7, 9, 8, 3, 6, 5.
15: 9, 6, 4, 3, 2.
7: 2, 0, 7, 5, 6, 3.

Take the *first* number of the following from each of the others.

7: 15, 19, 13, 11, 9.
8: 13, 17, 9, 18.
9: 18, 13, 11, 12.
6: 12, 7, 9. 18, 15.
5: 12, 13, 11, 15.
9: 17, 15, 18, 14.

Jane had seven pins and gave away three: how many had she left?

Richard bought ten apples, and gave half to his brother: how many had he for himself?

Mary had twelve cherries, and gave three to her sister: how many had she for herself?

Afterwards, Mary's sister bought twelve for a penny, and gave Mary half: how many more did Mary get than she gave?

William had eight marbles, he lost three, and gave away two; how many had he left?

Eliza has ten pins: how many would she have after losing three?

PART II.

Section IV.

SIMPLE MULTIPLICATION.

Definition.—**Multiplication means taking any number a given number of times.**

Illustration:

2 and 2 are 4, or if you eat two apples *twice*, you eat 4, because twice 2 make 4:—

2 apples
taken 2 times

are 4 apples.

Exercise. Find the answer of each of the following by adding the given number of apples the required number of times,—thus:—

1 apple*
1 or twice 1 make 2, or 2 times

are 2 apples

Then Multiplication is the same as Addition. Suppose I eat

	Addition.		Multiplication.
2 apples on Sunday	2 apples		2 apples
2 „ „ Monday	2 „	or	2 times
	4		are 4 apples.

* The pupil should be accustomed regularly to verify every sum in Multiplication, by Addition. *After* that, the sooner the multiplication table is committed to memory the better.

			Addition.			Multiplication.	
or, 3	apples	on Tuesday	3	apples			
3	„	„ Wednesday...	3	„	or	3	apples
3	„	„ Thursday	3	„		3	times
			9			are 9	apples

			Addition.			Multiplication.	
or, 4	„	„ Friday	4	apples		4	apples
4	„	„ Saturday.....	4	„	or	2	times
			8			are 8	

*** *The Multiplication Table up to 4 times inclusive, should now be learnt by heart, (as a home-lesson).*

If a boy eats 2 apples every day in the week, (or if 7 boys eat 2 apples each,) then how many have been eaten?

2	apples (once)				
2	„ (twice)				
2	„ (thrice)				
2	„ (four-times)			2	apples
2	„ (five „)	or,	multiplied	7	times
2	„ (six „)				
2	„ (seven „)		make	14	
14	apples				

Apples :—	1	2	3	4	5	6	7
Times :—	2	2	2	2	2	2	2

Apples :—	8	9	10	11	12
Times :—	2	2	2	2	2

Apples :—	1	2	3	4	5	6	7
Times :—	3	3	3	3	3	3	3

Apples :—	8	9	10	11	12
Times :—	3	3	3	3	3

Apples :—	1	2	3	4	5	6	7
Times :—	4	4	4	4	4	4	4

Apples :—	8	9	10	11	12
Times :—	4	4	4	4	4

☞ *The sign* × *means multiplied by.*

1 × 2; 1 × 3; 1 × 4; 2 × 2; 3 × 2; 2 × 3; 3 × 3; 3 × 4; 2 × 4; 4 × 2; 5 × 2; 4 × 3; 4 × 4; 6 × 2; 6 × 3; 6 × 4; 7 × 3; 7 × 4; 7 × 2; 8 × 2; 8 × 3; 8 × 4; 9 × 4; 9 × 2; 9 × 3; 10 × 2; 10 × 3; 10 × 4; 11 × 2; 11 × 3; 11 × 4; 12 × 4; 12 × 2; 12 × 3.

Section V.

SIMPLE ADDITION (Hundreds).

100	One hundred	400	Four hundred	700	Seven hundred
200	Two „	500	Five „	800	Eight „
300	Three „	600	Six „	900	Nine „

Position and Value. **A figure in the third place stands for so many hundreds of things.**

Example :—

123 apples. 3, being in the first place, means 3 apples; 2, being in the second place, means 2 tens of, or 20, apples; and because 1 is in the *third* place, it means 1 hundred apples.

Illustration :—

1 2 3													
: : :	1 hundred & twenty & three								100s.	10s.	1s.		
: : 3	or,	100	+	20	+	3	or,					or,	123*
: 2 0									1	2	3		
1 0 0													

* The pupil should again be practised on reversion of figures. [Section II. Note.]

☞ As any number of tens of a first column must be added or carried to the second, or tens', column; so any number of 10 tens, or hundreds, of a second column, must be carried to the third, or hundreds', column.

EXAMPLE:—

2	4	3
	5	6
		2
3	0	1

nuts.

2 and 6 are 8 and 3 are 11 nuts: set down the odd *one* and carry the ten. 1 ten and 5 tens make 6 tens and 4 tens make 10 tens, or 1 hundred nuts: set down 0 tens and carry 100. 1 hundred and 2 hundred make 3 hundred nuts.

	Apples.	Pears.	Plums.	Peaches.	Figs.	Raisins.
(1)	123	(2) 213	(3) 724	(4) 23	(5) 2	(6) 325
	15	27	3	156	14	76
	7	136	17	43	178	321

	Men.	Boys.	Sheep.	Horses.	Carts.	Trees.
(7)	504	(8) 859	(9) 694	(10) 756	(11) 798	(12) 564
	607	799	804	964	904	94
	84	864	76	759	79	998
	916	54	59	85	8	59
	84	701	986	9	596	698

(13)	218	(14) 643	(15) 3	(16) 28	(17) 862	(18) 682
	721	289	25	542	75	845
	3	157	164	17	463	24
	15	62	12	189	2	37

(19)	204	(20) 729	(21) 375	(22) 764	(23) 359	(24) 604
	75	13	14	52	56	9
	425	806	123	187	7	156
	179	21	9	505	132	32

(25)	234	(26) 701	(27) 523	(28) 345	(29) 594	(30) 683
	86	38	111	111	107	402
	293	857	101	72	317	713
	8	19	7	136	9	85

(31) Pigs, 947, 804, 72, 506, 81
(32) Ships, 801, 75, 216, 81, 7
(33) Ducks, 75, 904, 68, 7, 564
(34) Sheep, 905, 64, 8, 75, 99
(35) Trees, 855, 69, 7, 984, 8
(36) Deals, 665, 94, 7, 55, 99
(37) Pears, 304, 9, 875, 66, 9
(38) Sheep, 904, 75, 60, 805, 6
(39) Acres, 504, 63, 75, 8, 955
(40) Tons, 574, 96, 89, 7, 596
(41) Birds, 88, 7, 909, 854, 364
(42) Books, 504, 77, 564, 859, 642
(43) Pens, 980, 756, 22, 909, 364
(44) Lemons, 37, 546, 37, 809, 754

(45) 64 + 907 + 58 + 9 + 3
(46) 850 + 70 + 980 + 700 + 10
(47) 951 + 75 + 965 + 715 + 7
(48) 705 + 55 + 70 + 906 + 52
(49) 804 + 7 + 88 + 756 + 6
(50) 364 + 93 + 564 + 96 + 5
(51) 954 + 7 + 8 + 7 + 9
(52) 57 + 125 + 9 + 163 + 2
(53) 950 + 850 + 7 + 6 + 5
(54) 85 + 75 + 64 + 5 + 79
(55) 964 + 375 + 969 + 75
(56) 178 + 2 + 38 + 494 + 301

Also add up each of the above columns. (Quest. 57—66).

(67) Seven hundred and fifty-four, nine hundred and eleven, five hundred and seven, two hundred and nineteen, three hundred and fifty-four.

(68) One hundred (no tens) and seven, two hundred and forty-nine, six hundred and thirty-two, seven hundred and forty-nine, two hundred and seventy-nine.

(69) Nine hundred and two, three hundred and seventy-nine, six hundred and one, seven hundred and eight, three hundred and seven.

(70) Eighty-nine, seven hundred and eighty-eight, five hundred and sixty, twenty-seven, six hundred and fifty-five.

(71) Nine hundred and nine, seven hundred and two, sixty-seven, ninety-five, four hundred and forty.

(72) Seven hundred and eighty, one hundred and seventy-four, seven, sixty-nine, fifty.

(73) Two hundred and eighty-six, seven hundred and four, ninety, eight hundred and forty, five hundred.

(74) Seven hundred and nine, fifty-four, six hundred and eighty-nine, seven hundred and fifty, five hundred and fifty-five.

(75) Six hundred and eleven, seven hundred and ninety, eleven, four hundred and sixteen, seven hundred.

(76) Six, fifty, four hundred, seven hundred and ninety-five, two hundred and sixty-seven, seven hundred and ninety-four.

Section VI.

SIMPLE ADDITION. (Thousands).

Position and Value. **A figure in the fourth place stands for so many thousands.**

Illustration :—

```
5 6 4 2        5 thousand and 6 hundred and 4 tens and 2,
-------        or  5,000   +   600   +   40   +   2,
. . . .                        or
. . . 2        1,000s. | 100s. | 10s. | 1s.
. . 4 0        ------- | ----- | ---- | ---     or 5 6 4 2.
. 6 0 0           5    |   6   |  4   |  2
5 0 0 0
```

Ten hundred is equal to one thousand

Example :—1050 ships left the ports of England in one year, 1965 the next, 1604 the next, and 1293 the next: what was the number in four years?

```
1050
1965
1604
1293
----
5912
```

The sum of the units' column is 12. The odd 2 is placed under the units' column and 1 ten is carried to the tens' column. This, with the 1 ten carried, amounts to 21 tens, or 210. The odd 1 (ten) is set down, and the 2 tens of tens or 200 is carried to the hundreds' column. This will then amount to 19 hundred, or 10 hundred (=1000) and 9 hundred, or 1,900. The odd 9 (hundred) is set down, and the 1 thousand is carried to the thousands' column. This will then amount to 5 thousand.

Ans. 5,000 + 900 + 10 + 2, or 5912 ships.

Add together:—	Horses.	Bulls.	Sheep.	Ships.
(1)	5096	(2) 3040	(3) 9096	(4) 6947
	504	946	9981	596
	3074	2173	397	8847
	217	796	5469	596

(5) 9465 + 5432 + 3743 + 9647. (6) 8463 + 904 + 74 + 8969.
(7) 896 + 754 + 9984 + 8461. (8) 3944 + 2040 + 7 + 9986.
(9) 7742 + 9984 + 7859 + 6944. (10) 807 + 5096 + 89 + 7554.
(11) 7896 + 7784 + 964 + 9845. (12) 7786 + 804 + 7 + 9989.

Also add the above *columns* separately. (Quest. 13 to 20).

(21) 84,705 + 96 + 704 + 9840. (22) 94,097 + 54 + 98,704 + 809.
(23) 9,804 + 7590 + 84 + 7779. (24) 9,509 + 5 + 88,694 + 7,754.
(25) 39,642 + 8540 + 6 + 8964. (26) 3,942 + 77 + 5,964 + 984.
(27) 6,704 + 77 + 840 + 9884. (28) 7,777 + 840 + 9,964 + 7596.

Also add the above *columns* separately. (Quest. 29 to 36).

(37) 3742 + 6258 + 7942 + 2058 + 3214.
(38) 8941 + 1059 + 3842 + 6158 + 77.
(39) 3214 + 6786 + 2113 + 7887 + 4.
(40) 2642 + 60 + 4940 + 7704 + 22.
(41) 2046 + 7784 + 96 + 713 + 2.
(42) 8440 + 321 + 96,842 + 1 + 10.
(43) 2846 + 9 + 84,752 + 69 + 18.
(44) 9642 + 84 + 774 + 89,642 + 888.
(45) 9846 + 841 + 90,704 + 850 + 69.
(46) 84 + 990 + 75 + 896 + 12,284.

Nos. 47 to 56. (above *columns*).

(57) 90,407 + 54,860 + 95 + 704. (58) 9407 + 976 + 59 + 998.
(59) 9854 + 16,840 + 569 + 8. (60) 8474 + 99 + 8943 + 994.
(61) 88 + 94,569 + 6217 + 88. (62) 964 + 5970 + 69 + 7546.
(63) 956 + 8974 + 1608 + 555. (64) 942 + 897 + 4610 + 998.
(65) 754 + 99,999 + 8409 + 896. (66) 542 + 9840 + 598 + 7216.

Nos. 67 to 75. (above *columns*).

(76) 9454+84,754+ 847+906. (77) 9754+ 869 +9084+999
(78) 546+89,754+ 77 +8469. (79) 99 + 8704 +9821+77
(80) 546+ 847 +9843+91. (81) 7546+ 942 + 214 +754
(82) 5464+ 9464 + 54 +99,846. (83) 946 + 8475 +9984+70
(84) 845 + 9984 + 775 +88,471. (85) 9847+99,546+8047+806

Nos. 86 to 93. (above *columns*).

th. = thousands, *h.* = hundreds.

(94) (*a*) Twenty-five *th.* four *h.* and five; (*b*) two *h.* and fifty *th.* seven *h.* and six; (*c*) nine *h.* *th.* and fifty; (*d*) seventy *th.*

(95) (*a*) Eight *h.* and fifty *th.* and four; (*b*) ninety *th.* and eight; (*c*) seven *h.* and fifty-four *th.* seven *h.* and twenty; (*d*) sixty-nine *th.* four *h.* and ninety-eight.

(96) (*a*) Seven *h.* and forty *th.* four *h.* and ninety-seven; (*b*) twenty *th* and twenty; (*c*) eight *th.* four *h.*; (*d*) eighty-four *th.* five *h.* and twenty.

(97) (*a*) Nine *th.* four *h.* and eight; (*b*) twenty-nine *th.* four *h.* and eighteen; (*c*) two *th.* four *h.* and seven; (*d*) nine *h.* and seventy *th.* eight *h.* and seventy-four.

Nos. 98—101 = (98), $a+a+a+a$ (99) $b+b+b+b+$ &c.

(102) (*a*) Seven *th.* eight *h.*; (*b*) two *h.* *th.* five *h.*; (*c*) nine *h.* and seven *th.* four *h.* and five; (*d*) nine *h.* and seventy *th.* four *h.* and seven; (*e*) five *h.* *th.* and seventy-nine.

(103) (*a*) Eighty-four *th.* five *h.* and six; (*b*) nine *h.* *th.* and seven; (*c*) sixty-five; (*d*) two *h.* and seventy; (*d*) nine *th.* five *h.*; (*e*) six *h.* *th.* and sixty.

(104) (*a*) Sixty-seven *th.* four *h.* and seven; (*b*) nine *h.* and forty *th.* four *h*; (*c*) two *h.*; (*d*) nine *h.* *th.* nine *h.*; (*e*) eight *h.* and four *th.* five *h.* and six.

Nos. 105—109, similarly to Nos. 98—101.

Section VII.

SIMPLE SUBTRACTION.

Ex. A man took 57 sheep to market, and sold 24 of them: how many did he take home?

Place the number to be taken away under the other number, units under units, tens under tens. Begin with the units and take 4 from 7; 3 are left; place this under the units; take 2 tens from 5 tens; 3 tens are left. Ans. 33.

57
24 sold
—
33 taken home

☞ The sign of *Subtraction* is − (meaning *less*). When placed between two numbers, it signifies that the latter number is to be taken from the former one.

Nos. 1—16.

56 − 32; 64 − 21; 67 − 53; 29 − 15; 49 − 38; 26 − 13; 39 − 38; 27 − 13; 89 − 47; 98 − 64; 59 − 28; 69 − 15; 69 − 36; 27 − 13; 58 − 27; 98 − 15.

(17—21) 745−632; 874−30; 729−103; 765−54; 983−132;

(22—26) 591−70; 683−450; 910−100; 546−213; 7,462−3021;

(27—30) 4,635−3,213; 784−243; 9,375−2,142; 4,969−1,253;

(31—34) 4,927−3,203; 6,402−5,101; 7,504−6,401; 1,374−374;

(35—38) 7,354−6,321; 9,207−9,107; 7,564−7,532; 4067−4003;

(39—42) 6,541−541; 6,923−3,601; 2,846−35; 7,631−501;

(43) 3,428−313.

44) If I had 39 apples, and gave John 16, and James 5; how many had I left?

(45) A baker took 97 loaves in his cart; left at a school 42; in the same village, 23, and in the next 21: how many did he take home?

(46) I gave away 143 books in a school; in the (1st) class 15; (2nd) 21; (3rd) 36; (4th) 9; (5th) 27; (6th) 13: how many were left?

(47) 16 + 17 + 48 + 4, are how many more than 13 + 27 + 14 + 10?

(48) Four regiments went into battle, 3,987 strong, (1st) lost 207; (2nd) 364; (3rd) 97; (4th) 56: how many survived?

(49) The population of a village was, 2,347; 203 emigrated, 694 died, 143 removed: what was then its population?

(50) A boy had 36 marbles; gave 19 away, lost 16, then won 27, and bought 8: how many had he then?

(51) In a school of 188 children, 43 left, 3 died, and 54 were admitted: what was then the number in the school?

(52) Tom counted 189 apples on a tree: 27 were blown off, 119 were plucked: how many remained?

(53) A tea merchant had 1654 pounds of tea; in one week he sold 407 pounds, next week 309 pounds, next 189 pounds, and the next 59 pounds: how many pounds remained of the stock?

Section VIII.
MULTIPLICATION.

Direction:—

Find the answer of each of the following, by adding the given number of apples the required number of times, thus:—

1
1 or 1 + 1 + 1 + 1 + 1 = 5; or 5 times 1 are 5,
1 also thus: 5 times 1 are 5, or as it is
1 worked on a slate, 1
1 5 times
5 5

Apples:—	1	2	3	4	5	6	7
Times:—	5	5	5	5	5	5	5
Apples:—	8	9	10	11	12		
Times:—	5	5	5	5	5		
Apples:—	1	2	3	4	5	6	7
Times:—	6	6	6	6	6	6	6
Apples:—	8	9	10	11	12		
Times:—	6	6	6	6	6		
Apples:—	1	2	3	4	5	6	
Times:—	7	7	7	7	7	7	7
Apples:—	8	9	10	11	12		
Times:—	7	7	7	7	7		
Apples:—	1	2	3	4	5	6	7
Times:—	8	8	8	8	8	8	8
Apples:—	8	9	10	11	12		
Times:—	8	8	8	8	8		

☞ *The sign* × *means multiplied by.*

Questions (by multiplication).

2 × 5; 5 × 5; 9 × 5; 12 × 5; 4 × 5; 5 × 4; 5 × 3; 3 × 5; 2 × 6; 6 × 2; 4 × 6; 6 × 4; 10 × 6; 8 × 6; 8 × 5; 8 × 4; 5 × 6; 5 × 3; 9 × 6; 12 × 6; 11 × 5; 11 × 4; 11 × 6; 10 × 2; 10 × 3; 10 × 4; 10 × 5; 10 × 6; 7 × 5; 7 × 6; 7 × 4; 7 × 3; 7 × 2.

MULTIPLICATION.—Continued.

DIRECTION :—

Find the answer of each of the following by adding the given number of apples the required number of times, thus :—

2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 = 18 ; also, 9 times 2 are 18,

or $2 \times 9 = 18$, or 2 apples / 9 times

are 18 apples.

Apples :—	1	2	3	4	5	6	7
Times :—	9	9	9	9	9	9	9
Apples :—	8	9	10	11	12		
Times :—	9	9	9	9	9		
Apples :—	1	2	3	4	5	6	7
Times :—	10	10	10	10	10	10	10
Apples :—	8	9	10	11	12		
Times :—	10	10	10	10	10		
Apples :—	1	2	3	4	5	6	7
Times :—	11	11	11	11	11	11	11
Apples :—	8	9	10	11	12		
Times :—	11	11	11	11	11		
Apples :—	1	2	3	4	5	6	7
Times :—	12	12	12	12	12	12	12
Apples :—	8	9	10	11	12		
Times :—	12	12	12	12	12		

☞ The answer, which in Addition is called the *sum*, is in Multiplication called the *product*.

Find the product of the following :—

3 × 9; 9 × 3; 5 × 9; 10 × 9; 10 × 8; 8 × 9; 9 × 8; 12 × 9; 4 × 10; 5 × 10; 6 × 10; 8 × 10; 4 × 11; 3 × 11; 11 × 3; 9 × 11; 11 × 9; 12 × 11; 9 × 12; 12 × 9; 3 × 12; 5 × 12; 12 × 5; 7 × 9; 9 × 7; 2 × 9; 7 × 10; 10 × 7; 6 × 11; 11 × 6; 5 × 11; 12 × 8; 8 × 12; 12 × 12; 11 × 12; 10 × 12; 12 × 10.

Section IX.

SIMPLE ADDITION.

As a revisal exercise in addition, work each of the sums in the following square.*

The numbers in every row, are to be reckoned upright, or from right to left, or from corner to corner.

2016	4212	1656	3852	1296	3492	936	3132	576	2772	216
252	2052	4248	1692	3888	1332	3528	972	3168	612	2412
2448	288	2088	4284	1728	3924	1368	3564	1008	2808	648
684	2484	324	2124	4320	1764	3960	1404	3204	1044	2844
2880	720	2520	360	2160	4356	1800	3600	1440	3240	1080
1116	2916	756	2556	396	2196	3996	1836	3636	1476	3276
3312	1152	2952	792	2592	36	2232	4032	1872	3672	1512
1548	3348	1188	2988	432	2628	72	2268	4068	1908	3708
3744	1584	3384	828	3024	468	2664	108	2304	4104	1944
1980	3780	1224	3420	864	3060	504	2700	144	2340	4140
4176	1620	3816	1260	3456	900	3096	540	2736	180	2376

Figures (1 to 20).

I. II. III. IV. V. VI. VII. VIII. IX. X. XI. XII. XIII. XIV. XV. XVI. XVII. XVIII. XIX. XX.

Write out (in words) the names of the following:—

1. 6. 8. I. 7. IX. 2. II. XIV. 15. XIII. 3. 6. VI. 12. XIX. 18. XVII. 16. VI. 14. XII. 11. VII. 5. IV. III. XI. 20. 19. 17. XVIII. 13. 10.

* From *De Morgan's* Arithmetic.

NOTATION AND NUMERATION.

th place millns. or ,000,000s	6th place hunds. of thousds or 100,000s	5th place tens of thousds or 10,000s.	4th place thous. or 1,000s.	3rd place hunds. or 100s.	2nd place tens or 10s.	1st place units or 1s.	(Pebbles.)
						3	three
					2	1	two tens and one (or twenty-one)
				1	0	2	one hundred (no tens) and two
			3	0	3	0	three thousand (no hundreds) and thirty
		3	1	4	0	1	three tens of thous. and one thous. (or thirty-one thous.) & four hun. (no tens) and one
	2	4	2	3	3	0	two hun. thous. and four tens of thous. and two thous. (or two hund. & forty-two thous.) three hundred and thirty
6	3	1	2	1	1	1	six millions, three hund. and twelve thous., one hundred and eleven

6	+ 5	+ 8	+ 8	9	+ 9	+ 8
:	:	:	:	:	:	:
:	:	:	:	:	:	:
6,	5	8	8,	9	9	8

Six millns. five hund. & eighty eight thous., nine hun. & ninety eight.

Numerate:—215 : 176 : 2,842 : 3,568 : 12,944 : 211 : 710 : 82,765 : 931,472 : 8,325,811.

Write out *(in words)* these and other similar numbers.

one ten.	two tens.	three tens.	four tens.	five tens.
10	20	30	40	50
six tens.	seven tens.	eight tens.	nine tens.	ten tens.
60	70	80	90	100

How many *tens* and odd ones (or units) are:—

24, 57, 43, 68, 17, 39, 19, 72, 96, 83, 112, 145, 202, 364, 636?

Write in figures,—*three tens* and *four*, *seven tens* and *eight*, *two tens* and *eleven*, *five tens* and *fourteen*, *twelve tens* and *two*.

☞ Ten hundred = one thousand.

10,00 = 1,000

ADDITION TABLE.

1 and	3 and	5 and	7 and	9 and	11 and
1 are 2	1 are 4	1 are 6	1 are 8	1 are 10	1 are 12
2 3	2 5	2 7	2 9	2 11	2 13
3 4	3 6	3 8	3 10	3 12	3 14
4 5	4 7	4 9	4 11	4 13	4 15
5 6	5 8	5 10	5 12	5 14	5 16
6 7	6 9	6 11	6 13	6 15	6 17
7 8	7 10	7 12	7 14	7 16	7 18
8 9	8 11	8 13	8 15	8 17	8 19
9 10	9 12	9 14	9 16	9 18	9 20
10 11	10 13	10 15	10 17	10 19	10 21
11 12	11 14	11 16	11 18	11 20	11 22
12 13	12 15	12 17	12 19	12 21	12 23

2 and	4 and	6 and	8 and	10 and	12 and
1 are 3	1 are 5	1 are 7	1 are 9	1 are 11	1 are 13
2 4	2 6	2 8	2 10	2 12	2 14
3 5	3 7	3 9	3 11	3 13	3 15
4 6	4 8	4 10	4 12	4 14	4 16
5 7	5 9	5 11	5 13	5 15	5 17
6 8	6 10	6 12	6 14	6 16	6 18
7 9	7 11	7 13	7 15	7 17	7 19
8 10	8 12	8 14	8 16	8 18	8 20
9 11	9 13	9 15	9 17	9 19	9 21
10 12	10 14	10 16	10 18	10 20	10 22
11 13	11 15	11 17	11 19	11 21	11 23
12 14	12 16	12 18	12 20	12 22	12 24

SUBTRACTION.—By reversing this table subtraction is learned, thus: instead of saying 1 and 1 *are* 2, say 1 *from* 2 and 1 *remains*; 1 *from* 3 and 2 *remains*; again, 2 *from* 4 and 2 *remains*; 3 *from* 5 and 2 *remains*, &c.

MULTIPLICATION TABLE.

Twice	3 times	4 times	5 times	6 times	7 times
1 are 2	1 are 3	1 are 4	1 are 5	1 are 6	1 are 7
2 4	2 6	2 8	2 10	2 12	2 14
3 6	3 9	3 12	3 15	3 18	3 21
4 8	4 12	4 16	4 20	4 24	4 28
5 10	5 15	5 20	5 25	5 30	5 35
6 12	6 18	6 24	6 30	6 36	6 42
7 14	7 21	7 28	7 35	7 42	7 49
8 16	8 24	8 32	8 40	8 48	8 56
9 18	9 27	9 36	9 45	9 54	9 63
10 20	10 30	10 40	10 50	10 60	10 70
11 22	11 33	11 44	11 55	11 66	11 77
12 24	12 36	12 48	12 60	12 72	12 84

8 times	9 times	10 times	11 times	12 times
1 are 8	1 are 9	1 are 10	1 are 11	1 are 12
2 16	2 18	2 20	2 22	2 24
3 24	3 27	3 30	3 33	3 36
4 32	4 36	4 40	4 44	4 48
5 40	5 45	5 50	5 55	5 60
6 48	6 54	6 60	6 66	6 72
7 56	7 63	7 70	7 77	7 84
8 64	8 72	8 80	8 88	8 96
9 72	9 81	9 90	9 99	9 108
10 80	10 90	10 100	10 110	10 120
11 88	11 99	11 110	11 121	11 132
12 96	12 108	12 120	12 132	12 144

DIVISION.—To apply this table to Division, reverse the mode of using it for Multiplication; thus, instead of saying twice 1 are 2, say 2's in 2 are 1, or go once; 2's in 4 are 2, or go twice; 4's in 12 are 3, or go 3 times.

'STANDARD' MANUAL

OF

PRACTICAL ARITHMETIC.

PART III.

(Corresponding to Standard III.)

Section X.

SIMPLE MULTIPLICATION.

Definition.—To Multiply is to add or repeat the same number any number of times.

Example :— 4, 4, 4, 4, 4 = 20, or, 4
5 times

☞ ***The number multiplied is called the Multiplicand.***

When the multiplicand is a large number, such as 123, then each number is separately multiplied :—

$$\begin{matrix} 123 \\ 2 \end{matrix} = 100 + 2^{10s} + \begin{matrix} 3 \\ 2 \end{matrix}$$

$$246 = 200 + 4^{10s} + 6$$

☞ ***The number by which you multiply is called the Multiplier. The Answer is called the Product.***

When the answer, or product, contains 10, the 10 must be added, or *carried*, to the product of the tens, e.g.:—

123
4
492

4 times 3 are 12 : put down the odd 2 (units), and reserve the 10. 4 times 2 (tens) are 8 (tens) : add the previous 1 (ten) and you have 9 (tens). 4 times 1 (hun.) are 4 (hun.).

Exercises :—

235	439	214	516	607
2	2	3	4	3
406	714	628	140	406
5	7	3	8	8

When the product of the tens amounts to 10 tens, or 100, you must add, or carry, it to the product of the hundreds, e.g. :—

$$\begin{matrix} 200 + 5^{10s} + 2 = 252 \\ 3 \qquad\quad 3 \\ \hline 600 + 15^{10s} + 6 = 756 \end{matrix}$$

3 times 2 are 6 ; 3 times 5 (tens) are 15 (tens) : put down the odd 5 (tens) and reserve the 10 (tens) or (hun.) 3 times 2 (hun.) are 6 (hun.) : the 1 (hun.) added makes 7 (hun.)

In the same way you must add thousands to thousands, tens of thousands to tens of thousands, and so on.

Section XI.

SIMPLE MULTIPLICATION—continued.

Seven ships bring each 1,548 ounces of gold: how much is brought by the whole?

By Addition: 1548 + 1548 + 1548 + 1548 + 1548 + 1548 + 1548 = 10,836. In this exercise 1,548 has been repeated seven times; but the operation may be performed more readily, thus:—7 times 8 = 56; put the odd 6 in first place and reserve the 5 tens for the second place; 7 times 4 = 28 (tens); 28 + 5 = 33 tens, 3 tens in second place, and reserve 3 tens of tens or 3 hundred for third place; 7 times 5 (hundred) = 35 (hundred); 35 + 3 = 38 (hundred); put the odd 8 hundred in second place, and carry the 3 thousand to the fourth place; 7 times 1 = 7; 7 + 3 = 10 (thousand).

Total, 10,000 + 800 + 30 + 6 or 10,836.

$$\begin{array}{r} 1\,5\,4\,8 \\ \times\quad\quad 7 \\ \hline 1\,0,8\,3\,6 \end{array}$$

Multiply:—

(1) 7406 casks by 2; (2) 9084 yards by 3; (3) 5436 pigs by 4; (4) 34075 bricks by 5; (5) 80964 trees by 6; (6) 99847 horses by 7; (7) 3964 sheep by 8; (8) 9904 feet by 9; (9) 7849 oxen by 3; (10) 4904 boys by 9.

Multiply the first of the following numbers by each of the others.

(11—18) 879642315 by 9, 7, 3, 2, 8, 6, 5, 4.
(19—26) 751324698 „ 5, 6, 8, 4, 2, 3, 7, 9.
(27—34) 246987513 „ 7, 3, 2, 9, 4, 8, 6, 5.
(35—42) 824693157 „ 9, 7, 3, 2, 4, 8, 6, 5.
(43—50) 987654321 „ 9, 8, 2, 7, 3, 6, 4, 5.
(51—58) 753289614 „ 6, 5, 8, 4, 2, 3, 7, 9.
(59—66) 684697987 „ 7, 6, 9, 4, 3, 2, 8, 5.
(67—74) 23897564 „ 5, 4, 6, 9, 8, 3, 7, 2.
(75—82) 77596943 „ 2, 5, 7, 9, 6, 3, 8, 4.
(83—90) 299897960 „ 9, 8, 7, 5, 6, 4, 2, 3.

(91—95) 78464987 „ 9, 6, 7, 8, 5.
(96—100) 39475968 „ 7, 9, 4, 8, 6.
(101—105) 79462174 „ 4, 8, 12, 6, 7.
(106—110) 54759698 „ 5, 9, 10, 8, 11.

Multiply each of the following numbers by 9, 8, 7, 5, severally.

(111) 847596984. (112) 900800758. (113) 50984694.
(114) 96900984. (115) 80975496. (116) 99875096.
(117) 84790096. (118) 89485968. (119) 847546004.
(120) 54695483.

Multiply the following numbers by 8, 4, 6, 9, severally.

(121) 846947. (122) 97008096. (123) 5946947.
(124) 89754690. (125) 89750086. (126) 90098479.
(127) 9784756. (128) 9800496. (129) 84753975.
(130) 4756694.

The sign of multiplication is ×, and when placed between two numbers, it means that one is to be multiplied by the other.

Multiply the first number of the following by each and all of the others :—

(131) 847,598,407 × 7 × 9 × 8. (132) 89,647 × 9 × 3 × 7.
(133) 77,846 × 9 × 5 × 4. (134) 946,004 × 3 × 9 × 7 × 5.
(135) 946,217 × 8 × 4 × 7. (136) 93,004 × 10 × 7 × 6.
(137) 74,604 × 3 × 7 × 8. (138) 70,404 × 9 × 8 × 7.
(139) 84,690 × 8 × 9 × 6. (140) 54,620 × 7 × 9 × 10.

The answer which is obtained by multiplying one number by another is called the *product*.

Find the products of the following numbers when multiplied 1st by 11, 2nd by 12.

(141) 846,940. (142) 8,974,004. (143) 600,750.
(144) 784,069. (145) 346,405. (146) 706,407.
(147) 307,364. (148) 897,964. (149) 99,847.
(150) 54,647. (151) 83,754.

(152) It took nine cart-loads of bricks to build a wall; each cart carried 514 bricks: give the number of bricks in the wall.

(153) In a field there were eight rows of draining pipes; each row consisting of 1,084 pipes: give the total number of pipes.

(154) How many pounds of sugar had a grocer who bought six casks, each weighing 584 pounds?

(155) 984 trucks of coal were brought by rail to London,—each truck contained 8 tons: give the total number of tons.

(156) How many sheep in seven flocks, each containing 328?

Section XII.

SIMPLE SUBTRACTION.

Definition. **Subtraction is the method of finding the difference between two numbers, (or, how much greater one number is than another).**

Case I:—

Suppose I give 5 nuts to John and 8 to James: how many more has James than John; or what is the *difference* between James's number and John's number? Ans. 3.

John has 31 marbles and James has 17: how many more has John than James?

John has 31
James has 17

Therefore John has 14 more than James.

7 from 1 you *cannot*; take 1 ten from the 3 tens which will make 11: then 7 from 11 will leave 4. The 3 tens have been lessened by 1 ten, so you must now say, 1 (ten) from 2 (tens) and 1 (ten) remains.

Extension:— $31 = 3^{10s} + 1 = 2^{10s} + 11$

$17 = 1 + 7 = 1 + 7$

$1^{10} + 4 = 14.$

CASE II:—

Again, suppose I had given each of the boys 10 more, what would have been the difference between the above two quantities? Ans. 14. That is, the same as before.

$$\begin{array}{r} 31 + 10 = 41 \\ 17 + 10 = 27 \\ \hline 14 \end{array}$$

Therefore, *if you add equal quantities to two numbers, their* DIFFERENCE *will not be changed.*

Then it is quite the same, (and more convenient than changing the upper number as in Case I.,) if you add to the next lower number *that* quantity which you add to the previous upper number.

Ex. 1.—From 31 take 17.

$31 = 3^{10} + 1$; add $10^* = 3^{10} + 11$
$17 = 1^{10} + 7$; add $10^* = 2^{10} + 7$
$14 = \qquad\qquad = 1 + 4$

* Same added to both numbers.

7 from 1 you *cannot*, but 7 from 11 and 4 remain; 1 (ten) and 1 (ten) make 2 (tens): 2 (tens) from 3 (tens) and 1 (ten) remains.

Ex. 2.—From 242 take 157.

$242 = 2^{100} + 4^{10} + 2$; add $10^{10} + 10$ or $110^* = 2^{100} + 14^{10} + 12$
$157 = 1^{100} + 5^{10} + 7$; add $1^{100} + 1^{10}$ or $110^* = 2^{100} + 6^{10} + 7$
$85 = \qquad\qquad = 8^{10} + 5$

* Same added to both numbers.

7 from 2 you *cannot*, but 7 from 12 and 5 are left; (10 units or) 1 ten and 5 (tens) make 6*: 6 from 4 you *cannot*, but 6 from 14† and 8 remain; (10 tens or) 1 hundred and 1 make 2: 2 from 2 and none is left.

*6 *tens*, †14 *tens*, as you add 10 tens or 100.

(1—4)	34—18	56—49	87—69	72—59
(5—8)	36—27	84—78	32—29	84—58
(9—12)	37—29	84—79	52—76	52—17
(13—16)	84—27	36— 9	92—78	84—67
(17—20)	91—57	50—29	80—27	90—36
(21—24)	105—89	940—564	754—227	870—356
(25—28)	606—259	700—642	210—89	700—362
(29—32)	715—284	405—364	910—896	317—299

(33—36)	718—289	906—897	715—217	874—269
(37—40)	912—364	284—94	729—568	317—254
(41—44)	2207—1896	7541—2987	1000—948	7596—2721
(45—48)	7784—2964	8968—5999	7005—4869	2175—1984
(49—52)	8472—3291	7501—1975	3216—1298	8154—7962
(53—56)	9921—1496	3147—1989	2110—1849	3947—1996
(57—60)	9000—7964	5000—2184	7000—7004	8000—8009
(61—64)	35945—7009	21754—3198	21689—8999	28007—99
(65—68)	84964—78984	84004—8996	83475—99	75484—896
(69—72)	97546—89749	87100—2989	99840—999	8000—999

(73) 469754—213094 (74) 364524—298796 (75) 394217—8969
(76) 7596000—896984 (77) 7984001—89769 (78) 5969640—89998
(79) 364759—999 (80) 180009—98989

In the following columns find $a-b$; $a-c$; $a-d$; $a-e$.

	a	*b*	*c*	*d*	*e*
(81—84)	3746543	221894	77594	8964	609
(85—88)	2174549	784964	21886	9784	784
(89—92)	3047842	796849	98004	3469	656
(93—96)	8047001	217896	77596	7568	859
(97—100)	2176004	800007	21798	3742	896
(101—104)	3075009	794695	34694	9984	794
(105—108)	7754900	837964	77826	7784	784
(109—112)	7784216	219854	34751	9963	649
(113—116)	2118009	716896	89640	7789	764
(117—120)	8864604	219494	70098	9009	899

For Nos. (121—150) find $b-c$; $b-d$; $b-e$.

For Nos. (151—170) find $c-d$; $c-e$.

☞ *m* = millions, *th* = thousands, *h* = hundreds.

(171) From six *m.* nine *h.* and twelve *th.* four *h.* and seven, take nine *h.* and sixty-five *th.*

(172) From nine *h. m.* seven *h. th.* and ninety-six, take seventy-five *m.* nine *h.* and six *th.*

(173) From twenty-five *m.* four *h.* and seven *th.*, take eighty-nine *th.* seven *h.* and sixty-nine.

(174) From nineteen *m.* seven *h.* *th.*, take seventy-eight *th.* five *h.* and sixty-nine.

(175) From six *m.* five *h.* and seven *th.* two *h.* and sixty-nine, take two *h.* *th.* eight *h.*

(176) From thirteen *m.* and forty, take two *m.* three *h.* and seventy-eight *th.* and ninety-eight.

(177) From two *m.* eighty-five *th.*, take two *h.* and seven *th.* six *h.* and twenty-six.

(178) From six *h.* and seventy *m.* four *h.* and seven, take ninety-seven *th.* four *h.* and nine.

(179) From seven *h.* *m.* twenty *th.*, take ninety-nine *m.* six *th.* four *h.* and ninety-seven.

(180) From six *th.* eight *h.* and seventy, take eight *h.* and seventy-one.

The greater of the two terms of a subtraction sum is called the *minuend*, the lesser the *subtrahend*.

	Minuend.	Subtrahend.		Minuend.	Subtrahend.
(181)	40754621	3754961	(182)	13746125	946217
(183)	46984712	9984198	(184)	994732	274894
(185)	7534697	2164275	(186)	7769471	2964
(187)	3754943	216475	(188)	99846	694
(189)	77546912	34759	(190)	1375434	74

(191)	From 847 + 54 + 784 + 984	take 65 + 73 + 8 + 109		
(192)	„ 9465 + 4734 + 946	„ 774 + 807 + 972 + 9		
(193)	„ 504 + 3976 + 8 + 947	„ 347 + 84 + 7 + 94		
(194)	„ 784 + 964 + 665 + 94	„ 347 + 912 + 84 + 7		
(195)	„ 8469 + 77546 + 84 + 7	„ 3947 + 37 + 846 + 90		
(196)	„ 7742 + 9461 + 701 + 9	„ 8461 + 77 + 247 + 54		
(197)	„ 546 + 8993 + 704 + 50	„ 894 + 754 + 64 + 7		
(198)	„ 36409 + 774 + 86 + 77	„ 394 + 783 + 696 + 84		
(199)	„ 7549 + 84694 + 50 + 789	„ 540 + 999 + 76 + 86		
(200)	„ 7540 + 30070 + 9 + 70	„ 54 + 784 + 86 + 754		

Section XIII.

MULTIPLICATION.

☞ 1, 2, 3, 4, 5, 6, 7, 8, 9 are called *digits*, 0 is called a *cipher*.

When a number is moved one place to the LEFT, *it is increased or multiplied ten times.*

EXAMPLE:— 2 20

The 2 units have been moved one place to the left, or put in the second place: it is therefore equal to 2 × 10 = 20. Similarly

3 × 10 = 30	7 × 10 = 70
4 × 10 = 40	8 × 10 = 80
5 × 10 = 50	9 × 10 = 90
6 × 10 = 60	10 × 10 = 100

11 × 10 = 110	140 = 14 × 10	170 = 17 × 10
12 × 10 = 120	150 = 15 × 10	180 = 18 × 10
13 × 10 = 130	160 = 16 × 10	190 = 19 × 10

Then you can multiply any number by 10 by simply adding 0; by 100, two 0's; by 1000, three 0's, &c.

In full it would stand thus,—

Ex. 1.
$$\begin{array}{r} 18 \\ 10 \\ \hline 180 \end{array}$$
i.e set down the outside 0, and multiply by 1.

Ex. 2.—18 × 100 = 18
$$\begin{array}{r} 100 \\ \hline 1800 \end{array}$$

When the multiplier is 20 or 30, or 200 or 300, &c. set down the ciphers and multiply by the digit:—

17	27	56
40	300	7,000
680	8100	392,000

(1)	8406 × 10	(2)	8934 × 1000	(3)	54620 × 100
(4)	754 × 10000	(5)	3380 × 50	(6)	8945 × 30
(7)	9934 × 80	(8)	754 × 900	(9)	9846 × 5000
(10)	89421 × 90	(11)	374 × 800	(12)	745 × 5000
(13)	404 × 9000	(14)	9647 × 80000	(15)	346 × 200
(16)	99 × 7000	(17)	540 × 700	(18)	394 × 170
(19)	909 × 1000	(20)	754 × 100.	(21)	356 × 700

SECTION XIV.

MULTIPLICATION—continued.

☞ Two numbers multiplied together form the *product*. These two numbers are called the *factors* of that product; e.g.,

4 × 6 = 24
(factors.) (product.)

When you have to multiply by a certain number above 12, it is convenient to separate it into its factors.*

EXAMPLE:— 35 × 24. As 4 times 6 make 24, multiply first by 6 and then by 4. The product 840 is the same as 24 times 35.

35
6

210
4

840

The factors of 18 are 3 and 6; of 25 are 5 and 5; of 27 are 3 and 9; of 50 are 5 and 10.

What are the factors of 35, 28, 15, 27, 45, 56, 72, 96, 81, 108?

(1—5)	349 ×	14;	15;	16;	18;	50.
(6—10)	148 ×	20;	21;	22;	24;	42.
(11—15)	2569 ×	25;	27;	28;	30;	63.
(16—20)	1984 ×	33;	35;	36;	40;	72.
(21—25)	7269 ×	42;	44;	45;	49;	84.
(26—30)	9362 ×	50;	54;	56;	60;	96.
(31—35)	2468 ×	63;	70;	72;	77;	49.
(36—40)	7980 ×	80;	84;	90;	96;	33.
(41—45)	3107 ×	100;	110;	120;	121;	54.
(46—50)	9254 ×	132;	144;	96;	108;	60.

The multiplicand may be used as the multiplier, and the multiplier as the multiplicand.†

ILLUSTRATION:— 4 times 5, and 5 times 4 are equal.

3 times 9 = 9 times 3
7 × 9 = 9 × 7
8 × 5 = 5 × 8
9 × 10 = 10 × 9
7 × 11 = 11 × 7

* Certain numbers have no factors,—e.g. 13, 17, 19, 23, 29, 31, &c.
† i.e. in all abstract numbers.

Section XV.

MULTIPLICATION—continued.

Position of Multiplier.—The Multiplier should be arranged—units under units, tens under tens, &c.,—just as in Addition.

[Exception :—When the multiplier ends in ciphers.]

Examples :— 253 1459 76382
26 135 1254

☞ When you multiply by *tens*, the answer is in *tens*. When you multiply by *hundreds*, the answer is in *hundreds*, and so on.

When the multiplier consists of several figures, you multiply by each separately.* E.g. :—To multiply by 26, you first take the 253 6 times and then twice (i.e. 20 times). But it is clear that the products 1318 and 5060 must be added together before you can have the *joint* product of 253 × 26.

253 253
6 20
1518 5060

253 × 6 = 1518
253 × 20 = 5060

or 253 × 26 = 6578

It is, however, more convenient to do it as one sum, thus :—

253
26
1518
5060
6578

1. 6 times 3 are 18 : put down the odd 8 and reserve the 1 ten. 6 times 5 (tens) are 30 (tens) ; add 1 (ten) 51 (tens) : set down the odd 1 (ten) and reserve, or carry, the 30 tens (or 3 hun.) 6 times 2 (hun.) make 12 (hun.) : add the 3 (hun.) 15 (i.e. 1,500).

Extension :—200 + 50 + 3
20 + 6
1,200 + 300 + 18 = 1518
4,000 + 1000 + 60 = 5060
5,200 + 1300 + 78 = 6578

2. 2 times 3 are 6, but as this 6 is 6 *tens*, because you have multiplied by 2 *tens* or 20, the 6 must be put in the ten's place. Twice (or 2 ten times) 5 (tens) make 10 (*tens of tens*) i.e. 1000, because $2^{10s} = 20$, $5^{10s} = 50$, and $50 \times 20 = 1{,}000$. Twice 2 make 4, i.e. 4,000, because 20 times 200 are 4,000. Add the above 1,000, and 5,000 is the final number.

* Because you do not know the table up to 25 times, 135 times, &c.
[N.B. It is a great advantage to know the Table at least up to 20 times]

Practically, the rule is, to multiply as if the multiplier were units, but when you are really multiplying by tens, to put the first product in the second (or ten's) place; and when you are really multiplying by hundreds, to put the first product in the third (or hundreds') place, and so on.

Ex. 1. 253 × 26

1,518 = 253 × 6
5 06 = 253 × 20
6,578 = 253 × (6 + 20).

Ex. 2. 1,459 × 135

7,295 = 1,459 × 5
4,377 = 1,459 × 30
1,459 = 1,459 × 100
196,965 = 1,459 × (5 + 30 + 100) or 135.

(Ex. 2.) *Units.* 5 times 9 are 45; 5 & carry 4 (tens) &c. *Tens.* 3 times 9 are 27; set down the 7 under 9 (because it is 7 *tens*); 3 times 5 are 15 and 2 are 17 (tens, or 170), &c. *Hundreds.* Once 9 is 9. Put the 9 in the third place, because it is 900, &c.

☞ *The ciphers may be omitted as above, because a blank space is the same thing.*

(1)	5,464 × 13.	(2)	8,475 × 14.	(3)	9,463 × 15.
(4)	8,764 × 17.	(5)	9,984 × 18.	(6)	7,590 × 19.
(7)	8,047 × 21.	(8)	9,475 × 24.	(9)	8,445 × 27.
(10)	9,046 × 37.	(11)	3,849 × 56.	(12)	5,475 × 46.
(13)	5,800 × 64.	(14)	8,759 × 62.	(15)	5,963 × 57.

Multiply the first of the following numbers by each of the others.

(16—20)	7546 × 27;	36;	42;	75;	84
(21—25)	8940 × 36;	21;	47;	54;	62
(26—30)	9981 × 59;	78;	84;	71;	89
(31—35)	3304 × 68;	47;	99;	87;	54
(36—40)	9989 × 62;	75;	48;	64;	77
(41—45)	9874 × 108;	59;	69;	75;	601
(46—50)	7448 × 804;	770;	59;	78;	654
(51—55)	8846 × 984;	750;	964;	75;	5

(56—60) 7789 × 698; 684; 75; 96; 70
(61—65) 5990 × 802; 796; 590; 60; 84
(66—70) 9004 × 75; 964; 77; 569; 68
(71—75) 7046 × 84; 750; 99; 759; 6
(76—80) 8940 × 35; 999; 75; 849; 67
(81—85) 8894 × 780; 59; 650; 42; 7
(86—90) 5094 × 660; 75; 98; 7009; 42
(91—95) 9084 × 9064; 750; 9; 80; 7847
(96—100) 8969 × 175; 60; 7; 8094; 6942
(101—105) 8975 × 215; 8; 754; 9; 9847
(106—110) 2109 × 7; 8470; 7090; 9847; 6
(111—115) 5064 × 69; 94; 54; 8096; 7090

The number which is multiplied is called the *multiplicand*, and the number by which it is multiplied is called the *multiplier*.

Multiply 90756 by each of the following :—

(116—120) 89754; 89404; 75480; 99752; 704
(121—125) 20496; 7847; 5964; 99843; 9004
(126—130) 90047; 8975; 604; 72; 59698
(131—135) 8807; 6904; 759; 892; 75096

Multiply each of the following Nos. by those given below :—
[i.e. 99807 × 84, (Ans. 136); 99807 × 75, (Ans. 141), &c.]

99807; 596470; 75984; 64704; 990,876

(136—140) 84: (141—145) 75: (146—150) 609:
(151—155) 8475: (156—160) 6947: (161—165) 84602:
(166—170) 8947: (171—175) 89640: (176—180) 507:
(181—185) 84: (186—190) 9070: (191—195) 864704:
(196—200) 2754: (201—205) 2169: (206—210) 20:
(211—215) 897: (216—220) 82564: (221—225) 508216:
(226—230) 7759: (231—235) 6421: (236—240) 69:
(241—245) 78347: (246—250) 694750: (251—255) 6004:
(256—260) 88709: (261—265) 6947: (266—270) 509:
(271—275) 6470: (276—280) 82647: (281—285) 90804.

Section XVI.

DIVISION.

Suppose I have 6 apples, and give 1 to each of 6 boys, I *divide* the 6 apples equally.

Case I.—

1st boy	From 6 apples		2nd boy	From 5		3rd boy	From 4	
	take 1 apple			take 1			take 1	
	and 5	remain		and 4	remain		and 3	
4th boy	From 3 apples		5th boy	From 2		6th boy	From 1	
	take 1 apple			take 1			take 1	
	and 2	remain		and 1	remain		and 0	

Case II.—

Divide 6 apples equally among 3 boys; or how many 3's are there in 6?

6 apples { * * * / * * * }

(1st boy) 2 + (2nd boy) 2 + (3rd) 2; or 6 apples *contain* 2 apples 3 times.

This is the reverse of Addition or Multiplication, because if I get the 2 apples back from each boy I should again have 6, as 3 times 2 are 6. Then, as you can find the answer 2 by the Multiplication table, it is convenient to employ it in Division.

Thus, 4 divided by 2, or 2's in 4 twice, because 2 times 2 make 4:—

$$2 \mid \overline{4} \quad 2$$

4's in 12 go 3 times, because 4 times 3 make 12:— $\left(4 \mid \overline{12} \quad 3\right)$

6's in 18 go 3 times, because 6 times 3 are 18:— $\left(6 \mid \overline{18} \quad 3\right)$

2's in 10 go 5 times, because 2 times 5 are 10:— $\left(2 \mid \overline{10} \quad 5\right)$

How many 5's in 10? How many 5's in 20?

How many 7's in 14? How many 4's in 20?

How many 6^s in 12? How many 6^s in 24?
How many 8^s in 16? How many 8^s in 24?
How many 9^s in 18? How many 9^s in 36?
How many 10^s in 10? How many 10^s in 40?

Section XVII.

DIVISION OF UNITS AND TENS.

Definition:—Division is the method of finding how often one number contains another.

Ex. 3:—	8	contains	4	twice
	9	„	3	thrice
	7	„	7	once
	10	„	5	twice

☞ The first (or given) number is called the *Dividend*, because that is the number *to be divided*. The second number is called the *Divisor*, because by it you divide.

The answer is called the *Quotient*, because it gives the number of times which the Dividend contains the divisor.

Ex.:— Divide 15 by 3.

Divisor $3 \mid \underline{15}$ Dividend
5 Quotient

What is the *given* number? Ans. 15. Then 15 is the Dividend. By what number do you divide? Ans. 3. Then 3 is the Divisor. How many times does 3 contain 15? Ans. 5. Then 5 is the Quotient.

$2 \mid \underline{6}$	$2 \mid \underline{8}$	$3 \mid \underline{12}$	$2 \mid \underline{14}$	$7 \mid \underline{14}$	$5 \mid \underline{15}$
$4 \mid \underline{20}$	$4 \mid \underline{16}$	$4 \mid \underline{24}$	$7 \mid \underline{21}$	$6 \mid \underline{30}$	$10 \mid \underline{30}$
$4 \mid \underline{40}$	$3 \mid \underline{27}$	$5 \mid \underline{35}$	$6 \mid \underline{60}$	$6 \mid \underline{72}$	$12 \mid \underline{72}$
$11 \mid \underline{33}$	$12 \mid \underline{96}$	$8 \mid \underline{96}$	$6 \mid \underline{48}$	$5 \mid \underline{40}$	$5 \mid \underline{45}$
$8 \mid \underline{80}$	$7 \mid \underline{84}$	$12 \mid \underline{84}$	$13 \mid \underline{13}$	$18 \mid \underline{18}$	$37 \mid \underline{37}$

The sign ÷ means *divided by.*

100 ÷ 10; 48 ÷ 4; 48 ÷ 12; 108 ÷ 9.
120 ÷ 10; 56 ÷ 7; 56 ÷ 8; 144 ÷ 12.

When there is a remainder :—

Ex.—7 divided by 2 give 3 and 1 *over*. 2 | 7

It is clear that you have divided only the 6; and that the 1 is *over* because it cannot be divided by 2. Then the remainder is always *less* than the divisor.

9÷4: 7÷3: 11÷5: 10÷4; 13÷ 3: 21÷ 5: 36÷ 5:
49÷5: 19÷8: 34÷6: 70÷9: 50÷12: 42÷12: 100÷12.

DIVISION OF HUNDREDS.

When the hundreds are equal to, or greater than, the Divisor, the hundreds are divided as so many units.

Examples :— 4) 484 2) 842 3) 936

121 421 312

☞ When the hundreds are *less* than the Divisor they are reckoned as *tens*, and so form the Dividend.

Ex. 1. 5) 405 — 81 — That is, 5[s] in 4 you cannot,* but 5[s] in 40 tens are 8 (tens); 5[s] in 5, 1.

Ex. 2. 6) 372 — 62 — *i.e.* 6[s] in 3 you cannot, but 6[s] in 37 (*i.e.* 36) 6 times and 1 over. This one being 1 ten; 1 ten and 2 (units) are 12 : 6[s] in 12, 2.

Ex. 3. 8) 360 — 45 — *i.e.* 8[s] in 3 none; 8[s] in 36, 4 and 4 over. This 4 is 4 tens (because it is part of the 36 tens), and as 4 tens make 40, 8[s] in 40 go 5 times.

---

* In such cases the 5 is actually contained in the 400, but practically it is better to say that it is *not*.

e.g. 5) 400 (80 — 40 — *i.e.* 5[s] in 40 go 8 times, in 0 no times. In other words the 5 is contained in 400, 80 times, or 8 tens of times (as above).

EXERCISES. ☞ 100 = 10 TENS.

The 1 of 154 is 10 tens; the 1 and 5 are 15 tens.
The 3 of 371 are 30 tens: the 3 and 7 are 37 tens.
The 8 of 837 are 80 tens; the 8 and 3 are 83 tens.
The 9 of 956 are 90 tens; the 9 and 5 are 95 tens.

On the same principle thousands become hundreds, &c.

☞ 1,000 = 10,00, OR TEN HUNDREDS.

The 1 of 1256 is 10 hundred; the 1 and 2 are 12 hundred.
The 3 of 3162 are 30 hundred; the 3 and 1 are 31 hundred.
The 6 of 6415 are 60 hundred; the 6 and 4 are 64 hundred.
The 8 of 8702 are 80 hundred; the 8 and 7 are 87 hundred.

DIVISION (of higher numbers).

The principle above explained equally applies to higher numbers. The reason is that every set of *three* figures increases from units to tens, tens to hundreds, in a corresponding manner.

ILLUSTRATION:— 357,357,357.

357 millions, 357 thousands, 357 (units).

Millions.	Thousands.	Units.
3 5 7,	3 5 7,	3 5 7.
- - -	- - -	- - -
- - -	- - -	- - -
- - -	- - -	- - -
- - -	- - -	- - -
Hun. tens. units (of millions.)	Hun. tens. units (of thous.)	Hun. tens. units (of units.)

Ex. 1.:—

3 | 357, 357, 357
119, 119, 119

Say 3[s] in 3 are 1: 3[s] in 5 are 1 and 2* over; 3[s] in 27 are 9, and so on.

* In the first series, the remainder 2=20 mills.; in the second, 20 thous.; in the third, 20 units.

Ex. 2:—

5 | 423541302
84708260 + 2

Say 5[s] in 4, none, but 5[s] in 42, 8 times and 2 over; 5[s] in 23, 4 times and 3 over; 5[s] in 35, 7 times, 5[s] in 4, none*; but 5[s] in 41, 8 times and 1 over; 5[s] in 13, 2 times and 3 over; 5[s] in 30, 6 times; 5[s] in 2, 0 times and 2 over.

* Caution.—*The quotient* 0 *must always be set down.*

3 | 8475004 (2) 7 | 7594696 (3) 4 | 2694184 (4) 6 | 5742106

☞ The sign of Division is ÷ which means *divided* by.

(5) 7540604÷7 (6) 9374504÷5 (7) 846040÷8 (8) 90475÷9
(9) 846972÷7 (10) 347564÷8 (11) 216480÷9 (12) 216474÷4
(13) 420479÷6 (14) 374751÷8 (15) 294759÷4 (16) 247836÷5
(17) 778479÷5 (18) 732164÷7 (19) 846475÷6 (20) 347541÷3

Divide the first of the following numbers by each of the rest.

(21—25) 754647÷9, 8, 2, 1, 7 (26—30) 327546÷2, 9, 7, 6, 5
(31—35) 2170047÷3, 4, 9, 6, 8 (36—40) 7546041÷6, 8, 4, 7, 9
(41—45) 9464701÷3, 7, 8, 9, 6 (46—50) 9421501÷2, 9, 6, 4, 7
(51—55) 1364751÷3, 9, 2, 8, 6 (56—60) 7784316÷2, 9, 8, 4, 7

Divide each of the following numbers by 9, 2, 8, 6, 4, 7, 12, 3, 11, and 5.

(61—70) 75469008 (71—80) 937542175 (81—90) 406213004
(91—100) 75946102 (101—110) 375484795 (111—120) 64581300
(121—130) 21754610 (131—140) 21745964 (141—150) 84217608
(151—160) 7754964 (161—170) 87009847 (171—180) 59648217
(181—190) 33847564 (191—200) 21758469 (201—210) 37464175
(211—220) 84756421 (221—230) 84796410 (231—240) 20000400
(241—250) 7546475 (251—260) 84796421 (261—270) 77596004
(271—280) 7998469 (281—290) 78475641 (291—300) 38475642

Section XVIII.

DIVISION BY FACTORS.

Definition.—**Any two numbers which, multiplied together, form a certain product, are called the factors of that product.**

Thus, 6 and 3, or 9 and 2, are the factors of 18.

It is sometimes convenient to separate a divisor into factors precisely as explained with reference to the multiplicand in Multiplication (Section XIV.)

If I want to divide 768 by 27, I find that the factors of 27 are 9 and 3; and if I first divide 768 by 9, and then the resulting quotient by 3, the answer will be the same as if I had divided 768 by 27 at once.

For, supposing I know the multiplication table as far as 27 times, I could readily find that 27 is contained in 768 28 times and 12 over. It is, however, the same thing, if I divide by the factors of 27, that is, 9 and 3.

9) 768
3) 85 nines & 3 units over.
28 twenty-sevens & 1 nine over.

9s in 768, 85 and 3 over. Then 85 *nines* ÷ 3 give 28 and 1 over. Now this 1 is one 9 (because the dividend consists of nines), and one 9 and 3 are 12. Therefore, 768 divided first by 9 and then by 3 gives 28 and 12 over, so that the results are the same in both instances.

(1)	(2)	(3)
3)4296 ÷ 15	4)7290 ÷ 16	6)41098 ÷ 18
5)	4)	3)

(4—8) Divide 12409 by 20 : 21 : 22 : 24 : 25.
(9—13) „ 75670 by 27 : 28 : 30 : 33 : 35.
(14—18) „ 70054 by 36 : 40 : 42 : 44 : 48.
(19—23) „ 376800 by 50 : 54 : 55 : 56 : 60.
(24—28) „ 890123 by 63 : 64 : 66 : 70 : 72.
(29—33) „ 634000 by 77 : 80 : 84 : 88 : 90.
(34—38) „ 267748 by 96 : 99 : 100 : 108 : 110.
(39—42) „ 543472 by 120 : 121 : 132 : 144.

When the dividend and divisor end in ciphers, by cutting off an equal number from each, you shorten the process without affecting the quotient.*

* The reason is, that cutting off the cipher and then dividing by 4, (Ex. 1.), is equivalent to dividing by 10 and 4, or the factors of 40.

Ex. 1. $4,0)\overline{4,0}$

$40 \div 40 = 4 \div 4 = 1$ or 1

Ex. 2. $4,0)\overline{40,0}$

$400 \div 40 = 40 \div 4 = 10$ or 10

(13—48) 24680 ÷ 20 : 30 : 40 : 60 : 80 : 90.

(49—54) 763400 ÷ 100 : 1200 : 360 : 700 : 840 : 900.

(55—58) 520000 ÷ 300 : 12000 : 16000 : 10000.

(59—63) 298000 ÷ 540 : 3200 : 960 : 7000 : 100000.

Section XIX.

SIMPLE LONG DIVISION.

In Short Division only a part of the operation of each step is set down, thus :—Divide 5468 by 8 :

Operation :—How many times are 8 contained in 54?—6 times; $6 \times 8 = 48$; $54 - 48$ leaves 6. Set down 6 and carry 6; in Ex. 1., which is an example of short division, only the last part of the operation is set down, but in Ex. 2, which is an example of Long Division, each operation is set down: thus the part of the answer 6 is placed on the right of the dividend with a line between; 6 times 8 or 48 is placed under the 54 for subtraction, and the remainder 6 is placed under the 8. The next figure 6 is then brought down, making with the last remainder 66; 8 is contained in 66 eight times; 8 is placed in the answer, and (Ex. 2) 8 times 8 or 64 is set down under the 66, and subtracted. 2 remains. The next figure 8 is brought down. (Ex. 1 and 2). 8 in $28 = 3$. 3 is added to the answer: (Ex. 2). $8 \times 3 = 24$; 24 is placed under 28; $28 - 24$ leave 4. Ans. $683 + 4$.

Ex. 1.	Ex. 2.
8)5468	8)5468(683
683+4	48 (hun.)
	66 (tens.)
	64
	28 (units)
	24
	4

*** The pupil's chief difficulty in learning Long Division is, to find how many times the Divisor is contained in any given part of the Dividend; and as this difficulty can only be overcome by practice, it is desirable that the teacher should give the pupil, before he commences to work sums on the slate, numerous exercises of the following kind.

How many	13^s in	19,	25,	42,	63,	74,	99,	108
" "	17^s "	18,	43,	56,	71,	94,	110,	163
" "	29^s "	43,	84,	97,	126,	150,	190,	244
" "	37^s "	42,	69,	120,	208,	270,	304,	320
" "	82^s "	100,	190,	274,	315,	680,	719,	801
" "	103^s "	206,	412,	629,	743,	796,	804,	927
" "	576^s "	842,	973,	1060,	2349,	3708,	4000,	4984
" "	844^s "	1710,	2308,	5470,	6000,	7044,	7592,	8000

Work each of the following as in Ex. 1, by Factors; *also*, as in Ex. 2.

(1)	784264÷15	(2)	964804÷26	(3)	947846÷70
(4)	936421÷19	(5)	864712÷21	(6)	984694÷42
(7)	826204÷12	(8)	946484÷32	(9)	896475÷81

Divide, as in Ex. 2, the first number by each of the others.

(10—19)	946483÷25, 37, 59, 88, 13, 16, 75, 17, 39, 21.
(20—29)	374647÷39, 18, 82, 73, 17, 14, 15, 16, 19, 25
(30—39)	908475÷69, 13, 37, 64, 19, 16, 14, 17, 35, 24
(40—49)	800754÷53, 57, 41, 52, 21, 29, 36, 44, 19, 31
(50—59)	964784÷42, 39, 42, 43, 34, 45, 56, 47, 18, 19
(60—69)	210004÷15, 16, 59, 81, 92, 34, 46, 68, 22, 24

SECTION XX.

SIMPLE LONG DIVISION—continued.

Ex. Divide 506961 by 84.

EXAMPLE.	PROOF.	EXTENSION.
84)506961(6035 ans.	6035	84)506961 (6000
504	84	504000 30
296	24140	2961 5
252	48280	2520 6035
441	21	441
420	506961	420
21 remainder		21 remainder

1. *As to the Example*:—The divisor is placed to the left and the answer to the right of the dividend. Then, beginning with the left-hand figures, 84 is not contained in 5, nor 50, but in 506 it is contained 6 times. 6 is put in the highest place; 84 is multiplied by 6, and the product, 504, is taken from 506; 2 remains, and to this the next figure of the dividend 9 is annexed; 84 is not contained in 29, so *a cipher is added* to the answer, and the next figure 6 is brought down. 84 is contained in 296 3 times. 3 is added to the answer, and 84 × 3 or 252 is taken from 296; 44 remains; the next figure of the dividend 1 is brought down. 84 is contained in 441 five times; 5 is added to the answer, and the product of 84 × 5, or 420, taken from 441 leaves 21, which, as there are no more figures to be brought down, is the remainder of the sum.

2. *As to the Proof:*—Since it has been found that 84 is contained 6035 times in 506961 with a remainder of 21, it follows that 84 times 6035 with 21 added will amount to 506961. Therefore to prove a division sum:—Multiply the answer by the divisor, and to the product add the remainder: the result should be equal to the dividend.

3. *As to the Extension:*—

In 506961, 84 is contained 6000 times + 2961.
In 2961 84 is contained 30 times + 441.
In 441, 84 is contained 5 times + 21.
6000 + 30 + 5 = 6035 which, with the remainder 21, gives the answer.

RULE:—(*a*) Set down the dividend with a curved line on each side, placing the divisor on the left, and the answer, as it is obtained, on the right.

(*b*) Beginning with the left hand, observe how many times the divisor is contained in the fewest possible number of figures of the dividend, and set down the number thus obtained in the place assigned for the answer.

(*c*) Multiply the divisor by this number,* and subtract the product † from the set of figures taken in the dividend.§

(*d*) Annex to the remainder the next figure of the dividend, and proceed as before.

If after annexing, or (as it is generally called) *bringing down* a figure, the divisor is not contained in the number thus obtained, *a cipher must be added to the answer.*

(*e*) When all the figures of the dividend are brought down, the remainder then left is the remainder of the sum.

* *This number should never exceed* 9.
† *If the product exceed the number taken in the dividend the answer is too large.*
§ *If, after subtracting, the remainder is greater than the divisor, the answer is too small.*

☞ The answer of a division sum is called the *quotient.*

Find the quotients of the following:

1	2	3	4
23)2406(	41)4562(	37)7126(	26)8461(
5	**6**	**7**	**8**
19)7091(	38)8463(	29)6101(	43)4861(
9	**10**	**11**	**12**
47)1018(	52)6171(	61)6404(	73)7208(

40100 ÷	61,	89,	73, 98	37	41010 ÷ 782, 1685, 2098
50906 ÷	34,	82,	67, 29	38	754321 ÷ 5840, 783, 216
74842 ÷	107,	213,	510	39	684000 ÷ 9800, 4011, 9826
90150 ÷	210,	708,	365	40	51409 ÷ 712, 1900, 3016
72486 ÷	946,	327,	470	41	841098 ÷ 1019, 8040, 479
20403 ÷	617,	311,	501	42	1080635 ÷ 198, 347, 219
50048 ÷	650,	781,	996	43	8543216 ÷ 717, 936, 684
20482 ÷	319,	487,	361	44	1090805 ÷ 159, 2316, 728
854321 ÷	615,	725,	983	45	1087903 ÷ 2800, 5310, 7119
509023 ÷	710,	508,	368	46	8765432 ÷ 1984, 268, 4190
201000 ÷	360,	790,	257	47	7675481 ÷ 986, 3011, 1483
810608 ÷	583,	217,	936	48	2109817 ÷ 1688, 2190, 743
706540 ÷	800,	901,	725	49	1760942 ÷ 795, 6580, 365
360645 ÷	713,	219,	750	50	2141020 ÷ 1504, 761, 3098
843617 ÷	115,	999,	530	51	20810700 ÷ 1860, 2300, 9810
959084 ÷	672,	743,	861	52	48436108 ÷ 5432, 1234, 5678
741000 ÷	380,	710,	560	53	98765432 ÷ 1093, 678, 9800
111718 ÷	483,	982,	461	54	45606700 ÷ 539, 9809 476
841080 ÷	768,	867,	678	55	21900426 ÷ 3541, 297, 417
131081 ÷	1010,	2111,	8000	56	91439820 ÷ 5163, 742, 9810
408052 ÷	987,	3100,	5260	57	44556677 ÷ 5498, 135, 6821
400710 ÷	1840,	7001,	2112	58	47098216 ÷ 419, 5260, 738
568437 ÷	5084,	7239,	5861	59	14709312 ÷ 765, 4830, 7011
843000 ÷	7000,	2100,	8016	60	87084032 ÷ 627, 1580, 2199

61. There are 19 towns with a total population of 961,400, what is the average number in each?

62. How many miles, of 1760 yards, in 200,640 yards?

63. If 40,020 trees are planted in 23 rows, how many are there in each row?

64. If 39 potatoes weigh a stone, what is the weight of a heap of 3,000,036 potatoes?

65. How many penny-worths of nuts can be made out of a bag containing 446,340, at the rate of 43 a penny?

66. A crew of 173 men took a prize worth £49997, what is each man's share?

67. In 200088 gallons how many pipes, of 126 gallons each?

68. If 10,000,000 pounds of flour have to be placed in sacks, each holding 280 pounds, how many will be required?

69. How many geese are required to supply 2,000 quills, at the rate of 8 from each wing?

70. In an army of 199,956 men, every 57th man is a sergeant, how many are there?

71. How many shillings in 296,280 pence?

72. How many pipes, of 126 gallons, can be filled with 1,790,334 gallons of wine?

73. How many years, of 365 days, are equal to 3,579,190 days?

74. In a heap of 499,968 pounds of sugar: how many hundredweights of 112 pounds each?

75. Divide the difference between 6098437 and 38074825 by 387.

76. What is the 39th part of 100,000?

77. Multiply 81,200 by 718, and divide the product by 2,398.

'STANDARD' MANUAL

OF

ARITHMETIC,

(THEORETICAL AND PRACTICAL).

PART IV.

(Corresponding to Standard IV.)

ARITHMETICAL TABLES, (COLENSO).

MULTIPLICATION TABLE.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	15	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	90	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	36	48	60	72	84	96	108	120	132	144

MONEY.

4 Farthings (*f*) make 1 Penny (*d*)
12 Pence . . 1 Shilling (*s*)
20 Shillings . . 1 Pound (£)

One farthing, *two* farthings or a half-penny, and *three* farthings, are also denoted by ¼, ½, and ¾, meaning *one-fourth*, *one-half*, and *three fourths* respectively of a penny.

A Crown . . = 5 Shillings
A Sovereign . = 20 Shillings
A Guinea . . = 21 Shillings

d.		*s.*	*d.*
12	make	1	0
20	. .	1	8
24	. .	2	0
30	. .	2	6
36	. .	3	0
40	. .	3	4
48	. .	4	0
50	. .	4	2
60	. .	5	0
70	. .	5	10
72	. .	6	0

d.		*s.*	*d.*
80	make	6	8
84	. .	7	0
90	. .	7	6
96	. .	8	0
100	. .	8	4
108	. .	9	0
110	. .	9	2
120	. .	10	0
130	. .	10	10
132	. .	11	0
140	. .	11	8

144*d.* make 12*s.*

TIME.

60 Seconds make 1 Minute
60 Minutes . . 1 Hour
24 Hours . . 1 Day
7 Days . . 1 Week
4 Weeks . . 1 Lunar Month
365 Days . . 1 Year

Since 52 Weeks, or 13 Lunar Months, contain 364 Days, these are often reckoned as a Year.

The Year is also divided into 12 Months, called *Calendar Months*, which contain unequal numbers of Days—

January . . .	31	April . . .	30	July . .	31	October . . .	31
February . . .	28	May . . .	31	August . .	31	November . . .	30
March	31	June . . .	30	September . .	30	December . . .	31

Of these all contain 31 days, except February, which has 28, and those mentioned in the following rhyme, which have 30 :—

Thirty days have September,
April, June, and November.

Every Fourth Year contains 366 Days, and is called Leap-Year; and in such a year February has 29 days.

QUARTER DAYS.

Lady Day . .	March 25th.	Michaelmas Day . .	September 29th.
Midsummer Day .	June 23th.	Christmas Day . .	December 25th.

Miscellaneous Exercises in Addition, Subtraction, Multiplication, and Division.

1. Four boys had 2 dozen marbles each: how many marbles had they in all?

2. A man had six fields, and in each field there were 24 sheep: how many would there be if he had put them altogether?

3. Prince Albert was born in 1819 and died in 1862: how old was he when he died?

4. How many more are 321,560 miles than 7,790?

5. A man bought a horse, a gig, and a set of harness for £64; the price of the horse and gig was £45, and the price of the horse, and harness £33: find the price of each?

6. A cheese weighs 39 lbs.: what is the weight of 19 such?

7. In a flock of three thousand four hundred and seventy sheep: how many legs?

8. A pigeon flies at the rate of 55 miles an hour: what distance will it fly in 9 hours?

9. If a box of oranges containing 14 dozen was distributed in an Infant School, and each scholar got 3: how many scholars were there?

10. Divide 32 thousand 6 hundred and 46 bushels of corn among 57 persons.

11. 573 nuts were divided among 13 boys: how many did each get?

12. On 14 dozen pinafores there were 840 buttons: how many buttons were on each pinafore?

13. If 144 lozenges be divided amongst 9 children, how many will each have?

14. If a father gives to each of his 9 children 87 nuts, how many does he give to all?

15. A gardener plants 20 rows of cabbages, 17 in a row: how many does he plant?

16. If 22 boys score 198 notches, how many does each score?

17. A horse and cart together are worth £25; the cart is worth £14: what is the value of the horse?

18. If a man makes 1890 steps in walking a mile: how many steps will he make in a journey of 94 miles?

19. If a clock ticks 60 times a minute, how many times does it tick in 1600 minutes?

20. How many times does a common clock strike in 3 weeks?

21. Oliver Goldsmith died in 1774 at the age of 46: when was he born?

22. At an election, 315 persons voted for Mr. Smith, and 225 for Mr. Jones: what was the majority?

23. A train arrived at a station with 159 passengers, of whom 87 got out: how many went on?

24. How many boys can be seated in a school in which there are 98 forms, holding 15 boys each?

25. How many oranges in fifteen bags, containing 86 each?

26. A man has 120 horses, and 12 stables to put them in: how many can be put in each stable, so that he may not have more in one stable than in any of the others?

27. In a school there are 12 windows, and in each window there are 16 panes of glass: how many panes are there in all the windows?

28. A regiment was marching 8 deep, and there were 126 lines of men: how many soldiers were there altogether?

29. There are 12 pence in a shilling: how many in 7 shillings?

30. How many oranges are there in 19 bags, containing 86 each?

31. How many apples are there in 12 dozen?

32. Multiply seven thousand, four hundred and seventy-six, by six hundred and forty-five; the product, by seven hundred and four.

33. What is the value of a row of 29 houses, worth three hundred and sixty-five pounds each?

34. If I travel by railway 12 hours at 31 miles an hour, and next day walk 17 hours at 3 miles an hour: how far do I travel?

35. A thousand nuts have to be divided among 37 children: how many will each have?

36. There are 31,684 persons in a certain town, and on an average seven live in each house: how many houses are there in the town?

37. Find the eighteenth part of thirty-six; and the twenty-fourth part of 144.

38. Five hundred and seventy-seven marbles have to be divided among 29 boys: how many will each receive?

39. How many nuts will a class of 8 boys get, if 17 dozen are divided among them equally?

40. There were 5 chests of oranges: the first contained 246, the second 265, the third 169, the fourth 172, and the fifth 78: how many oranges were there altogether?

41. A person paid 90 pence for coffee, 80 pence for tea, 27 pence for rice: what did he pay altogether in pence?

42. A man was born in May, 1786: what age was he in May, 1846?

43. How many nuts are there in 8 bags, when each contains 169?

44. How many lemons are there in 6 chests, when each contains 798?

45. If a man earns £198 a year, how much will he earn in 9 years?

46. In a drove of 399 cattle, how many feet are there?

47. A parish contains 1,692 houses: if each house holds 5 persons, how many people are there in the parish?

48. A gentleman gave 11 pence each to 736 poor boys: how many pence did he give away?

49. How many days are there in 119 weeks?

50. A bricklayer worked 9 hours a day for 716 days: how many hours did he work?

51. How many cocoa-nuts are there in 24 chests, when each contains 399?

52. If a man walks 27 miles a day, how many miles will he walk in 78 days?

53. Divide 649 marbles among 9 boys.

54. 150 shelves contain 10 books each: how many are there in all?

55. There are 115 boys in a school: into how many rows of nines can they be put?

56. How many times must I hold up 5 fingers to count 990?

57. If a man walks 3 miles an hour, how many hours will he take to walk 427 miles?

58. How many lambs at 11 shillings each can be purchased with 1299 shillings?

59. If one man can build a wall in 159 days, how many days will it take 16 men to do the same?

60. There are 416 pears in 16 baskets: how many pears does each contain?

61. Divide 696 marbles equally among 29 boys: how many will each receive?

62. A farmer has 145 cows, and he wishes to put them into 29 equal lots: how many should he have in each lot?

63. If a man walk 35 miles every day, in what time will he walk 1000 miles?

64. Add together the following lengths of road: 62 miles, 47 miles 3 miles, 247 miles, 10 miles, and 198 miles?

65. Multiply 48 by 52, multiplied by 9.

66. Out of 220 books, how many parcels of ten can I make?

67. In a school there are 31 rows of boys, and 17 in each row: how many boys are there in the school?

68. There are 8 furlongs in a mile: how many are there in 78 miles?

69. Supposing there are 148 farms in each county: how many farms are there in England, which contains 52 counties?

70. Multiply 426 + 219,400 by 63.

71. A draper has 2,409 yards of calico and 3,172 yards of cloth: his premises are burnt, together with 1,908 yards of calico and 1,402 yards of cloth: how many yards of each are left?

72. A race horse runs over a course of 10 miles 25 times in a year: how far has he run?

73. There are 365 days in a year: how many days are there in 75 years?

74. Fifteen men rent a field and put 75 cows in it: how many does each put in?

75. How many animals are the following: 48 cows, 1365 sheep, 165 lambs, 19 pigs, and 65 calves?

76. Divide twenty-five thousand nine hundred and eighty by four.

77. A train travels 40 miles the first hour, 35 the second, and then keeps on at that rate for 6 hours: how far will it have travelled?

78. A fruiterer has 204 oranges, another has 42 more than the first, and another 52 more than the second: how many have they altogether?

79. A man rides by train 147 miles, then by omnibus 7 miles, walks 15 miles, and then rides on horseback 73 miles: how many miles does he travel?

80. How much older is a man that was born in 1811 than one born in 1833?

81. It takes 13 buttons for a man's shirt: when the buttons have been sewn on 17 shirts, how many will remain out of 300?

82. A shoemaker uses 44 nails to one boot: how many will be wanted to nail twelve pairs?

83. A bricklayer's labourer carried in his hod 22 bricks up a ladder 156 times in a day: how many bricks did he carry?

84. A boy can count 9486 in an hour: how many will he count in a day of 24 hours?

85. 144 is called a gross: how many pens are there in 89 gross?

86. A basket contains 75 eggs, 47 were duck's eggs, and the rest hen's eggs: how many were there of the latter?

87. There were 823 apples on a tree, of these 227 were gathered and 129 were blown down: how many remained?

88. Add together all the numbers on the face of the clock.

89. A packet of pins was dropped on a school floor, and 4 boys picked them up. One picked up 137, another 129, a third 167, and a fourth 138: how many pins were in the paper?

90. John was born in 1822, and Thomas in 1844: what were their ages in 1863?

91. In 9 bags of nuts, there are altogether 489: how many are there in each bag?

92. A smith used 10 nails in putting on a horseshoe—in one day he used 430 nails: how many shoes did he put on?

93. I counted the fingers of all the boys in a school, and found there were 530: how many boys were in the school?

94. How many dozen apples were in 19 score and 4?

95. In an army of 181,463 soldiers, 1,872 were officers; how many men were there to each officer?

96. There are 20 shillings in a pound; how many pounds are there in 100 shillings?

97. Multiply by 6 the sum of 8 and 6, divide it by 12, add 24, and take away 18: how many are left?

98. A cattle dealer went to market with £600; he bought 25 oxen at £17 each, and 17 pigs at £6 each: how much money did he *not* spend?

99. What would be the cost of 3468 toy horses at 6*d.* each?

100. A girl in sewing a pocket-handkerchief put 15 stitches in an inch, and the handkerchief was 60 inches round: how many stitches were made?

101. In a piece of music, there were four notes in a bar, and 18 bars in a line, and 29 lines: how many notes were there in all?

102. A copy book contained 24 leaves: how many leaves were there in 3 gross?

103. A person had 204 marbles to divide among 20 boys, but he lost 12, and when he gave them away 3 of the boys were absent: how many did each boy have?

104. A farmer had 3,868 sheep, 98 horses, 1,301 oxen: what was the number of his live stock?

105. A boy had two baskets containing eggs which were to be carried to market. While going, he fell down, and broke a dozen in one basket, and half-a-score in the other; he sold 3 dozen at the market, and brought home a score: how many had he when he started?

106. A grocer received three boxes of eggs, in one were 18 dozen and 9, in another 10 score, and in the third 2 gross: how many eggs were there in all?

107. 4,599 apples were divided among the girls in a school; each girl got 17, and there were nine over: how many girls were there in the school?

108. A gentleman sold 254 acres of land at £15 per acre: what was the price of the whole?

109. A number of soldiers were allowed 4 quarts of beer, and it was found that, in a certain time, they had consumed 481,216 quarts: how many soldiers were there?

110. How many must be added to 27 to make it equal to 19 and 18 multiplied together?

111. Two boys are playing at marbles, one has pitched his marble in the hole 9 times, and has 6 marbles every time, the other has pitched his in 17 times: how many marbles has he?

112. If a person owed £768 and paid back £154, £79, £32, and £229, at different times, how much does he still owe?

113. How many dozen apples are there in a chest containing 2,713 apples?

114. Four mail steamers brought from New York, 1st, £183,060; 2nd, £215,050; 3rd, £85,010; 4th, £105,785: what was the total?

115. The following number of bags of sugar were sold in one day: Mauritius, 11,458; Madras, 4,428; Penang, 7,021; Jamaica, 26,740 bags: give the total.

116. The metals produced in England in 1862, were:—tin, 8,476 tons; copper, 14,843 tons; lead, 69,031 tons; zinc, 2151 tons; iron, 3,943,649 tons: give their entire weight.

117. The value of these metals is as follow:—tin, £983,216; copper, £1,493,241; lead, £1,436,345; zinc, £50,548; iron, £9,358,672: give their total value.

118. The number of visitors to the Great Exhibition in 1851, were:—May, 734,782; June, 1,133,116; July, 1,314,176; August, 1,023,435; Sep. 1,155,240; Oct. 841,107: give the total.

119. The following number of quarters of corn were imported in one week: wheat, 25,407; barley, 13,205; oats, 32,202: give the total.

120. In 1848, 196,000 persons emigrated to New York; in 1849, 247,500; in 1850, about 300,000: what was the average in three years?

Section XXI.
COMPOUND ADDITION.

The adding together of numbers of the same name is called Simple Addition.

The adding together of numbers of different names, is called Compound Addition.

Thus, £27 16s. 11¾d.; £1 6s. 9½d.; and £5 10s. 4½d., are Compound numbers, since they are made up of units of different values.

To add these together it is evident that pounds must be added to pounds, shillings to shillings, pence to pence, and farthings to farthings.

Thus ¼ + ½ + ¾ = 7 farthings; 4 + 9 + 11 = 20 pence; 10 + 6 + 16 = 32 shillings, and 5 + 1 + 27 = 33 pounds. Ans. £33 32s. 24d.$\frac{7}{4}$f.

£	s.	d.
27	16	11¾
1	6	9½
5	10	4½
33	32	24¾

Add, in like manner, the following :—

(*a*)	£26 4 11½	£16 19 3½	£8 3 11
(*b*)	£27 13 2½	£20 9 5	£3 15 4¼
(*c*)	£19 11 5¼	£37 15 11½	£60 9 10½
(*d*)	£19 17 5	£109 18 5¼	£25 13 8
(*e*)	£0 19 5½	£26 13 4½	£17 15 6¼
(*f*)	£27 0 0¾	£27 12 5½	£38 2 7
(*g*)	£26 4 5½	£33 14 9	£15 1 9¾
(*h*)	£0 19 0	£108 17 11¾	£2 10 6
(*i*)	£16 15 4½	£16 17 4½	£1 11 4½
(*j*)	£27 15 11¼	£14 15 7¼	£6 16 9¾

In simple addition when the units' column amounted to more than 9, the number of tens was found, and added to the tens' column. So in the above example, since 4 farthings make 1 penny, the 7 farthings are equal to 1 penny + 3 farthings; the ¾ may therefore be set down in the farthings' place and 1 penny added to the 24

pence, making 25 pence. But since 12 pence make 1 shilling, 25 pence = 2 shillings and 1 penny, therefore set down the 1 penny in the pence column, and add 2 shillings to the shillings. These will amount to 34 shillings, but as 20 shillings make £1, so 34 shillings = £1 14s. Set down the 14 in the shillings' place, and carry the £1 to the pounds' column. The Answer will therefore be £34 14 $1\frac{3}{4}$.

Find the sum of the following :—

1			2			3			4		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
1	3	$6\frac{1}{4}$	17	16	$3\frac{1}{2}$	4	4	$4\frac{1}{2}$	7	12	$9\frac{1}{2}$
	19	$11\frac{1}{2}$	2	5	9	19	12	$10\frac{1}{2}$	2	10	$4\frac{3}{4}$
3	8	2	5	1	7	11	6	7	16	8	$11\frac{1}{2}$
	7	$4\frac{3}{4}$		3	$4\frac{3}{4}$		1	$8\frac{3}{4}$		19	0
9	2	10	12	10	$3\frac{1}{4}$	3	14	$9\frac{1}{4}$	1	22	7

5			6			7			8		
4	4	$2\frac{1}{4}$	10	13	$6\frac{1}{2}$	32	11	$8\frac{3}{4}$	24	15	$11\frac{1}{4}$
2	8	$6\frac{3}{4}$	9	4	$0\frac{1}{4}$		7	3	9	3	6
	13	$9\frac{1}{2}$		18	$9\frac{3}{4}$	5	15	$11\frac{1}{4}$	16	17	$8\frac{3}{4}$
8	6	7	6	10	7	7	10	$6\frac{1}{2}$		2	$10\frac{1}{2}$
4	12	$3\frac{1}{4}$	8	16	$3\frac{1}{4}$	16	2	$5\frac{3}{4}$	47	10	$5\frac{3}{4}$

9			10			11			12		
84	6	$11\frac{1}{2}$	38	16	$8\frac{1}{4}$	49	12	$6\frac{1}{4}$	24	15	$9\frac{3}{4}$
15	14	6	7	2	9	3	9	11	73	3	8
3	5	$10\frac{3}{4}$	12	10	$3\frac{3}{4}$	90	8	5	15	16	$3\frac{1}{2}$
68	11	$3\frac{1}{2}$	76	8	6	35	16	$7\frac{3}{4}$	9	12	$10\frac{1}{4}$
75	10	$5\frac{3}{4}$	25	5	$5\frac{1}{2}$	6	15	$10\frac{1}{2}$	16	10	2
50	9	$4\frac{1}{4}$	9	13	$4\frac{3}{4}$	48	7	$1\frac{1}{4}$	85	9	$11\frac{1}{2}$

13. £35 16 $3\frac{1}{4}$ + 167 2 11 + 408 9 $6\frac{3}{4}$ + 25 17 $4\frac{1}{2}$ + 690 3 $10\frac{1}{4}$
14. £249 8 $6\frac{3}{4}$ + 55 11 $7\frac{3}{4}$ + 94 2 $0\frac{1}{4}$ + 201 8 $6\frac{1}{2}$ + 1 19 $3\frac{3}{4}$
15. £593 12 $9\frac{1}{2}$ + 3 18 $9\frac{1}{4}$ + 87 13 7 + 678 0 $1\frac{3}{4}$ + 16 14 11
16. £16 0 $11\frac{1}{4}$ + 942 7 $1\frac{1}{2}$ + 8 19 $4\frac{1}{2}$ + 35 13 $8\frac{1}{4}$ + 365 0 10
17. £463 16 $8\frac{1}{2}$ + 9 2 10 + 30 6 $7\frac{3}{4}$ + 932 6 7 + 209 14 $3\frac{1}{2}$
18. £2 9 $11\frac{3}{4}$ + 840 13 4 + 61 14 $3\frac{1}{4}$ + 609 11 $6\frac{1}{2}$ + 14 6 $9\frac{1}{4}$
19. £904 3 $2\frac{1}{2}$ + 8 16 $9\frac{1}{4}$ + 49 6 $8\frac{1}{2}$ + 450 3 11 + 674 19 $2\frac{3}{4}$
20. £56 7 $3\frac{1}{4}$ + 4 8 0 + 708 14 $11\frac{3}{4}$ + 72 18 $4\frac{1}{2}$ + 538 6 $9\frac{1}{2}$

21. £607 3 $9\frac{3}{4}$ + 9 16 $4\frac{1}{8}$ + 24 12 0 + 924 4 $5\frac{1}{2}$ + 114 15 $3\frac{1}{8}$
22. £9 19 $11\frac{3}{4}$ + 507 3 10 + 14 16 $11\frac{1}{4}$ + 497 12 $6\frac{1}{2}$ + 16 8 $10\frac{1}{8}$
23. £36 4 $6\frac{1}{2}$ + 784 12 9 + 102 8 $6\frac{3}{4}$ + 43 13 8 + 409 6 $10\frac{1}{8}$
24. £904 2 $9\frac{3}{4}$ + 86 13 0 + 500 18 6 + 89 12 $10\frac{3}{4}$ + 684 3 $9\frac{1}{8}$
25. £247 14 $2\frac{1}{4}$ + 31 2 $8\frac{1}{2}$ + 19 $3\frac{3}{4}$ + 450 0 0 + 1 1 $10\frac{1}{8}$
26. £19 17 $8\frac{1}{2}$ + 308 12 $11\frac{1}{4}$ + 2 7 $6\frac{1}{2}$ + 1 $6\frac{3}{4}$ + 39 6 5
27. £480 16 $6\frac{3}{4}$ + 18 13 $7\frac{1}{2}$ + 504 16 0 + 18 4 $3\frac{1}{4}$ + 14 $2\frac{1}{8}$
28. £156 15 $3\frac{1}{2}$ + 2 $6\frac{1}{4}$ + 18 4 8 + 9 13 $2\frac{1}{2}$ + 18 $9\frac{1}{8}$
29. £219 4 $8\frac{1}{4}$ + 12 4 2 + 9 $4\frac{1}{4}$ + 316 8 $6\frac{3}{4}$ + 2 6 $8\frac{1}{8}$
30. £14 12 $3\frac{1}{2}$ + 16 $7\frac{1}{2}$ + 274 2 $11\frac{3}{4}$ + 29 14 $9\frac{1}{2}$ + 365 19 2
31. £2970 18 $6\frac{3}{4}$ + 101 0 0 + 1180 15 $4\frac{1}{2}$ + 69 1 $1\frac{1}{2}$ + 1 $11\frac{1}{8}$
32. £468 12 $11\frac{1}{4}$ + 2534 19 $4\frac{3}{4}$ + 278 14 $8\frac{3}{4}$ + 1264 14 $9\frac{1}{2}$ + 4 $6\frac{1}{8}$
33. £1863 15 $2\frac{1}{2}$ + 69 16 $8\frac{1}{4}$ + 1924 5 $6\frac{3}{4}$ + 112 18 $11\frac{1}{2}$ + 9 $7\frac{1}{8}$
34. £3648 6 $11\frac{1}{2}$ + 274 10 $3\frac{3}{4}$ + 1198 16 $9\frac{1}{2}$ + 916 14 $7\frac{1}{8}$ + 29 13 6
35. £643 14 $2\frac{1}{4}$ + 1921 19 6 + 24 15 $3\frac{1}{4}$ + 2681 12 $8\frac{3}{4}$ + 15 $7\frac{1}{8}$
36. £49 0 $6\frac{1}{2}$ + 3162 16 $4\frac{3}{4}$ + 18 $6\frac{1}{4}$ + 478 6 $11\frac{1}{2}$ + 69 5 $6\frac{1}{8}$
37. £1841 16 $11\frac{1}{2}$ + 214 12 $8\frac{3}{4}$ + 17 12 $4\frac{1}{2}$ + 19 $7\frac{1}{4}$ + 678 4 $7\frac{1}{8}$
38. £769 12 9 + 2719 19 $4\frac{1}{2}$ + 619 18 $3\frac{1}{4}$ + 413 9 $6\frac{3}{4}$ + 1471 2 5
39. £174 8 $4\frac{3}{4}$ + 3462 17 $7\frac{1}{4}$ + 76 12 $4\frac{1}{2}$ + 694 4 $2\frac{1}{4}$ + 297 6 7
40. £2271 14 $0\frac{1}{2}$ + 174 17 $9\frac{3}{4}$ + 46 0 1 + 1170 18 $4\frac{3}{4}$ + 16 $7\frac{1}{8}$
41. £18 16 $7\frac{3}{4}$ + 1461 14 $4\frac{1}{2}$ + 18 $4\frac{3}{4}$ + 2927 6 $9\frac{1}{2}$ + 927 17 $1\frac{1}{8}$
42. £2916 2 $8\frac{1}{4}$ + 819 16 $11\frac{1}{4}$ + 174 12 $0\frac{1}{2}$ + 18 $6\frac{1}{4}$ + 29 0 1
43. £718 15 $1\frac{3}{4}$ + 2015 9 $10\frac{1}{2}$ + 15 $6\frac{1}{4}$ + 676 18 $9\frac{3}{4}$ + 1174 14 $9\frac{1}{8}$
44. £2421 4 $6\frac{1}{2}$ + 19 $11\frac{3}{4}$ + 719 4 $3\frac{1}{4}$ + 2171 16 $5\frac{1}{2}$ + 417 5 6
45. £896 10 $0\frac{1}{2}$ + 2 0 $11\frac{1}{4}$ + 4020 0 6 + 705 13 $7\frac{1}{4}$ + 86 7 $4\frac{1}{8}$
46. £4332 13 $7\frac{3}{4}$ + 53 4 $0\frac{1}{2}$ + 135 14 8 + 127 3 $6\frac{1}{4}$ + 16 $0\frac{1}{8}$
47. £2071 10 $0\frac{1}{2}$ + 137 0 $2\frac{3}{4}$ + 702 6 3 + 485 17 $6\frac{1}{4}$ + 7 0 4
48. £1511 $2\frac{1}{4}$ + 915 18 $11\frac{1}{4}$ + 108 7 $6\frac{1}{4}$ + 10 11 10 + 81 16 $0\frac{1}{8}$
49. £3240 8 $10\frac{1}{2}$ + 2011 13 4 + 116 9 $11\frac{1}{4}$ − 278 18 $0\frac{3}{4}$ + 20 6 $1\frac{1}{8}$
50. £1832 12 $9\frac{3}{4}$ + 32 15 7 + 709 1 $8\frac{1}{2}$ + 676 16 9 + 6790 0 5
51. £10060 17 $4\frac{1}{2}$ + 802 9 $11\frac{3}{4}$ + 9 16 $4\frac{1}{2}$ + 1000 0 $0\frac{1}{2}$ + 606 14 $1\frac{1}{8}$
52. £29 14 $3\frac{1}{4}$ + 1080 6 4 + 99 19 $11\frac{3}{4}$ + 101 0 6 + 7070 8 $3\frac{1}{8}$
53. £604 15 $6\frac{1}{4}$ + 2017 2 8 + 18040 16 $9\frac{1}{2}$ + 112 0 11 + 2179 16 7
54. £20300 13 7 + 4016 8 $4\frac{1}{2}$ + 1090 17 $2\frac{1}{4}$ + 271 3 $6\frac{1}{2}$ + 5 0 $0\frac{1}{8}$

55. £5700 11 11 + 138 9 4¾ + 25010 15 6 + 365 7 8½ + 1608 0 4
56. £40400 10 0½ + 896 13 3 + 1010 15 7½ + 91 11 5 + 425 7 1½
57. £1576 8 0 + 11 12 6¾ + 1292 11 4½ + 358 17 11 + 12884 10 8
58. 1647 18 10⅝ + 59 17 2½ + 1 11 1 + 2950 0 0 + 548 1 10
59. £7492 13 6¼ + 1000 0 0 + 473 12 5¼ + 81 19 9¾ + 12 12 0
60. £1 19 9½ + 3648 1 11½ + 69 19 2½ + 11 12 8¼ + 4 14 7

61. How much must I pay for the following items:—coffee 2s. 8½d., sugar 3s. 1d., tea 5s. 3d., candles 2s. 6d., treacle 4½d., tobacco 1s. 7½d.?

62. A man spends £750 13 10 a year; he saves £216 14 2, and gives away £32 12 0: what is his income?

63. Add together:—a half-sovereign, 3 florins, a half-guinea, 2 half-crowns, £27 18 1½, 3 crowns, and £5 17 1½.

64. A man earned 2s. 6d. on Monday, 4s. 3½d. on Tuesday, 3s. 8½d. on Wednesday, 6s. 8¾d. on Thursday, 5s. 8d. on Friday, 4s. 6½d. on Saturday: what was the amount of his week's earnings?

65. A man owes to different creditors:—£5420 18s. 6½d., £421 12s. 8¾d., £1863 14s. 2½d., £4386 13s. 9½d., £18 6s. 2d., £2020 19s. 11½: what is the amount of his debts?

66. A man gets 19s. 6½d. a week, his wife 12s. 6d., 2 sons 7s. 6d. each, and 3 daughters 4s. each: what was the family's weekly earnings?

67. Add together £78, 78 shillings, 78 pence.

68. A man had in his purse 3 half-sovereigns, 4 five-pound notes, 4 half-crowns, 5 florins, 6 fourpenny pieces, 9 sixpences, 3 shillings, and 2 sovereigns: how much had he in all?

69. I have 6s. left after paying £16 10s. for a horse, 58s. for a cart, 2 guineas for harness, and £1 15s. for hay: what sum had I at first?

70. What did my Christmas pudding cost, if I gave 4½d. for flour, 17½d. for plums, 9½d. for suet, 8¾d. for eggs, and 7d. for currants?

Section XXII.
COMPOUND SUBTRACTION.

From £26 13s. 7½d. take £19 12s. 11¾d.

The less amount is placed under the greater, pounds under pounds, shillings under shillings, &c. Then beginning with the farthings, take ¾ from ½: as this cannot be done, add 1d. or 4 farthings, to the ½ = 6 farthings; then, as 6 − 3 = 3, place ¾ in the farthings' column. Now, since 4 farthings were added to the top, add 4 farthings or 1d. to the bottom. 11 + 1 = 12; 7 − 12 you cannot; add 12 pence to 7d. = 19d. 19 − 12 = 7. Set down 7d. Next, since 12d. were added to the minuend, add 12d. or 1s. to the subtrahend. 12 + 1 = 13; 13s. − 13s. = 0. Set down 0 in shillings place. £26 − £19 = £7. Ans. £7 0s. 7¾d.

£26	13	7½
£19	12	11¾
£7	0	7¾

Proof:—As in Simple Subtraction, add the answer to the subtrahend and the sum should equal the minuend.

Rule: (*a*) Place the less under the greater, and take the under number from the upper.

(*b*) When the under number is greater then the upper, add to the upper *one* of the next minuend, taking care to add *one* to the next subtrahend as an equivalent.

1			2			3			4		
4	7	10½	13	17	2½	10	1	6	15	7	2¾
1	11	8½	5	4	3½	3	8	4½	4	19	1

5			6			7			8		
17	18	5¾	70	13	2	52	9	1¼	61	8	7
9	6	11½	13	6	5¾	38	18	7½	49	16	3¾

9			10			11			12		
100	0	6¼	49	18	1	365	2	4½	445	1	2½
81	2	11	23	15	2½	96	14	5½	209	2	9

13. £321 7 6¼ − 19 15 4½
14. £902 9 3 − 10 11 7¾
37. 5008 14 3¼ − 912 13 10
38. 4679 5 8 − 1440 12 11¾

15. £634 0 8 − 57 18 $2\frac{1}{4}$ 39. 7001 18 $7\frac{1}{4}$ − 9 9 $9\frac{1}{2}$
16. £470 12 $3\frac{1}{2}$ − 144 3 9 40. 3652 4 $3\frac{1}{2}$ − 140 12 $1\frac{1}{2}$
17. £231 4 $1\frac{1}{4}$ − 201 17 2 41. 94673 0 $0\frac{1}{4}$ − 181 7 $4\frac{3}{4}$
18. £845 8 4 − 13 2 $5\frac{1}{4}$ 42. 13759 4 $2\frac{1}{2}$ − 8000 15 $0\frac{1}{2}$
19. £139 10 $10\frac{1}{2}$ − 5 16 $6\frac{3}{4}$ 43. 76804 0 $1\frac{1}{4}$ − 171 16 3
20. £700 5 $8\frac{3}{4}$ − 89 2 $11\frac{1}{4}$ 44. 44763 19 $8\frac{1}{4}$ − 51 0 $9\frac{1}{2}$
21. £5842 13 1 − 15 19 $0\frac{1}{2}$ 45. 10043 2 $7\frac{1}{2}$ − 9999 19 $9\frac{3}{4}$
22. £1000 0 $5\frac{1}{2}$ − 777 18 $1\frac{3}{4}$ 46. 46012 13 $4\frac{1}{4}$ − 806 5 $8\frac{1}{4}$
23. £9871 14 $3\frac{1}{4}$ − 468 19 $2\frac{1}{4}$ 47. 25410 1 $7\frac{1}{2}$ − 1144 18 $1\frac{3}{4}$
24. £5740 3 $7\frac{1}{2}$ − 1389 4 $8\frac{1}{2}$ 48. 39000 0 $3\frac{1}{4}$ − 8761 12 $0\frac{1}{2}$
25. £9463 18 $1\frac{1}{4}$ − 989 3 11 49. 11111 10 11 − 3570 7 $8\frac{3}{4}$
26. £5102 2 $6\frac{1}{2}$ − 1662 18 $4\frac{3}{4}$ 50. 24850 15 $3\frac{1}{2}$ − 10008 0 $9\frac{1}{2}$
27. £8000 14 $10\frac{1}{4}$ − 31 13 $10\frac{1}{2}$ 51. 70014 9 $7\frac{1}{2}$ − 1394 11 6
28. £7325 10 1 − 19 11 $0\frac{1}{4}$ 52. 242730 0 $6\frac{1}{4}$ − 140 8 $2\frac{1}{2}$
29. £7729 19 $6\frac{1}{4}$ − 301 8 7 53. 110672 12 $1\frac{1}{4}$ − 9889 2 11
30. £1648 1 $0\frac{1}{2}$ − 19 2 6 54. 330091 10 $5\frac{1}{2}$ − 448 0 8
31. £3579 2 $4\frac{1}{4}$ − 1703 9 $3\frac{1}{4}$ 55. 556236 2 $4\frac{1}{4}$ − 1961 13 $2\frac{3}{4}$
32. £1906 13 $8\frac{1}{2}$ − 14 12 $10\frac{3}{4}$ 56. 900001 18 $11\frac{3}{4}$ − 147 9 $10\frac{1}{2}$
33. £4000 1 10 − 207 18 $3\frac{1}{4}$ 57. 370012 14 2 − 368 18 $1\frac{1}{2}$
34. £4371 18 $8\frac{1}{2}$ − 9 18 $8\frac{3}{4}$ 58. 583170 2 $1\frac{3}{4}$ − 71380 1 $4\frac{1}{2}$
35. £1010 10 10 − 51 15 $5\frac{1}{4}$ 59. 350012 16 10 − 40 11 $6\frac{1}{4}$
36. £2709 3 $2\frac{1}{4}$ − 14 10 $2\frac{1}{2}$ 60. 200190 1 3 − 800 19 $2\frac{1}{2}$

61. A farmer sold a horse for 20 guineas, and bought a cow for £11 10*s.*: what money did he take home?

62. My income is £200 a year; I spend £175 18*s.* $6\frac{1}{2}$*d.*: what do I save?

63. Subtract £95 11*s.* $3\frac{1}{2}$*d.* four times from £500.

64. A bankrupt has £8020 15*s.* $4\frac{1}{2}$*d.* to pay debts amounting to £10050: what does he owe?

65. I bought some cloth for £60, and sold it for £67 14*s.* $9\frac{1}{2}$*d.*: what did I gain?

66. A tradesman allowed me a discount of 14*s.* 6*d.* on a bill of £31 17*s.* 0*d.*: how much did I pay?

67. What would remain of a £10 note, after paying a bill of £8 6*s*. 5½*d*.?

68. By how much does £11 2*s*. 9½*d*. exceed £2 9*s*. 11*d*.?

69. I gave away £2 0*s*. 6½*d*. out of £10: what have I left?

70. I buy a horse for thirteen guineas, and sell him for £18 5*s*.: what do I gain by the transaction?

71. Two men's wages for a month are £12 15*s*. 8*d*.; of this, one receives £5 18*s*. 0½*d*.: what does the other get?

72. Which is the greater, and by how much, £11 4*s*. 3½*d*., or the sum of £9 3*s*. 2*d*. and £2 6*s* 0½*d*.?

73. From £27 18*s*. 10½*d*. take the sum of three guineas, three crowns, and three half-crowns.

74. If I exchange a horse worth £19 15*s*. 6*d*. for one worth 50 guineas, how much money must I pay?

75. Out of a sovereign I paid for five dozen eggs at 1*d*. each; 18½*d*. for butter; 3*s*. 6*d*. for a duck; and half-a-crown for a fowl: what change did I receive?

76. My grocer's bill for a month is £13 17*s*. 4½*d*.; if I pay a £5 note, 2 sovereigns, and 3 half-sovereigns; how much shall I still owe?

77 What is the difference between £13269 4*s*. 8½*d*. and £24680 10*s*. 3*d*.?

78. I lent £1000, and have received back £249 17*s*. 6½*d*.: what is still due?

79. Subtract £44 19*s*. 11½*d*. from 100 guineas.

80. A tailor has two pieces of cloth, one is worth £10 8*s*. 6*d*., the other £20: what is the difference in their value?

Section XXIII.

COMPOUND MULTIPLICATION.

Case I.

Ex. How much money is there in 6 bags, each containing £27 13*s.* 4½*d.*?

In six bags there will be six times the quantity that each contains: we therefore multiply by 6. ½ × 6 = 3*d.*; 4*d.* × 6 = 24*d.*; 24 + 3 = 27*d.* 27 = 2*s.* 3*d.*; set down 3*d.* in the pence place, and carry the 2*s.* to the shillings. 13 × 6 = 78; 78 + 2 = 80; 80*s.* = £4. Put 0 in shillings' place, and carry £4 to the pounds. 27 × 6 = 162; 162 + 4 = 166

Ex.

£	s.	d.
27	13	4½
		6
£166	0	3

Ans. £166 0 3.

	£	s.	d.		£	s.	d.		£	s.	d.		£	s.	d.
(1)	7	9	4	(2)	3	10	8	(3)	5	4	6	(4)	6	11	8
			4				6				7				8

Case II.—(*a*) If the multiplier exceed 12, resolve it if possible into factors less than 12, and multiply by them successively. Thus, if the multiplier be 24: separate it into 6 and 4, or 12 and 2, or 3 and 8. If 56, separate it into 7 and 8.

Ex. 2. Multiply £84 7 11½ by 63.

63 = 9 × 7; therefore multiply £84 7 11½ first by 9, and the answer thus obtained by 7; the result will be 63 times £84 7 11½, or £5317 0 0¾, which is required.

£	s.	d.
84	7	11½
		9
£759	11	5½
		7
£5317	0	0¾

(5) £ s. d.	(6) £ s. d.	(7) £ s. d.	(8) £ s. d.
27 19 4 × 18	0 18 11¾ × 27	209 4 6 × 42	754 16 6 × 64
3	3	7	8
6	9	6	8

(*b*) When the multiplier cannot be resolved into factors exactly, multiply by numbers which are factors of the nearest number to that given, and add or subtract as many times the top line as will make the difference. Thus, 17 cannot be resolved into factors exactly, but 16 or 18 can: 16 = 4 × 4: therefore multiply by 4

and that result again by 4, as in Example II. But this answer is too small by once the top line; add therefore the top line to the result. If 18 times the quantity be found, the result will be too great by once the top line: therefore, in this case, subtract the top line from the result.

Ex. III. Multiply £7 16s. 4½d. by 98. This can be worked finding the result by 100 or by 96. In the first case subtract twice the top line, in the second add twice the top line.

£	s.	d.	
7	16	4½	× 2
		8	
62	11	0	
		12	
750	12	0	
15	12	9	
£766	4	9	

£7 16 4½ × 2 =

(9)			(10)			(11)			(12)		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
84	17	11½ × 59	216	11	8½ × 67	504	3	10¼ × 79	63	18	1¾ × 83

CASE III.

To multiply by any number consisting of one figure with ciphers attached, it is only necessary to multiply by as many *tens* as there are ciphers in the multiplier, and that result by the first figure,—thus,

Ex. IV. Multiply £1 7s. 6d. by 90,000. Here are four ciphers. Multiply therefore by four tens successively, and lastly by 9. The reason of this is evident from the fact that 90,000 = 10 × 10 × 10 × 10 × 9.

£	s.	d.	
1	7	6	
		10	
13	15	0	
		10	
137	10	0	
		10	
1375			
13750	0	0	
		9	
123750	0	0	

Multiply £28 6s. 3d. by 500; 8,000; 700; 1,000; 60,000; 70,000; 900; 7,000; 400; 6,000. (Questions 13 to 22).

Ex. V. Multiply £10 5s. 4d. by 8,756. Separate this number in the following manner:—8,756 = 8,000 × 700 × 50 × 6. Find by Ex. IV. the product by 8,000. This equals £10266 13s. 4d. To this add the product by 700, 50, and 6, but 700 = 7 × 10 × 10. The amount has been multiplied by 10 × 10, therefore it is necessary to multiply the third line by 7, and place the result below at *; 50 = 5 × 10, therefore it is only necessary to multiply the second line by 5, and place the result below at **. The top line is then multiplied by 6, and placed below at ***, and the sums of these products will give the product by 8,756.

£	s.	d.	
10	5	4	× 6
		10	
102	13	4	× 5
		10	
1026	13	4	× 7
		10	
10266	13	4	
		8	
82133	6	8	
7186	13	4*	
513	6	8**	
61	12	0***	
89894	18	8	

Multiply £7. 16s. 4½d. by each of the following numbers:—7004; 609; 8704; 6474; 8070; 6004; 9908; 37110; 11001; 111001. (Questions 23 to 32).

Section XXIV.

Find the product of the following:—

1			2			3			4		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
2	3	4¼	5	10	8½	10	12	8¾	15	14	6½

5			6			7			8		
19	12	3¾	12	19	10¼	16	18	3¾	17	15	9½
		6			7			8			9

9			10			11			12		
28	11	11¾	64	12	2¼	84	15	4¾	99	19	9¼
		10			11			12			12

(13—16)	64	17	3¾	×	15, 16, 18, 20
(17—20)	148	12	8¼	×	22, 24, 25, 28
(21—24)	99	19	11½	×	30, 32, 33, 35
(25—28)	190	13	6¼	×	36, 40, 42, 44
(29—32)	278	10	10	×	49, 50, 54, 55
(33—36)	473	5	4½	×	56, 63, 64, 65

(37—40)	679	15	8	×	72, 77, 80, 84
(41—44)	980	19	$4\frac{1}{4}$	×	96, 100, 108, 120
(45—47)	465	14	7	×	121, 132, 144
(48—51)	716	19	$5\frac{3}{4}$	×	17, 19, 23, 26
(52—55)	300	10	$4\frac{1}{2}$	×	29, 31, 34, 37
(56—59)	505	0	$6\frac{1}{4}$	×	39, 41, 43, 46
(60—63)	100	12	$0\frac{1}{2}$	×	47, 51, 52, 54
(64—67)	209	11	$1\frac{1}{4}$	×	57, 59, 62, 67
(68—71)	180	15	$2\frac{1}{2}$	×	68, 69, 73, 74
(72—75)	619	7	$3\frac{3}{4}$	×	76, 78, 82, 86
(76—79)	158	13	$10\frac{1}{4}$	×	89, 91, 92, 93
(80—83)	980	0	$0\frac{1}{2}$	×	94, 95, 97, 98
(84—86)	65	17	$8\frac{1}{2}$	×	101, 109, 115
(87—89)	132	4	$10\frac{1}{4}$	×	119, 164, 180
(90—92)	19	11	3	×	191, 215, 306
(93—95)	642	13	$8\frac{3}{4}$	×	412, 501, 617
(96—98)	700	16	$6\frac{1}{2}$	×	983, 405, 327
(99—101)	210	11	$11\frac{1}{4}$	×	742, 615, 310
(102—104)	48	11	$6\frac{1}{2}$	×	999, 415, 181
(105—107)	213	1	$1\frac{1}{4}$	×	320, 591, 708
(108—110)	661	15	$4\frac{3}{4}$	×	660, 741, 384
(111—113)	583	17	$2\frac{1}{2}$	×	217, 510, 111
(114—116)	215	7	$7\frac{1}{4}$	×	1000, 1111, 1260
(117—119)	98	19	$2\frac{1}{2}$	×	2110, 3515, 1491
(120—122)	130	0	$11\frac{1}{4}$	×	7212, 9990, 3111
(123—125)	508	10	$10\frac{1}{2}$	×	6004, 1285, 1370
(126—128)	709	16	$3\frac{1}{4}$	×	2001, 3100, 5215
(129—131)	284	1	$1\frac{1}{2}$	×	7080, 1800, 7401
(132—134)	77	19	$11\frac{3}{4}$	×	2016, 5091, 1740
(135—137)	240	10	2	×	1606, 3720, 1999
(138—140)	660	16	$8\frac{1}{4}$	×	5550, 7321, 1580
(141—143)	128	3	$3\frac{1}{4}$	×	6018, 4110, 9000
(144—146)	1000	12	$2\frac{1}{2}$	×	8888, 2317, 5211

Section XXV.

COMPOUND DIVISION.

Ex. I.—Divide £27 13 8½ by 6.

The divisor in this case (when the divisor is below 12) is placed to the left of the dividend, with a line between. 6 is contained in £27 four times, and £3 over: bring £3 to shillings, and add 13*s.* = 73; 6 in 73 = 12 + 1: place 12 shillings in shillings' place, and bring 1 *sh.* to pence; 1 shilling = 12 pence. 12 + 8 = 20; 20 ÷ 6 = 3 + 2: put 3 in pence place. Bring the remaining 2 to farthings, 2*d.* = 8*f.*: 8 + 1 = 9; 9 ÷ 6 = 1 + 3. Ans. £4 12 3½.

```
6)27  13  8½
   4  12  3½ + 3
             6
  £27  13  8½ proof
```

The proof is the same as in Simple Division: multiply the answer by the divisor, and the result should give the dividend.

Ex. II.—Divide £149 17 10½ by 14.

Here, as in Simple Division, we find the factors of the divisor, and proceed as in the former exercise.

Thus, the factors of 14 are 2 and 7. Then £149 17 10½ ÷ 2 gives £74 18 11½, which divided by 7 gives £10 14 1½, or the fourteenth part of £149 17 10½

```
2)149  17  10½
7)74   18  11½
 £10   14   1½ and 3 over
```

Ex. III.—Divide £127 7 11 by 76.

In this case (where the divisor exceeds 12, and cannot be separated into factors,) the process is much the same as in Simple Long Division. First divide the pounds: this gives 1, with a remainder of £51: £51 is brought to shillings, and the 7*s.* added, making 1027 *sh.* This is divided by 76, giving 13 *sh.* and 39 sh. remaining. 39 sh. + 11 pence = 479 pence. 479 ÷ 76 = 6*d.* with a remainder of 23 pence: 23*d.* = 92 farthings. 92 ÷ 76 = 1 farthing + 16. Ans. £1 13 6¼ + 16 farthings.

Proof.—Multiply the answer by the divisor, adding the remainder; the result should give the dividend.

```
76)127  7  11(1
    76
    51
    20
76)1027(13
    76
    267
    228
    ·39
     12
76)479(6
   456
   ·23
     4
76)92(1
   76
   16
```

1	2	3	4
2)10 5 6½	3)25 8 4½	4)16 9 2½	5)81 10 6¾

5	6	7	8
6)44 11 5½	7)95 19 3½	8)121 16 7½	9)138 12 5¼

9	10	11	12
10)216 15 3¼	11)647 19 2¾	12)853 14 9¼	12)590 19 9½

(13—16)	£349 17 8½	+ 14, 16, 18, 20.
(17—20)	£975 16 2¼	+ 21, 22, 24, 25.
(21—24)	£1100 1 8¾	+ 27, 28, 30, 32.
(25—28)	£6191 12 1	+ 33, 35, 36, 40.
(29—32)	£719 13 7¼	+ 42, 44, 45, 48.
(33—36)	£1790 10 10½	+ 50, 54, 56, 63.
(37—40)	£3705 18 2¾	+ 64, 70, 72, 77.
(41—44)	£29150 11 11	+ 84, 90, 96, 99.
(45—48)	£52100 17 6¼	+ 100, 108, 120, 21.
(49—51)	£88664 5 2	+ 132, 144, 96.
(52—55)	£401 17 3¼	+ 23, 26, 29, 31.
(56—59)	£839 14 2¾	+ 37, 39, 41, 43.
(60—63)	£726 7 11	+ 46, 47, 49, 51.
(64—67)	£319 12 6½	+ 52, 53, 57, 59.
(68—71)	£842 16 10	+ 61, 62, 65, 67.
(72—75)	£791 1 5¼	+ 69, 71, 73, 74.
(76—79)	£98 2 10½	+ 76, 78, 79, 82.
(80—83)	£140 2 1	+ 83, 85, 86, 87.
(84—87)	£52 10 0	+ 89, 91, 92, 93.
(88—91)	£563 17 4¼	+ 94, 95, 97, 98.
(92—94)	£274 12 10½	+ 101, 109, 115.
(95—97)	£300 1 6	+ 124, 240, 365.
(98—100)	£768 7 7¼	+ 824, 317, 500.
(101—103)	£999 10 10¾	+ 781, 900, 387.
(104—106)	£24680 19 2½	+ 946, 872, 490.
(107—109)	£70908 16 6¼	+ 2190, 709, 1768.
(110—112)	£20846 1 0½	+ 784, 6047, 319.
(113—115)	£81700 19 10	+ 5168, 4217, 608.
(116—118)	£4170 12 5½	+ 7192, 3846, 290.
(119—121)	£48461 16 7¾	+ 1985, 2370, 439.

MISCELLANEOUS QUESTIONS.

1. In 1851, the population of England and Wales was 17,905,831; Scotland 2,870,784: what was the total population of Great Britain?

2. Henry VII. began to reign in 1485; Elizabeth died 1603: how long did this (Tudor) line of monarchs exist?

3. How old is a man in 1864 who was born in 1779?

4. In 1860, 15,968 tons of copper were produced; in 1861, 15,331 tons; in 1862, 14,843 tons: what was the difference between that of 1860 and 1861: 1861 and 1862: and 1860 and 1862?

5. In the same years the quantity of pig iron produced was 3,826,752 tons, 3,712,390 tons, and 3,943,469 tons respectively: find the same as before.

6. The quantity of coals produced in 1861 amounted to 83,635,214 tons; in 1862 to 81,638,338; what was the decrease?

7. The population of Great Britain in 1841, was 18,655,981: and in 1851, 20,919,531: what was the increase in ten years?

8. The population of London in 1841 was 1,948,369; in 1851, 2,363,141: what was the increase?

9. The population of Ireland in 1841, was 8,175,124; in 1851, 6,515,794: what was the decrease?

10. Required the sum and difference of 1,084,756 and 390,475.

11. The excise duty on railways in 1851, was £287,331; on stage carriages £217,052: give their sum and difference.

12. In 1850, 1,098,863 persons visited the British Museum; in 1851, there were 2,524,754 visitors: give the sum and difference.

13. The population of Great Britain in 1740, was 7,064,850; in 1851, 20,919,531: what was the increase?

14. The value of the exports for 1851 was £68,492,659; 1850, £65,736,447: what was the increase?

15. In the same years the number of eggs imported were, 115,526,236, and 105,689,060: what was the difference?

16. In a suburb of London the population is 105,684; 750 remove to the sea-side, 8,975 emigrate, 3,906 are born, 2,904 die, and 1,005 remove to the town: what is then its population?

17. A owes me £64 18s., B £127 16s. 3d., C £944 8s., D £17 9s. 7½d., E £12 2s. 10d.: how much is due to me?

18. A grocer has four casks of sugar which cost him £21 10s., £18 5s., £17 15s., and £24 8s.; he gained £10 15s. on the whole: for how much were they sold?

ROMAN NUMERALS

I	or	1	XVII	or	17	LX	or	60
II	„	2	XVIII	„	18	LXX	„	70
III	„	3	XIX	„	19	LXXX	„	80
IV	„	4	XX	„	20	XC	„	90
V	„	5	XXI	„	21	C	„	100
VI	„	6	XXII	„	22	CI, &c.	„	101
VII	„	7	XXIII	„	23	CC, &c.	„	200
VIII	„	8	XXIV	„	24	CCCC or CD	„	400
IX	„	9	XXV	„	25	I$\overline{\text{O}}$ or D	„	500
X	„	10	XXVI	„	26	I$\overline{\text{O}}$C or DC, &c.	„	600
XI	„	11	XXVII	„	27	I$\overline{\text{O}}$CCCC, DCCCC, or CM		900
XII	„	12	XXVIII	„	28	CI$\overline{\text{O}}$ or M	„	1000
XIII	„	13	XXIX	„	29	CI$\overline{\text{O}}$C or MC, &c.	„	1100
XIV	„	14	XXX	„	30	MM or II, &c.	„	2000
XV	„	15	XL	„	40	I$\overline{\text{OO}}$ or V, &c.	„	5000
XVI	„	16	L	„	50	I$\overline{\text{OOO}}$ or L, &c.	„	50,000

MDCCLXI = 1761. 1864 = MDCCCLXIV.

Express in ordinary figures VIII, XIX, XXV, L, LXXI

„ „ „ CLX, CCXV, CCVII, CCCLIX

„ „ „ MCLXV, DCCCXVII, DLVIII

Express in Roman Numerals 8, 10, 19, 26, 39, 48, 90

„ „ „ 208, 384, 219, 725, 483, 740

„ „ „ 1200, 1081, 1820, 1649, 1864

THE

STANDARD MANUAL

OF

ARITHMETIC,

(THEORETICAL AND PRACTICAL).

PART V.

(Corresponding to Standard V.)

XXVI.

REDUCTION OF MONEY.

☞ When you have to reduce from a *higher* to a *lower* name, you must *multiply*.

Ex. I.—How many shillings are there in £27 10s.?

In £1 there are 20 shillings, in £27 there are therefore 27 × 20s., and in £27 10s. 27 × 20 + 10 or 550 shillings.

£27 10s.
20
550 ans.

Rule. Multiply the pounds by the number of shillings contained in one, and add the odd shillings.

Reduce the following to shillings:—

(1) £25 10s. 0d. (2) £29 13s. 0d. (3) £15 14s. 0d. (4) £28 13 0d. (5) £58 19s. 0d. (6) £86 17s. 0d. (7) £905 17s. (8) £64 11s. 0d. (9) £519 12s. 0d. (10) 984 17s. 0d. (11) 815 guineas (12) 271 guineas (13) 81 guineas 15 shillings (14) 515 guineas 7 shillings (15) 96 crowns (16) 715 crowns (17) 908 crowns (18) 504 sovs. 4 shillings (19) 115 half-sovereigns (20) 907 h. sovs. 4 crowns.

Ex. II.—How many pence are there in 15 sh. 7d.

In 1 sh. there are 12d. In 15 sh. there are therefore 15 × 12d.; and in 15s. 7d., 15 × 12 + 7 = 187d.

15s. 7d.
12
187 ans.

Find the number of pence in the following:—

(21) 17s. 5d. (22) 19s. 4d. (23) 12s. 11d. (24) 17s. 2d. (25) 120s. 9d. (26) 754s. 5d. (27) 27 florins 7d. (28) 56fl. 4d. (29) 86 groats 7d. (30) 97s. 10d.

Ex. III.—How many farthings are there in 11¼d.

In 1d. there are 4 farthings: 11d. × 4=44 f.: add 3 f. = 47 f.

11¼
4
47 ans.

How many farthings are there in the following?

(31) 7¼d. (32) 9¼d. (33) 11¼d. (34) 17¼d. (35) 190¼d. (36) 216¼d. (37) 171¼d. (38) 984 half-pence (39) 96 h. pence

Ex. IV.—How many farthings are there in £16 17 5½?

First find by Ex. I. the number of shillings in £16 17: 16 × 20 + 17 = 337: next, by Ex. II. find the number of pence in 337 sh. 5d.: 337 × 12 + 5 = 4049: next, by Ex. III. find the number of farthings in 4049½d.: 4049 × 4 + 2 = 16198 ans.

16 17 5½
20
337
12
4049
4
16198 ans.

Find the number of farthings in the following :—

(40)	£19 7 11	(41)	£27 13 11½	(42)	£54 17 0
(43)	£96 0 0	(44)	£34 17 5½	(45)	£54 15 5¾
(46)	26 *sh.* 11¾*d.*	(47)	£19 0 11¼	(48)	£54 0 0¾

☞ When you have to reduce from a *lower* to a *higher* name, you must *divide*.

Ex. V.—How many pounds sterling are there in 550 *sh.*?

For every 20 *sh.* there will be £1: therefore the number of pounds in 550 shillings = 550 + 20 = £27 10.

20)550
£27 10 0

Bring the following to £s.

(49) 39 *sh* (50) 847 *sh* (51) 965 *sh* (52) 784 *sh* (53) 964 *sh* (54) 846 *sh*

To guineas.

(55) 9645 *sh.* (56) 8476 *sh.* (57) 5964 *sh.* (58) 210 *sh.* (59) 96 *sh.*

Ex. VI.—How many shillings are there in 187 pence?

For every 12*d.* there will be 1 *sh.*; therefore the number of shillings in 187*d.* = 187 + 12 = 15*s.* 7*d.*

12)187
15—7

How many shillings in the following?

(60) 984*d.* (61) 964*d.* (62) 8504*d.* (63) 77564*d.* (64) 9987*d.*
(65) 20*d.* (66) 519*d.* (67) 7746*d.* (68) 50007*d.* (69) 99047*d*

Ex. VII.—How many pence in 874 farthings?

For every 4 farthings there will be 1*d.*; therefore the number of pence = 874 + 4 = 218½*d.*

4)874
218½

(70) 8464 *f.* (71) 906 *f.* (72) 5064 *f.* (73) 307 *f.* (74) 9696 *f.*
(75) 5964 *h.pence* (76) 8406 *h.p.* (77) 9049 *h.p.* (78) 840 *h.p.*
(79) 2210 *f.*

Ex. VIII.—How many £s, &c., are there in 16198 farthings?

Find by Ex. 7 the number of pence in 16198 farthings: 16198 ÷ 4 = 4049¼: next by Ex. 6, find the number of shillings there are in 4049 pence. 4049 ÷ 12 = 337—5: next by Ex. 5, find the number of £s in 337 sh.: 337 ÷ 20 = £16 17. Ans. £16 17 5¼.

4)16198
12)4049¼
2,0)33,7--5¼
£16 17 5¼

How many £s, &c., are there in the following?

9764 *f.*	78004 *d.*	2775 *sh.*	94008 *f.*	80475 *f.*
7564 *f.*	9004 *sh.*	8475 *d.*	98640 *f.*	77540 *f.*

In all these examples, the same amount has been expressed in a different name or *denomination*.

The method by which the name or names of any single or compound quantity are changed into other denominations, is called *Reduction*.

☞ (*a*)—Observe if the quantity should be multiplied or divided.

If the denomination is to be changed into one of *lower* value, there will be a *greater* number of units of the new denomination, and therefore the Reduction must be by Multiplication.

If the denomination is to be changed into one of *higher* value, there will be a *less* number of units, and therefore the Reduction must be by Division.

(*b*)—Reduce the quantity to the denomination next in order to that given, and then to the next in order, and so on until the required denomination is found.

Reduce the following:—

1	7546 sh.	to £s.	31	£847 17 11¼	to farthings.
2	9074 „	„ „	32	£54 15 4	„ „
3	8475 „	„ „	33	£906 0 0	„ „
4	8475 d.	„ „	34	8464 farthings	„ £s.
5	9046 „	„ „	35	6754 pence	„ „
6	8475 „	„ „	36	8976 sh.	„ „
7	9047 f.	„ „	37	9047 sixpences	„ „
8	8475 „	„ „	38	9047 h. crowns	„ „
9	99847 „	„ „	39	8047 farthings	to shillings.
10	7846 „	„ „	40	9046 „	„ „
11	5476 crowns	„ „	41	8047 „	„ „
12	8475 h. crs.	„ „	42	9964 „	„ „
13	8475 florins	„ „	43	3475 d.	„ „

14	9904	sixpences	to	pence	44	£96	4	2	to	pence.
15	8496	f.	„	„	45	£84	7	5¼	„	farthings.
16	£75	15	0	„ shillings	46	£6	7	11	„	groats.
17	£908	17	6	„ pence	47	£9	16	0	„	florins.
18	£847	9	5¼	„ farthings	48	£7	3	6	„	½ farthings.
19	£27	19	11½	„ h. pence	49	£13	7	6	to	three-pennies.
20	£946	7	9¼	„ farthings	50	£84	6	9	„	„ „
21	£26	15	0	„ crowns	51	£66	7	0	„	four-pennies
22	£119	17	6	„ h. crowns	52	£94	7	6	„	six-pences.
23	£54	7	6	„ „	53	£55	10	0	„	half-sovs.
24	£94	12	6	„ „	54	£96	7	5	„	„ „
25	£704	16	4	„ pence	55	£54	7	10	„	„ „
26	£849	7	8	„ „	56	£16	17	6	„	h.crns.
27	£96	19	11	„ „	57	£49	15	4	„	farthings.
28	£84	7	0	„ „	58	9464	pence		„	£s.
29	£807	15	11	„ „	59	9469	„		„	shillings.
30	£904	13	4	„ „	60	8475	h.crns.		„	pence.

☞ When one denomination does not contain the other exactly:—

RULE:—Bring the first denomination to another which is exactly contained in the second, and proceed as before.

EX.—How many pounds sterling are there in 546 guineas?

Pounds are not contained in guineas exactly, therefore, the guineas are reduced to shillings, and the shillings reduced, as before, to pounds.

546
21
546
1092
2,0 | 1146,6
£573—6—0

Reduce the following:—

1. 9754 guineas to £s.
2. 4645 „ „
3. £7819 16s. 7d. to guineas.
4. £546 7s. 0d. „ „
5. £9647 13s. 0d. „ „
6. £7460 12s. 6d. „ „
7. 9475 guineas to £s.
8. 8697 „ „
9. 546 „ „
10. 8475 „ „

SECTION XXVII.

AVOIRDUPOIS WEIGHT.

16 drams = 1 oz.
16 „ = 1 lb.
224 „ = 14 „ = 1 stone.
448 „ = 28 „ = 2 „ = 1 qr.
112 „ = 8 „ = 4 „ = 1 cwt.
2240 „ = 160 „ = 80 „ = 20 „ = 1 ton

REDUCTION.

How many lbs. are there in 5 cwt. 3 qrs. 14 lbs.?

In 1 cwt. there are 4 qrs.: in 5 cwt. 3 qrs. there are therefore 5 × 4 + 3 or 23 qrs. In 1 qr. there are 28 lbs.: in 23 qrs. there are therefore 23 × 28, and in 23 qrs. 14 lbs. there are 23 × 28 + 14 lbs., or 658 lbs.

cwt.	qrs.	lbs.
5	3	14
4		
23		
28		
184		
46		
658		

Reduce 658 lbs. to cwts., &c.

In 1 qr. there are 28 lbs.: in 658 lbs. therefore there are 658 ÷ 28, or 23 qrs. + 14 lbs. In 1 cwt. there are 4 qrs.: in 23 qrs. therefore there are 5 cwt. + 3 qrs.; and in 658 lbs. there are 5 cwt. 3 qrs. 14 lbs.
Ans. 5 cwt. 3 qrs. 14 lbs.

28)658(23 qrs.
56
98
84
14 lbs.

4)23
5 + 3 qrs

(1) How many ozs. in 3 qrs. 14 lbs.?
(2) „ „ „ „ 5 lbs. 16 ozs.?
(3) „ „ qrs. „ 4 cwt. 2 qrs.?
(4) „ „ ozs. „ 27 lbs. 16 ozs.?
(5) „ „ lbs. „ 8465 drams.?
(6) „ „ „ „ 9 tons 7 cwt.?
(7) Reduce 7 cwt. 14 lbs. to ozs.?
(8) „ 9 cwt. 3 qrs. 2 lbs. to lbs.?
(9) „ 5 tons 6 cwt. to qrs.?
(10) „ 8 cwt. 3 qrs. to lbs.?
(11) „ 54906 qrs. to tons.?
(12) „ 89754 lbs. to cwts.?

(13—16) Reduce to ozs.:—5 cwt. 3 qrs.; 14 lbs. 7 ozs.; 5 st. 7 lbs. 13 ozs.: 3 qrs. 4 lbs.

(17—20) „ 7546 dms.; 23 lbs. 14 ozs.; 17546 dms.; 5 tons 3 cwt. 14 ozs.

(21—24) „ to lbs.:—84 cwt. 5 qrs.; 5465 dms.; 8475 ozs.; 5 tons 6 cwt. 3 qrs.

(25—28) „ to stones:—5 tons 6 cwt.; 8475 lbs.; 6947 ozs.; 8 cwt. 4 qrs.

(29—32) „ qrs.:—15 cwt. 3 qrs.; 78469 ozs.; 8465 lbs.; 2 ton 15 cwt. 3 qrs.

(33—36) „ cwt.:—16 tons 7 cwt; 5469 lbs.; 75463 ozs.; 84756 dms.

(37—40) „ tons:—5464 cwt.; 5483 lbs.; 89334 ozs.; 34754 dms.

ADDITION.

Add together:—5 cwt. 3 qrs. 14 lbs.; 3 cwt. 2 qrs. 17 lbs.; 24 cwt. 1 qr. 13 lbs.

As in addition of money, first add the quantities of lowest value, 14 lbs. + 17 lbs. + 13 lbs. = 44 lbs.: bring the 44 lbs. to the next highest value, viz. qrs. 44 lbs. = 1 qr. 16 lbs.: set down 16 lbs. under the lbs. and carry 1 qr. to qrs. 1 + 1 + 2 + 3 = 7 qrs. = 1 cwt. 3 qrs. Set down 3 qrs. and carry 1 cwt. to the cwt. column. 1 + 24 + 3 + 5 = 33 cwt. = 1 ton 13 cwt. Ans. 1 ton 13 cwt. 3 qrs. 16lbs

cwt.	qrs.	lbs.
5	3	14
3	2	17
24	1	13
1	13	

Add together:—

41. 5 cwt. 2 qrs. 11 lbs.; 8 cwt. 3 qrs. 13 lbs.; 12 cwt. 2 qrs. 4 lbs 8 cwt. 4 qrs.

42. 5 tons. 3 cwt. 2 qrs.; 4 tons 15 cwt. 17 lbs.; 14 tons 5 cwt.; 4 tons 3 qrs. 21 lbs.

43. 3 qrs. 17 lbs.; 15 lbs. 10 ozs.; 2 qrs. 13 lbs. 7 ozs.; 5 lbs. 13 ozs.

44. 3 lbs. 14 ozs.; 15 lbs. 7 ozs. 4 dms.; 5 lbs. 13 ozs. 14 dms.; 17 lbs. 3 ozs. 14 dms.

45. 5 tons; 4 tons 3 cwt. 2 qrs.; 13 cwt. 3 qrs. 15 lbs.; 14 cwt. 27 lbs.

46. 274 tons + 115 cwt. + 46 qrs. + 24 lbs.

47. 64 cwt. + 115 qrs. + 241 lbs. + 864 ozs.

48. 116 cwt. + 114 qrs. + 27 lbs. + 89 ozs.

49. 217 stone + 516 lbs. + 849 oz. + 641 dms.

50. 610 qrs. + 514 stone + 96 lbs. + 215 dms.

SUBTRACTION.

51. From 15 tons 3 cwt. 2 qrs. take 13 tons 11 cwt. 1 qr.
52. „ 13 cwt. 3 qrs. 14 lbs. „ 11 cwt. 2 qrs. 27 lbs.
53. „ 3 qrs. 17 lbs. 14 ozs. „ 1 qr. 24 lbs. 15 ozs.
54. „ 2 qrs. 13 lbs. 11 ozs. „ 26 lbs. 7 ozs. 15 dms.
55. „ 4 cwt. 15 lbs. 12 ozs. „ 3 qrs. 27 lbs. 15 ozs.
56. 1464 lbs. — 615 oz. 61. 217 lbs. — 84 ozs. — 610 dms.
57. 2176 ozs. — 217 lbs. 62. 8 cwt. 3 qrs. 4 lbs. — 5416 dms.
58. 87 lbs. — 2164 dms. 63. 4 tons. 7 cwt. 3 qrs. — 2846 lbs.
59. 47 tons — 216 ozs. + 847 lbs. 64. 16 cwt. 2 qrs. 27 lbs. — 8921 ozs.
60. 817lbs. — 2164ozs. + 84dms. 65. 26 cwt. 1 qr. — 8475 ozs.

MULTIPLICATION.

(66—75) Multiply 15 cwt. 3 qrs. 4 lbs by 5, 7, 4, 6, 12, 3, 8, 9, 10, 11.
(76—85) „ 5 tons 7 cwt. 3 qrs. by 14, 27, 36, 24, 42, 84, 60, 72, 16, 80.
(86—95) „ 7 lbs. 3 ozs. 14 dwts. by 13, 17, 29, 37, 53, 47, 69, 73, 87, 93.

DIVISION.

(96—105) Divide 201 cwt. 2 qrs. 17 lbs. by 11, 9, 3, 2, 5, 6, 8, 12,
(106—115) „ 27 tons 15 cwt 2 qrs. by 16, 18, 24, 28, 30, 33. 36, 45, 66, 72.
(116—125) „ 504 cwt. 3 qrs. 17 lbs. by 26, 17, 37, 43, 59, 97, 79, 13, 19, 23.

Section XXVIII.

TROY WEIGHT.

24 grains = 1 dwt.
420 „ = 20 „ = 1 oz.
5760 „ = 240 „ = 12 „ = 1 lb.

REDUCTION.

(1) Reduce 8475 grs. to dwts. (2) Reduce 754 dwts. 23 grs. to grs.
(3) „ 3264 dwts. to ozs. (4) „ 64 ozs. 19 dwts. to dwts.
(5) „ 7721 ozs. to lbs. (6) „ 36 lbs. 11 ozs. to ozs.
(7) „ 4641 dwts. to lbs. (8) „ 467 lbs. 3 ozs. to dwts.
(9) „ 55464 grs. to ozs. (10) „ 36 oz. 4 dwts. 21 grs. to grs.

(11) Reduce 70460 grs. to lbs. (12) Reduce 5 lbs. 3 ozs. 16 dwts. 17 grs. to grs.

(13—16) Reduce to grs. 12 lbs. 2 dwts.; 14 ozs. 20 grs.; 15 lbs. 7 ozs. 205 lbs.

(17—20) „ to dwts. 4 lbs. 3 ozs.; 207 lbs.; 84604 grs.; 5 lbs. 7 ozs. 16 dwts.

(21—24) „ to ozs. 116 lbs 13 ozs; 84750 grs; 2605 dwts; 18 lbs 4 ozs.

(25—28) „ to lbs. 20501 grs; 8040 dwts; 216 ozs; 25644 dwts.

ADDITION.

(29) Add together 15 lbs 11 ozs 13 dwts; 17 lbs 4 ozs; 9 ozs 7 dwts; 15 lbs 14 dwts.

(30) „ „ 16 ozs 15 dwts 14 grs; 17 dwts 21 grs; 15 ozs. 14 dwts; 21 grs.

(31) „ „ 216 grs + 117 dwts + 4050 grs + 840 ozs.

(32) „ „ 847 dwts + 1440 grs + 705 dwts + 8407 ozs.

(33) „ „ 904 dwts + 25 ozs + 8407 grs + 15 lbs.

(34) „ „ 5 lbs 4 ozs 17 dwts; 15 lbs 11 ozs; 24 lbs; 7 ozs. 15 dwts; 216 lbs.

(35) „ „ 17 lbs 5 ozs 16 dwts; 11 ozs 17 dwts; 16 lbs. 23 grs; 7 ozs 15 dwts.

SUBTRACTION.

(36) From 24 lbs 5 ozs 17 dwts take 16 lbs 14 dwts 7 grs.

(37) „ 16 ozs 7 dwts 14 grs „ 5 ozs 19 dwts 21 grs.

(38) „ 114 lbs 5 ozs 7 grs „ 84 ozs 5 dwts 27 grs.

(39) „ 8475 grs + 64 dwts „ 217 grs + 15 dwts.

(40) „ 704 lbs + 1840 dwts „ 216 ozs + 8754 grs.

MULTIPLICATION.

(41—50) Multiply 24 lbs 6 ozs 17 dwts by 2, 7, 5, 9, 6, 4, 3, 12, 10, 8

(51—60) „ 17 ozs 4 dwts 15 grs „ 20, 16, 12, 36, 28, 42, 50, 64, 72, 84

(61—70) „ 6 lbs 2 dwts 15 grs „ 37, 17, 13, 29, 43, 57, 67, 79, 83, 91

DIVISION.

(71—80) Divide 24 lbs 6 ozs 17 dwts „ 2, 7, 5, 9, 6, 4, 3, 12, 10, 8

(81—90) „ 17 ozs 4 dwts 15 grs „ 20, 16, 12, 36, 28, 42, 50, 64, 72, 84

(91—100) „ 6 lbs 2 dwts 15 grs „ 37, 17, 13, 29, 43, 57, 67, 79, 83, 91

SECTION XXIX.

MEASURE OF TIME.

60 sec. = 1 min.
3600 „ = 60 „ = 1 hr.
1440 „ = 24 „ = 1 day.
10080 „ = 168 „ = 7 „ = 1 week.
672 „ = 28 „ = 4 „ = 1 month.
8760 „ = 365 „ = $52\frac{1}{7}$ „ = $13\frac{1}{3}\frac{1}{8}$ = 1 year.

Leap year = 366 days; 100 years = 1 century.
365 d. 5 h. 48 m. 57 sec. = a solar year.

REDUCTION.

(1) Reduce 7 weeks to days.
(2) „ 36 days to hours.
(3) „ 126 hours to min.
(4) „ 45 min. to sec.
(5) „ 116 days to weeks.
(6) „ 214 hours to days.
(7) „ 2176 sec. to min.
(8) „ 8464 min. to hours.
(9) „ 8754 sec. to min.
(10) „ 715 hours to days.
(11) Reduce 84 days of 10 hrs. to hours
(12) „ 916 weeks of 6 days to days.
(13) „ 1217 hrs. to days of 8 hours.
(14) „ 2176 hrs. to days of 12 hrs.
(15) „ 846 weeks to years.
(16) „ 316 months to years.
(17) „ 216 months to years.
(18) „ 84 years to days (365).
(19) „ 216 mo. to weeks (4).
(20) „ 8416 days to years.
(21—24) to years: 647 mo.; 8964 days; 86964 weeks; 86970 min.
(25—28) to mo.: 96 years; 7546 weeks; 99047 days; 775960 hrs.
(29—32) to days: 796 years; 5964 weeks; 59460 min.; 84096 hrs.
(33—36) to hrs: 9964 days; 54846 min.; 697546 sec.; 284 weeks.
(37—40) to min.: 5464 sec.; 26 weeks; 496 days; 543 hours.
(41) 75464 hours to weeks.
(42) 946 w. 6 days to hours
(43) 84 yrs. 115 d. to days
(44) 18 yrs. 17 d. 26 h. to min.
(45) 21647 min. to days
(46) 200,400,991 sec. to yrs.
(47) 4040516 hrs. to years
(48) 16 d. 15 h. 16 m. to min.
(49) 56 h. 14 min. 56 sec. to sec.
(51) 7 mo. 3 w. 4 d. 20 hrs. to hours.
(52) 19 w. 5 d. 14 h. to min.
(53) 2176405 min. to years.
(54) 7004 d. 21 h. to min.
(55) 17 w. 3 d. 10 h. to hours
(56) 56475 h. to days of 10 hours
(57) 74645 d. to years
(58) 9475640 sec. to years.
(59) 4 ma. 3 w. 2 d. 15 hrs. to sec.

(50) How many sec. in a solar year?

(60) How many min. in a century?

How many days from—

(61) March 6th to Dec. 9th?

(62) Jan. 1st to June 26th?

(63) March 11th to Nov. 1st?

(64) June 10th to Christmas-day?

(65) July 5th to Michaelmas-day?

How many days from—

(66) Jan. 19th to Lady-day (leap year)?

(67) Feb. 5th, 1860 to July 12th, 1864?

(68) Dec. 4th, 1854, to Jan. 5th, 1858?

(69) March 12th, 1860 to Midsummer-day, 1863?

(70) Jan. 1st, 1864 to Feb. 6th, 1869?

ADDITION.

(71) 16 hrs. 15 min. 12 sec. + 24 min. 18 sec. + 17 hrs. 59 min. + 16 hrs. 42 min.

(72) 8 days 16 hrs. 14 min. + 5 d. 7 hrs. 21 min. + 18 hrs. 56 min. + 24 min. 34 sec.

(73) 15 w. 4 d. 17 hrs. + 5 d. 16 hrs. + 4 w. 16 h. + 16 w. 3 d. 7 hrs.

(74) 546 w. + 2784 hrs. + 3746 min. + 27 sec. + 62 w. + 1 year.

(75) 864 sec. + 274 min. + 8946 hrs. + 15 days + 3 years.

SUBTRACTION.

(76) From 27 d. 7 hrs. 26 min. take 15 days 13 hrs. 42 min.

(77) „ 24 hrs. 17 min. 46 sec. „ 14 hrs. 58 sec.

(78) „ 11 d. 17 hrs. 42 sec. „ 3 days 14 hrs. 29 min.

(79) „ 340 d. + 17 w. + 416 m. „ 27 days + 164 min. + 276 hrs.

(80) „ 841 days + 74 min. „ 2174 hrs. + 286 min. + 64 sec.

MULTIPLICATION.

(81—90) Multiply 64 d. 13 hrs. 15 min. by 3, 8, 7, 9, 12, 11, 4, 5, 10, 6

(91—100) „ 3 yrs. 164 days 17 min. by 16, 18, 24, 36, 48, 50, 60, 96, 144, 70.

(101—110) „ 1 day 15 hrs. 14 min. 16 sec. by 57, 64, 37, 97, 53, 41, 79, 63, 111, 119.

DIVISION.

(111—120) Divide 3 days 17 hrs. 15 min. by 12, 3, 6, 9, 11, 8, 7, 10, 4, 5.

(121—130) „ 7 days 19 hrs. 14 sec. by 24, 36, 16, 28, 18, 22, 56, 66, 84, 100.

(131—140) „ 15 hrs. 14 min. 16 sec. by 75, 59, 62, 97, 53, 41, 79, 63, 111, 119.

Section XXX.

MEASURES OF CAPACITIES.

2 pints = 1 quart *(qrt.)*
4 „ = 1 gal.
8 „ = 2 „ = 1 peck
32 „ = 8 „ = 4 „ = 1 bushel
256 „ = 64 „ = 32 „ = 8 „ = 1 quarter *(qr.)*

9 gals = 1 firkin; 18 gals = 1 kilderkin; 36 gals = 1 barrel of ale 54 gals = 1 hogshead of ale; 72 gals = 1 puncheon (ale) 108 gals = butt; 216 gals = 1 tun.

10 gals = 1 anker; 31½ gals = 1 bar$_{l}$ (wine) 2 bars. (wine) = 1 hhd. 84 gals = 1 puncheon (wine); 2 hhd. = 1 pipe; 2 pipes = 1 tun(wine) 4 gills = 1 pint; 2 qrts = 1 pottle.

REDUCTION.

(1) 216 pints to qrts.
(2) 360 qrts. to gals.
(3) 84 gals. to pecks.
(4) 5 pks. 1 gals. 3 qrts. to pts.
(5) 7546 pecks to bush.
(6) 217 bus. to qrs.
(7) 3 qrs. 7 bus. to gals.
(8) 5 bus. 3 pks. 4 gals. to pts.
(9) 75464 pints to bus.
(10) 74806 gals. to qrs.
(11) 8460 gals. to firkins.
(12) 206 fir. 5 gals. to qrts.
(13) 30704 gals. to kiln.
(14) 3 kils. 1 fir. 7 gals. to h. pints.
(15) 54640 gills to gallons.
(16) 3 bars. (ale) 14 gals. 3 qts. to qts.
(17) 740604 gals. to tuns (ale).
(18) 21 butts 34 gals. to qts.
(19) 34050 gals. to pipes.
(20) 7 pipes 16 gals. to qts.

(21—25) to bus: 3074 qts; 384 gal; 4 qrs 7 bus; 7540 pks; 6040 gal.

(26—30) to gals: 7404 gills; 3045 qts; 7 qr 3 bus; 2704 pints; 2 bus 3 pks 1 gal.

(31—35) to qts: 784 pts; 3 pks 1 gal; 7 bus 3 pks; 8040 gills 2045 h. pts

(36—40) to qrs: 7040 bus; 6401 pk; 84061 qts; 304 gal: 21404 h. pints

(41—45) to gals: 8464 qts; 27 bar (ale); 307 kildn; 36 hhds. 3 tun, 3 pun, 1 bar (ale)

(46—50) Reduce to bar (ale): 4074 qts; 384 gal; 127 fir; 216 pun 13 gal; 21 kil. 1 fir. 3 gal

(51—55) „ to pipes: 7045 gal; 26 bar 3 ankers; 84696 qts; 21 tuns 54 gal; 70460 pts

(56—60) „ to gal (wine): 374 ankers; 946 bar; 3 pipes 1 hhd 1 bar; 216 pipes 84 tuns

ADDITION.

(61) Add 27 bus 3 pks 1 gal + 27 bus 2 pks 1 gal + 7 pks 1 gal 3 qts + 3 pks 2 qts

(62) „ 7 bus 3 pks 1 gal 3 qts + 2 pks 0 gal 2 qts + 3 pks 0 gal 3 qts + 1 gal 2 qts

(63) „ 27 qts 1 pt 3 gills + 18 qts 1 pt 2 gills + 1 pint 3 gills + 15 qts 3 pts

(64) „ 847 pks + 216 gal + 841 qts + 616 pints

(65) „ 748 qrs + 84 bus + 16 pk + 813 gals

(66) „ 17 ank 3 gals 1 qt + 15 ank 7 gals + 8 gals 3 qts + 14 gals 3 qts

(67) „ 16 bar 1 k 1 fir + 14 bar 1 fir + 1 fir 5 gals + 16 bar

(68) „ 84 fir + 78 gals + 116 bar + 615 butts

(69) „ 36 ank 415 gals + 564 pints + 175 punch

(70) „ 410 hhds (wine) + 74 punch + 849 pipes + 164 gals

SUBTRACTION.

(71) From 27 bus 3 pk 1 gal 3 qts take 1 bus 3 pk 0 gal 3 qts

(72) „ 15 qr 3 bus 2 pk „ 4 qr 6 bus 3 pk

(73) „ 26 tuns 141 gal. „ 7 tun 208 gal. 3 qts. (wine)

(74) „ 846 bar. + 716 kil. + 64 fir. „ 647 kil. + 316 fir. + 847 gal.

(75) „ 347 gill + 74 qts. + 847 pts. „ 86 gal. + 15 pts.

(76) „ 849 ank. + 26 bar. + 56 gal. „ 304 ank. + 16 bar. + 44 gal.

(77) „ 216 hhd. + 631 pun. + 54 butts take 21 bar. + 847 gal + 16 kildn.

(78) „ 445 tuns + 64 gal. take 54 pun. + 754 bar. (ale)

(79) „ 64 pipes + 754 pun. + 36 bar. take 604 hhd. + 271 ank. + 36 gal.

(80) „ 44 pun. 36 pipes take 84 ank. 514 gal.

MULTIPLICATION.

(81—90) 7 bus. 3 pk. 1 gal. × 8, 7, 6, 9, 11, 3, 12, 4, 5, 10.

(91—100) 16 gal. 3 qts. 2 gills × 8, 7, 6, 9, 11, 3, 12, 4, 5, 10.

(101—110) 56 hhd. 3 fir. 4 gal. × 8, 7, 9, 4, 6, 11, 10, 12, 3, 5.

(111—120) 5 hhd. 3 bar. 14 gal. (wine) × 26, 34, 75, 108, 854, 69, 75, 80, 16, 41.

DIVISION.

(121—130) 5 qrs. 3 bus. 16 qts. ÷ 9, 7, 4, 6, 2, 8, 12, 11, 10, 5.

(131—140) 7 bar. 1 kil. 1 fir. 5 gal. ÷ 27, 84, 69, 70, 51, 218, 29, 364, 75, 18.

(141—150) 13 pipes 84 gal. 2 qts. (wine) ÷ 77, 84, 912, 77, 364, 86, 71, 15, 19, 28.

SECTION XXXI.

LONG MEASURE.

12 in. = 1 foot.

36 in. = 3 „ = 1 yard.

16½ „ = 5½ „ = 1 pole.

660 „ = 220 „ = 40 „ = 1 furlong.

5280 „ = 1760 „ = 320 „ = 8 „ = 1 mile.

7$\frac{92}{99}$in. = 1 link, 100 links = 1 chain, 2½in. = 1 nail, 4 nails = 1 qr.

4 qrs. = 1 yd. 5 qrs. = 1 ell. 6 feet = 1 fathom. 3 miles = 1 league.

REDUCTION.

1. 4641 in. to feet.
2. 8464 ft. to yds.
3. 946 yds. to poles.
4. 4490 poles to furlongs.
5. 3746 fur. to miles.
6. 453 miles to leagues.
7. 7 lea. 14 fur. to furlongs.
8. 4 m. 3 furlongs to poles.
9. 17 fur. 3 poles to yds.
10. 16 poles 3 yds. to ft.
11. 7 yds. 2 ft. to in.
12. 24 ft. 7 in. to in.
13. 84647 yds. to miles.
14. 5464 in. to nails.
15. 4640 nails to qrs.
16. 764 qrs. to yds.
17. 764 qrs. to ells.
18. 9 ells 3 qrs. to in.
19. 5 yds. 3 qrs. 2 nails to in.
20. 27 ells 3 qrs. 2 nls. 2 in. to in.

(21—24) to yds: 5464 in.; 640 ft.; 15 fur. 7 po.; 3 m. 7 fur. 15 po.

(25—28) to poles: 347 yds.; 2164 ft.; 7 m. 4 fur.; 3 fur. 16 po.

(29—32) to miles: 84647 ft.; 3469 yds.; 547 poles; 84 furlongs.

(33—36) to furlongs: 3746 in.; 3769 ft.; 2174 yds.; 8464 poles.

(37—40) to inches: 546 ft.; 3774 yds.; 154 poles; 3 miles.

(41) 7546 ft. to chains. (46) 7546 fath. to miles.

(42) 89 chains to ft. (47) 3756 links to ft.
(43) 54 chains to links. (48) 4475 links to chains.
(44) 7040 links to chains. (49) 7464 chains to yds.
(45) 546 fathoms to feet. (50) 936 leagues to miles.

ADDITION.

(51) Add 3 yds. 3 ft. 9 in. + 5 ft. 7 in. + 7 yds. 2 ft. 11 in. + 1 ft. 5 in.
(52) „ 4 fur. 30 po. 4 yds. + 5 fur. 7 po. + 5 fur. 27 po. 4 yds. + 3 fur. 28 rds.
(53) „ 7 lea. 2 m. 4 fur. + 7 lea. 6 fur. + 3 fur. + 7 lea. 2 m. 4 fur.
(54) „ 775 m. + 464 fur. + 774 poles + 8694 yds.
(55) „ 846 fur. + 742 yds. + 84 in. + 774 ft.
(56) „ 45 ells 3 qrs. 7 in. + 3 yds. 4 nls. + 15 ells 3 qrs. 3 nls.
(57) „ 40 ells 2 qrs. 2 nls. + 17 ells 3 qrs. 2 in. + 7 qrs. 2 nls. 2 in. + 3 nls. 2 in.
(58) „ 17 yds. 3 qrs. 3 nls. + 1 qr. 2 nls. + 6 yds. 3 qrs. 1 nl. + 5 yds. 3 qrs. 3 nls.
(59) „ 7946 nls. + 340 in. + 54 qrs. + 7046 ells + 3650 in.
(60) „ 4454 in. + 7043 nls. + 304 qrs. + 27 yds. + 746 in.

SUBTRACTION.

(61) From 216 yds. 2 ft. 4 in. take 64 yds. 0 ft. 7 in.
(62) „ 746 m. 6 fur. 30 poles. „ 364 m. 7 fur. 27 po.
(63) „ 73 fur. 18 po. „ 54 fur. 29 po. 1 yd.
(64) „ 754 fur. + 64 po. „ 17 fur. + 84 po. + 615 yds
(65) „ 3 lea. + 17 m. + 1846 fur. „ 6 m. + 746 fur.
(66) „ 27 yds. 3 qrs. 2 nls. „ 24 yds. 2 qrs. 3 nls.
(67) „ 54 ells 2 qrs. 3 nls. „ 27 ells 4 qrs. 3 nls.
(68) „ 56 qrs. 3 nls. 2 in. „ 16 qrs. 2 nls. 2 in.
(69) „ 274 qrs. + 56 nls. + 20 in. „ 24 qrs. 29 nls. + 64 in.
(70) „ 721 nls. + 3 qrs. + 216 in. „ 15 qrs. + 216 in. + 12 nls.

MULTIPLICATION.

(71—80) Multiply 4 fur. 16 po. by 7, 10, 9, 5, 3, 4, 11, 12, 6, 8.
(81—90) „ 16 yds. 2 ft. 4 in. by 16, 36, 48, 54, 66, 64, 72, 84, 88, 96.
(91—100) „ 15 lea. 2 m. 7 fur. 36 po. by 29, 37, 39, 43, 47, 46, 34, 29, 17, 13.

(101—110) Multiply 26 qrs. 3 nls. 2 in. by 8, 6 12, 11, 4, 3, 5, 9, 10, 7.
(111—120) „ 24 ells. 2 qrs. 3 nls. by 16, 36, 44, 72, 108, 132, 160, 124, 112, 24.
(121—130) „ 3 yds. 2 qrs. 3 ells by 904, 76, 89, 316, 27, 54, 64, 177, 58, 892.

DIVISION.

(131—140) Divide 4 m. 6 fur. 30 po. by 9, 4, 6, 3, 7, 12, 11, 10, 5, 8.
(141—150) „ 27 yds. 2 qrs. 3 nls. by 96, 88, 84, 72, 64, 66, 54, 48, 36, 16.
(151—160) „ 16 fur. 13 po. 2 yds. 2 ft. by 154, 804, 76, 908, 174, 216, 112, 827, 99, 107.

Section XXXII.

SQUARE MEASURE.

144 sq. in. = 1 sq. foot.
9 „ = 1 sq. yard.
30¼ „ = 1 perch.
1210 „ = 40 „ = 1 rood.
4840 „ = 160 „ = 4 „ = 1 acre.
640 „ = 1 sq. mile.

REDUCTION.

(1) Reduce 3464 in. to ft.
(2) „ 748 ft. to yds.
(3) „ 9370 yds. to perches.
(4) „ 15per. 3yds. 19in. to in.
(5) „ 8 yds. 2 ft. 73 in. to in.
(6) „ 9984 per. to roods.
(7) „ 7406 roods to miles.
(8) „ 284 roods to acres.
(9) „ 7754 ac. to sq. miles.
(10) „ 3 ac. 2 ro. 27 per. to yds.
(11) 5 ro. 16 per. to yds.
(12) 17 per. 15 yds. to ft.
(13) 16 yds. 7 ft. 4 in. to in.
(14) 7546 in. to per.
(15) 8947 yds. to per.
(16) 4604 per. to acres.
(17) 224 r. 16 per. 17 yds. to yds.
(18) 17 ac. 3 ro. 14 per. to yds.
(19) 3 m. 76 ac. to roods.
(20) 76453 per. to acres.
(21—24) to roods: 754631 in.; 84694 ft.; 9642 yds.; 17 ac. 3 ro.
(25—28) to per.: 34751 in.; 9464 yds.; 37 ac. 15 per.; 24 ro. 13 per.
(29—32) to acres: 8464 per.; 746 roods; 84756 yds.; 894 miles.
(33—36) to yds.: 89754 in.; 7546 per.; 7 ac. 3 ro. 20 per.; 16 ro. 27 per. 18 yds.
(37—40) to per. 8464 yds. 754 ro.; to yds. 84 per. 7 yds. 5 ro.; 16 per.

ADDITION.

(41) Add 3 ac. 2 ro. 27 per. + 5 ac. 3 ro. 16 po. + 2 ro. 27 po. + 2 ac. 36 po.

(42) „ 3 ro. 27 per. 14 yds. + 15 per. 18 yds. + 3 ro. 16 po. 27 yds. + 2 ro. 27 per.

(43) „ 3 yds. 7 ft. 116 in. + 8 ft. 41 in. + 17 yds. 5 ft. + 3 yds. 4 ft. 88 in.

(44) „ 7546 ft. + 3964 in. + 3729 yds. + 842 per.

(45) „ 2164 ac. + 3 m. + 7546 ro. + 332 per. + 7746 yds.

SUBTRACTION.

(46) From 7 ac. 3 ro., 27 po. take 2 ac. 2 ro. 34 po.

(47) „ 3 ro. 26 per. 17 yds. „ 2 ro. 26 per. 19 yds.

(48) „ 5 ac. take 4 ac. 3 ro. 27 po. 15 yds. 4 ft.

(49) „ 374 ac. + 27 ft. + 1147 per. take 29 ac. + 37 ft. + 44 ro.

(50) „ 94 ro. + 847 per. + 907 yds. „ 26 ro. + 374 per. + 866 yds.

MULTIPLICATION.

(51—60) Multiply 3 ac. 2 ro. 27 per. by 9, 7, 6, 4, 3, 8, 11, 12, 10, 5.

(61—70) „ 3 yds. 7 ft. 114 in. by 16, 54, 36, 48, 96, 88, 84, 72, 132, 144.

(71—80) „ 17 yds. 5 ft. by 90, 75, 408, 67, 117, 184, 207, 915, 718, 215.

DIVISION.

(81—90) Divide 3 ac. 2 ro. 27 per. by 7, 5, 6, 4, 2, 8, 11, 9, 12, 10.

(91—100) „ 7 ac. 3 ro. 16 po. by 59, 604, 72, 86, 16, 78, 911, 54, 64, 312.

MISCELLANEOUS EXERCISES.

1. A man spends 15*s.* 4½*d.*, and saves half-a-crown weekly: what are his wages for a year?

2. At 7*d.* in the £, what is the tax on an income of £480?

3. A man died worth £20,000; one-fourth of this he left to his wife, and the remainder to be equally divided among his seven children: what was each child's share?

4. Bring a million pence to pounds.

5. Multiply the half of 100,000 by the fourth of 10,000.

6. What will remain out of £100, after paying for 37 sheep at £1 14*s.* 8*d.* each?

7. Divide £467 10*s.* 8¼*d.* equally among 67 persons.

8. £1,000 a year, is how much per week?

9. How many 7 lb. parcels of sugar can be made out of a cask containing 3¼ cwts.?

10. On one tree there are 7831 apples: what are they worth at four a penny?

11. I bought soap at 49 shillings per cwt., and sold it at 5¾*d.* per lb.: what did I gain by selling half a ton?

12. A farmer's wife sold 15 lbs. of butter at 14½*d.* per pound, and bought 21 yards of calico at 3¾*d.* per yard: what money did she take home?

13. How many days from January the 1st to July 31st, both included?

14. What is a box of 1,200 oranges worth at 18*d.* per dozen?

15. How many pint bottles can be filled out of a hogshead of wine?

16. Reduce £141 17*s.* 10½*d.* to half-pence.

17. I bought two pieces of cloth each 27 yards for £10: what did it cost per yard?

18. Add together three dozen, two score, and a gross; and take the sum from 10,000.

19. Add together a half-crown, seven shillings, 3*s.* 4½*d.*, a guinea, and eighteen pence; and take the sum from £5.

20. Multiply the number of pounds in a hundred-weight by the number of yards in a mile, and divide the product by the number of pence in a pound.

21. If 37 oxen cost £500: what is one worth?

22. When herrings are $1\frac{1}{2}$ for three-half-pence: how many shall I get for £1?

23. How many florins in 7684 half-crowns?

24. Add 3 guineas to £7 19s. $4\frac{3}{4}$d., and bring the sum to farthings.

25. How many pecks in 169 quarters of wheat?

26. Take 5 times £3 18s. $4\frac{1}{4}$d. from 13 times £2 19s. $8\frac{3}{4}d$.

27. If I take half a hundred-weight from half-a-ton: how many pounds remain?

28. A farmer goes to market with 56 bullocks, and sells them at £11 5s. 6d. each, at the same time he buys 170 sheep at £1 10s. 3d. each: what money did he take home?

29. What will remain out of £100 after paying for 216 yards of cloth at 2s. $6\frac{3}{4}$d. per yard?

30. A man bought a hogshead of beer for £3, and sold it at 6d. per quart: what did he gain?

31. A man saves £7 quarterly out of an income of £200: what does he spend weekly?

32. A grocer bought a cask of sugar, weighing 3 cwt. for 8 guineas, and sold it for 9 guineas: what did he gain per lb.?

33. If a family eat 5 loaves of bread in a week: how many would they eat in 5 years?

34. Multiply the sum of the numbers on the face of a clock by 802.

35. Take £95 15s. $10\frac{1}{2}$d. from 100 guineas.

36. If a man can do a piece of work in a year: how long would 5 men take to do the same work?

37. Take the tenth part of 100,000 from the hundredth part of 10,000,000.

38. How long will a train be going a journey of 384 miles at the rate of 34 miles per hour?

39. Bring 2,840,638 three-pences to half-sovereigns.

40. Bring 754,321 farthings to four-pennies.

41. What must I pay for 5 lbs. of sugar at 7½d., 13 lbs. of bacon at 8½d., 25lbs. of cheese at 4¾d., 4 lbs. of treacle at 2¾d., and a dozen lbs. of candles at 6½d.?

42. Reduce 24,086 tons to pounds.

43. In 47 miles how many feet?

44. If a boy got 784 nuts for 8d.: how many will he get for 10s.?

45. A has 5 times £31, B has 3 times £2 17s. 8½d., C has 8 times £14 19s. 6¾d.: how much money have they?

46. How many spoons weighing 2 oz. each can be made from a bar of silver weighing 5½lbs.?

47. How long is it from 1491 B.C. to 1863 A.D.?

48. How many times is 6s. 8d. contained in £501 13s. 4d.

49. How many half-pound parcels can be made out of half-a-ton of sugar?

50. How much butter at 9d. per lb, can I get for £100?

51. Divide the difference between one hundred thousand and one, and two millions by 487.

52. I was born 12th May, 1810: how old shall I be on 5th June, 1875?

53. If 204,870 trees are arranged in 492 rows: how many are there in a row?

54. A butcher kills 16 oxen, 35 sheep, 17 lambs, and 10 calves weekly: how many animals does he kill in a year and a half?

55. If a man drink a hogshead of beer in 6 months: how many quarts would he drink in 7 years?

56. When eggs are 6d. a dozen: how many shall I get for £5 6s. 8½d.?

57. How many gross are there in a million?

58. If a man walk 6,000 yards an hour, in what time would he walk 28 miles?

59. What must be added to 39,708 to make two millions and thirty?

60. I gave away among 3 boys 4,008 nuts; the first gets half, the second 137: what is the third one's share?

61. Suppose there are 7,842 persons in a certain town, what would the population of 120 such towns be?

62. A ship's cargo consists of 1,200,000 oranges in 4,000 boxes: how many in a box?

63. A draper buys 224 yards of cloth at £2 16*s.* 8$\frac{3}{4}$*d.* per yard, and sells them at £3 4*s.* 7$\frac{1}{4}$*d.* per yard, how much does he gain?

64. Find the wages of 26 labourers for 14$\frac{1}{2}$ days at 3*s.* 2$\frac{1}{2}$*d.* per day.

65. How many times are 500 farthings contained in £40 2 3$\frac{1}{2}$?

66. If 19 horses cost 500 guineas, what will 171 cost at the same rate?

67. What was gained by buying 17 dozen pairs of gloves at 2*s.* 6$\frac{1}{4}$*d.* per pair, and selling them at 3*s.* 4*d.*?

68. A man receives in exchange for a cheque 3 twenty-pound notes, 7 ten-pound notes, 13 five-pound notes, 20 sovereigns, 7 half-sovereigns, 24 crowns, and 87 shillings: what was the amount of the cheque?

69. What is the tax on an income of £469 10*s.* at the rate of 7*d.* in the £?

70. What will an acre of land cost at 2*s.* 3$\frac{1}{2}$*d.* per square yard?

71. Find the value of 4320 knives at 7*s.* 6*d.* per dozen?

72. At 3$\frac{1}{4}$*d.* per pound, what must I pay for a sack of flour?

73. What is the worth of three sheep weighing respectively, one hundredweight, 99 lbs., and 5 score, at 5$\frac{3}{4}$*d.* per lb.?

74. What is the cost of 281 brace of rabbits at 9$\frac{1}{2}$*d.* each?

75. My brother borrowed £10 of me, he has paid £1 11*s.* 6*d.* and £3 14*s.* 2$\frac{1}{2}$*d.*: what is still owing?

76. What change shall I have from £3, after paying £1 12*s.* for a coat, 10*s.* 6*d.* for a waistcoat, and 3*s.* 9*d.* for gloves?

77. A hosier bought 96 pairs of stockings for £3 8*s.* and sold them at 10*d.* per pair; what did he gain on each pair?

78. How many square inches are there in a door 18 inches wide and 37 inches long?

79. Find the value of 63 gross of pens at $3\frac{1}{2}d.$ a dozen.

80. Half-a-crown a day is how much a year?

81. Find the difference between a half and a quarter of 4,806,000.

82. In 84,632 groats, how many sovereigns?

83. How long will a person take to save £480, at the rate of £4 10*s.* a month?

84. Multiply the third of £5 by 982.

85. What are three days' wages at 17*s.* 6*d.* per week?

86. Add together three-fourths of 100, two-thirds of 9,000, and one-half of 786,324.

87. What is the value of half-a-hundredweight of gold at £3 10*s.*6*d.* per ounce?

88. If two ounces of tea cost $7\frac{3}{4}d.$, what is the value of a chest containing 14 pounds?

89. In 247 miles, how many feet?

90. In 172 gallons, how many pints?

91. Reduce £421 10*s.* $4\frac{1}{2}d.$ to half-pence.

92. How many guineas in 240,982 sixpences?

93. A man earns 17*s.* 6*d.* per week, his wife 10*s.*, and each of three children half-a-crown: what were the family's earnings per year?

94. What will 37,000 bricks cost at £1 7*s.* 6*d.* per thousand?

95. At $8\frac{1}{2}d.$ per dozen, what is the value of 120,000 eggs?

96. How many panes of glass in a street of 183 houses, each house having 10 windows, and each window 16 panes?

97. What will a quarter of a yard of cloth cost, if a piece of 27 yards cost £1 13 9?

98. Multiply the number of days in August, September, and October, by the number in November and December.

99. I have in the bank £847 19 $3\frac{1}{2}$; if I draw £15 a month for 9 months: how much will remain?

100. If a train goes 645 miles in $10\frac{3}{4}$ hours, what is the rate per minute?

Supplementary Exercises on Weights and Measures.

ADDITION.

(1) The Bank of England received from Australia 10 lb 6 oz 10 dwt 12 grs of gold; from California 9 oz 12 dwt 2 grs; from Russia 15 lb 10 oz 10 dwt 4 grs; also 5 lb 2 oz 6 dwt 4 gr of silver from Austria: find the total weight received.

(2) A grocer sold on the market day 12 ton 2 cwt 3 qrs of sugar; 20 ton 12 cwt 2 qrs 10 lb of currants; 1 qr 20 lb of tea; 15 cwt 0 qrs 11 lb of bacon; and 30 tons of flour: find the amount of his sales.

(3) At a school treat the following quantities were used: 12 lb 10 oz of butter, 19 lb 8 oz of currants, 15 lb 11 oz of tea, and 1 cwt 13 lb of flour: find how much was consumed.

(4) A farmer had 10 ac 2 ro 18 po of wheat, 15 ac 3 ro 38 po of barley, 17 ac 2 ro 19 po of oats, 16 ac 0 ro 17 po in grass, and 40 ac fallow: find the size of his farm.

(5) What are the united ages of the following boys,—John is 11 yrs 12 wks 1 day, William 14 yrs 6 days, Henry 13 yrs 10 wks 4 days 17 hrs, and Thomas 9 yrs 40 wks 1 day 20 hrs.

(6) During a journey, a man has travelled by rail 110 m 7 fur 30 po; by steamer 16 m 2 fur 30 po; horseback 8 m 36 po, and he has yet to go 16 m 2 fur 30 po: find the length of his journey.

Find the value of the following quantities :—

(7) 12 lb 10 oz 18 dwt 30 grs + 17 lb 8 oz 16 dwt 11 grs + 19 lb 11 oz 16 dwt 21 grs + 16 lb 10 oz 19 dwt 17 grs.

(8) 110 lb 10 oz + 108 lb 19 gr + 107 lb 2 oz 13 dwt 11 grs + 65 lb 11 oz 15 dwt 16 gr + 104 lb 11 oz 13 dwt 14 gr.

(9) 108 ton 13 cwt 3 qr 10 lb 14 oz + 90 ton 15 lb 10 oz + 2 cwt 1 qr 24 lb 15 oz + 68 ton 19 cwt 3 qr 11 lb 11 oz.

(10) 17 yds 1 ft 11 in + 100 yds 10 in + 117 yds 2 ft 9 in + 60 yds 2 ft 8 in + 810 yds 0 ft 7 in.

(11) 114 m 7 fur 19 po + 181 m 2 fur 16 po + 1081 m 3 fur 26 po + 80 m 29 po.

(12) 18 ac 39 po + 20 ac 1 ro 29 po + 209 ac 3 ro 27 po + 15 ac 0 ro 28 po + 177 ac 3 ro 16 po.

(13) 17 yrs 10 wks 2 da 11 hrs + 201 yrs 20 wks 4 da 16 hrs + 18 yrs 15 wks 23 hrs + 189 yrs 37 wks 6 da 23 hrs.

(14) 19 wks 2 da 12 hrs 50 min + 1 wk 59 min + 4 wks 1 da 23 hrs + 13 hrs 48 min.

(15) 81 qrs 7 bus 2 pks + 19 qrs 6 bu 1 pk + 104 qrs 5 bu 3 pks + 84 qrs 2 pks + 9 qrs 4 bu 1 pk.

SUBTRACTION.

(16) Gold ore weighing 110 lb 2 oz 10 dwt 12 grs. lost 25 lb 6 oz 11 dwt 2 grs in the furnace: find what remains.

(17) A grocer bought 108 tons 16 lb of loaf sugar, and sold 91 ton 5 cwt 1 qr 18 lb: what weight remained?

(18) A telegraph is 96 m 3 fur 17 po in length; 14 m 6 fur 28 po are cut off: what length remains?

(19) A farm contains 801 ac 2 ro 36 po: of this, 98 ac 0 ro 38 po is pasture: find the amount of tillage.

(20) A miller bought 109 qrs 2 bu 0 pk of wheat, and ground 87 qrs 7 bus 3 pks: what was left?

(21) A tailor cut 18 yds 1 qr 3 nls of West of England cloth from a piece of 81 yds: find the remnant.

Find the value of the following quantities:—

(22) 190 lb 11 oz 19 dwt 20 gr — 87 lb 9 oz 19 dwt 22 gr.

(23) 180 lb 15 gr — 30 lb 6 oz 17 dwt 20 gr.

(24) 996 lb 2 oz 14 dwt 15 gr — 868 lb 9 oz 6 dwt 17 gr.

(25) 980$\frac{3}{4}$ tons 0 cwt 0 qrs 0 lb — 906 ton 11 cwt 3 qrs 27 lb.

(26) 701 tons 18 lb — 2 qrs 15 oz.

(27) 901 m 3 fur 11 po — 99 m 7 fur 28 po.

(28) 706 yds 1 ft 9 in — 87 yds 2 ft 10 in.

(29) 366 m 2 fur 20 po 4 yds — 19 m 3 fur 27 po 5 yds.

(30) 319 s. yds 7 s. ft 106 s. in — 88 s. yds 7 s. ft 111 s. in.

(31) 1006 ac 1 ro 18 po — 984 ac 3 ro 36 po.

(32) 98 ac 2 ro 15 po 21 yds — 18 ac 2 ro 19 po 26 yds.

(33) 116 yds 2 qrs 2 nls — 19 yds 2 qrs 3 nls.

(34) 84 yds 1 qr 0 nls 1 in — 17 yds 2 qrs 1 nl 2 in.

(35) 108 yrs 3 mo 1 wk 2 da — 76 yrs 6 mo 3 wks 4 days.

MULTIPLICATION.

(37) A man sent home 7 nuggets each 1lb 9 oz. 10 dwt. 11 gr., find the total weight.

(38) A cask holds 19 cwt. 1 qr. 17 lbs., find how much 12 casks will contain.

(39) A man walks 7 m. 2 fur. 18 po. each day, how far does he travel in a fortnight?

(40) A boy's suit contains 6 yds. 2 qrs. 3 nls. of cloth, find what quantity would be required for 21 boys.

(41) A house and garden occupy 12 ac. 3 ro. 16 po., how much will 18 such houses require?

(42) A voyage to India required 3 mo. 2 wks. 3 days 19 hours, what is the length of 25 such voyages?

Find the value of the following quantities:—

(43) 2 lb. 10 oz. 6 dwt. 8 gr. × 6.
(44) 9 oz. 12 dwt. 15 gr. × 7
(45) 15 lb. 6 oz. 10½ dwt. 0 gr. × 28
(46) 2 ton 10 cwt. 2 qr. 10 lb. × 9
(47) 8 cwt. 0 qr. 26 lb. 7 oz. × 8.
(48) 30½ ton × 32.
(49) 38 yds. 1 ft. 11 in. × 12.
(50) 106 yds. 9 in. × 15.
(51) 13 m. 6 fur. 31 po. 4 yds. × 40
(52) 81 qrs. 3 bu. 2 pks. × 12.
(53) 143 qr. 7 bu. 3 pks. × 26.
(54) 1586 yd. 2 qr. 3 nls. × 112.
(55) 81 yds. 1 qr. 0 nls. 2 in. × 64.
(56) 12 hrs. 10 min. 31 sec. × 14.
(57) 2 yr. 8 mo. 3 wks. × 28.
(58) 2 cent. 45 yrs. 13 wks. × 18.
(59) 7 sq.yd. 4 sq.ft. 100 sq.in. × 7
(60) 13 ac. 2 ro. 21 po. 20 yds × 15

DIVISION.

(61) To make 9 watches 17 oz. 12 dwt. 12 grs. of gold is required; what would be the weight of one?

(62) Divide a load of 110 ton 12 cwt. 1 qr. equally amongst 8 engines; what would that be for each?

(63) Divide 148 qrs. 2 bu. 1 pk. of oats amongst 18 horses, what will be the share of each?

(64) Take the 21st part of 196 ac. 2 ro. 36 po.

(65) A tailor has 130 yds. 2 nls. of cloth to divide into 8 equal parts; find one of them.

Find the value of the following :—

(66) 15 lb 9 oz. 3 dwt. 15 gr. ÷ 7.
(67) 181 lb. 0 oz. 0 dwt. 19 gr. ÷ 15
(68) 97 lb. 11 oz. 0 dwt. 14 gr. ÷ 21
(69) 17 ton 3 cwt. 2 qr. 14 lb. ÷ 5.
(70) 18 cwt. 15 lb. ÷ 11
(71) 181 lb. 11 oz. 10 dr. ÷ 30
(72) 190 m. 2 fur. 30 po. ÷ 6.
(73) 153 yds. 6 ft. 2 in. ÷ 12.
(74) 15 yds. 2 ft. 11 in. ÷ 4½.
(75) 421 ac. ÷ 60.
(76) 108 sq.yd. 7 sq.ft. 100 sq.in. ÷ 5.
(77) 861 ac. ÷ 56.
(78) 1086 qrs. 2 bu. 3 pks. ÷ 90.
(79) 14 qrs. 2 bu. ÷ 3 bu. 1 pk.
(80) 1 century ÷ 33.

Section XXXIII.

APOTHECARIES' WEIGHT.

20 grains = 1 scruple *sc* or ℈
60 „ = 3 „ = 1 dram *dr* or ʒ
480 „ = 24 „ = 8 „ = 1 oz or ℥
5760 „ = 288 „ = 96 „ = 12 „ = 1℔

REDUCTION.

(1) Reduce 2170 grs to sc.
(2) Reduce 54 sc 16 grs to grs.
(3) „ 846 sc to drs.
(4) „ 54 drs 2 sc to sc.
(5) „ 154 drs to oz.
(6) „ 60 drs 1 sc 15 grs to grs.
(7) „ 8475 ozs to lbs.
(8) „ 1 lb 7 ozs 3 drs to drs.
(9) „ 5 lbs 4 drs 1 sc to grs
(10) „ 216040 grs to lbs.
(11—14) To grs : 8 lbs 7 ozs ; 3 drs 2 sc ; 5 drs 2 sc 15 grs ; 21 lbs
(15—18) „ ozs : 25 lbs 6 ozs ; 7546 grs ; 1375 sc ; 124 drs
(19—22) „ sc : 15 ozs 5 drs ; 8475 grs ; 21 lbs 10 oz ; 14 oz ; 20 sc
(23—26) „ drs : 20 lbs 11 ozs ; 1464 sc ; 1642 grs ; 21 ozs 5 drs
(27—30) „ lbs : 87546 grs ; 2164 drs ; 1546 ozs ; 4041 sc

ADDITION.

(31) Add together : 17 lbs 4 ozs 1 dr + 15 ozs 4 drs + 21 lbs 5 drs + 164 lbs
(32) „ „ 24 ℔s. 4 ozs. 3 drs. + 7 ozs. 5 drs. + 20 ℔s. 5 ozs. + 10 drs. 3 scrs.
(33) „ „ 7 ozs. 2 drs. 1 scr. + 3 ℔s. 2 drs. + 11 ozs. 5 drs. + 2 scrs.

(34) Add together 640 scrs. + 8461 grs. + 364 ozs. + 54 drs.

(35) „ „ 164 drs. + 840zs. + 16 lbs. + 5 lbs 3 ozs. 4 drs. 2 scrs

SUBTRACTION.

(36) From 5 lbs. 4℥. 3ʒ. take 11℥. (37) 8℥. 4ʒ. 2ȝ.—3℥. 4ʒ. 1ȝ.

(38) „ 13 lbs. 8℥. 5ʒ. „ 7 lbs. 6ʒ. (39) 5ʒ. 2ȝ. 16 grs.—3ʒ 2ȝ. 19 grs.

(40) „ 12 lbs. 7℥. 7ʒ. 12 grs. take 3 lbs. 3℥. 5ʒ. 17 grs.

MULTIPLICATION.

(41—50) Multiply 24 lbs. 4℥. 3ʒ. by 5, 7, 8, 6, 4, 9, 3 12, 11, 2.

(51—60) „ 8℥. 4ʒ. 2ȝ. by 16, 18, 28, 35, 44, 49, 56, 66, 77.

(61—70) „ 5ʒ. 2ȝ. 16 grs. by 27, 38, 59, 67, 83, 69, 43, 58. 97, 87.

DIVISION.

(71—80) Divide 12 lbs. 7℥. 7ʒ. 12 grs. by 2, 11, 12, 3, 9, 4, 6, 8, 7, 5.

(81—90) „ 5 lbs. 4℥. 3ʒ. by 96, 77, 66, 56, 49, 44, 35, 28, 18, 16.

(91—100) „ 27 lbs. 11℥. 18 grs. by 37, 51, 13, 19, 17, 23, 87, 78, 95, 118.

Section XXXIV.

CUBIC OR SOLID MEASURE.

1728 cubic inches (c.in.) = 1 cubic foot (c.ft.)
27 „ = 1 cubic yard (c.yd.).
40 cubic feet = 1 load timber (rough).
50 „ „ = 1 „ „ (hewn).
40 „ „ = 1 ton „ (shipping).

Reduce the following:—

(1) 90640 c. in. to c. ft. (6) 700405 c. in. to c. yds.

(2) 540 yds. 17 c. ft. to c. ft. (7) 87469 c. ft. to c. yds.

(3) 7 c. yds. 3 c. ft. to c. ft. (8) 27 c. yds. 13 c. ft. to c. ft.

(4) 5 c. ft. 1600 c. in. to c. in. (9) 9 c. yds. 860 c. in. to in.

(5) 8475 c. ft. to c. yds. (10) 9 c yds. 17 c.ft. 1400 c.in. to c.in.

(11—14) How many loads of rough timber in 27 c. yds. ? in 846407 c. in ? in 127 c. ft. ? in 184 c. yds. 19 c. ft. ?

(15—18) How many loads of hewn timber in 197546 c. in. ? in 754 c. yds. 15 ft. ? in 1874 c. ft. ? in 99 c. yds. 17 c. ft. ?

(19—22) Reduce the following to tons of shipping: 946975 c. in.; 847 c. yds. 15 c. ft.; 27 c. yds.; 18 c. ft. 94754 c. in.

(23) Add:—5 c. yds. 13 c. ft. + 7 c. ft. 847 c. in. + 9 c. ft. 847 c. in. + 989 c. in.

(24) „ 8 c. yds. 7 c. ft. + 7 c. ft. 847 c. in. + 64 c. yds. 1350 c. in. + 954 c. in.

(25) „ 84756 c. in. + 964 c. ft. + 36 c. yds. + 77464 c. in. + 8475 c. ft.

(26) „ 3748 c. ft. + 888405 c. in. + 775460 c. in. + 1964 c. ft.

(27) From 9 c. ft. 374 c. in. take 5 c. ft. 1846 c. in.

(28) „ 75 c. yds. 847 c. in. take 60 c. yds. 8 c. ft. 1546 c. in.

(29) „ 84647 c. ft. take 84647 c. in.

(30) „ 127 c. yds. take 8464 c. ft. + 84750 c. in.

(31—35) Multiply 3 c. yds. 14 c. ft. 184 c. in. by 9, 17, 54, 82, 96.

(36—40) Divide 84 c. yds. 7 c. ft. 84 c. in. by 7, 94, 72, 15, 18.

Section XXXV.

APOTHECARIES' FLUID MEASURE.

60 minims (m) = 1 dram (ʒ)

8 „ = 1 ounce (ȝ)

16 „ = 1 pint (o)

Reduce the following:—

(1) 1464 m to ʒ.

(2) 8964 m to ȝ.

(3) 94754 m to o^{s}.

(4) 3647 m to ȝ.

(5) 9460 m to ʒ.

(6) 9 pts. 13 ȝ to ʒ.

(7) 15 ȝ 4 ʒ to m.

(8) 118 ʒ to m.

(9) 5 pts. 9 ȝ 7 ʒ 28 m to m.

(10) 8 pts. 39 m to m.

(11) Add together:—5 ȝ 7 ʒ + 3 ʒ 19 m + 17 pts. 15 ȝ.

(12) „ „ 7 pts. 13 ȝ + 7 ȝ 5 ʒ 59 m + 3 ȝ 17 m.

(13) „ „ 9 ȝ 7 ʒ 3 m + 3 ȝ 4 ʒ 47 m + 19 ȝ 4 m.

(14) From 15 pts. 59 m take 6 ȝ 7 ʒ 26 m.

(15) „ 9 pts. 7 ȝ take 7 pts. 5 ȝ 6 ʒ 16 m.

(16) „ 8 ȝ 7 ʒ take 7 ȝ 5 ʒ 16 m.

(17—20) 9 pts. 3 ȝ 5 ʒ 17 m × 6, 8, 9, 7.

(21—25) 5 pts. 3 ȝ 7 ʒ × 27, 54, 89, 72, 79.

(26—30) 17 pts. 5 ȝ 9 ʒ + 9, 19, 27, 56, 108.

Section XXXVI.

THE AVERAGE OF NUMBERS,

(With corresponding exercises on preceding sections).

One boy is 6 years of age, another 12: what is the age of a third boy who is as much younger than the one, than he is older than the other?

Here it is required to find a number equidistant between 6 and 12.

Since this must be as much above 6 as below 12, it will be the half of the sum of 12 and 6, or 9.

$12 + 6 = 18$
$18 \div 2 = 9$

Definition.—A number equidistant between other numbers, is called the average number.

Rule.—To find an average number, add the given quantities together, and divide the sum by the number of the given quantities.

Find the average of the following numbers:—

(1) 36, 26.
(2) 7, 8, 9, 10.
(3) 54, 64, 36.
(4) 87, 94, 37.
(5) 50, 49, 84.
(6) 92, 74, 86, 109.
(7) 75, 406, 64, 69.
(8) 51, 94, 76, 83.
(9) 94, 75, 8, 7, 9, 6.
(10) 2, 8, 10, 20, 36, 49, 54.

11. Find the average age of a class: 1st boy, 5 years; 2nd, 9; 3rd, 7; 4th, 11; 5th, 9.

12. „ „ attendance of a school, for a week. Monday morn. 64, aft. 89; Tues. 59, 86; Wed. 75, 98; Thur. 87, 98; Fri. 88, 79.

13. Find the average attendance of a school for a week, Monday 108, 75; Tues. 109, 84; Wed. 79, 124; Thurs. 98, 164; Fri. 116, afternoon no school.

14. The average attendance of a school for each week for a quarter was as follows: give the average for the quarter—1st 207; 2nd 164; 3rd 198; 4th 164; 5th 189; 6th 210; 7th 199; 8th 174; 9th 201; 10th 179; 11th 159; 12th 186; 13th 197.

15. What will be the average attendance for a year, when that of the four quarters are as follows:—179, 207, 198, 174?

16. Give the average age of the children in a school, which has, 40 aged 6, 34 aged 7, 36 aged 8, 24 aged 9, 16 aged 10, 15 aged 11, 3 aged 12.

17. I employ 6 men, at the following rates per week, what is their average weekly wages? 1st, 17s. 6d.; 2nd, 19s. 9d.; 3rd, £1 6s. 4d.; 4th, 18s. 10d.; 5th, and 6th, £1 7s. 8d. each?

18. What will be the average sum which I give per day in a week—Monday 1s. 8½d., Tues. 6s. 9d., Wed. 7s. 4d., Thur. 1s. 9½d., Fri. 2s. 7½d., Sat. 16s. 8d., Sunday £1 7s. 0d.

19. What will be the average weight of four silver cups—1st, 5 lbs. 3 ozs. 5 dwts.; 2nd, 7 ozs. 16 dwts. 17 grs.; 3rd, 3 lbs. 7 ozs. 16 drs.; 4th, 17 ozs. 17 dwts. 17 grs.?

20. What is the average weight of each sack, if a load 1st weighing 16 cwt. 3 qrs. 4 lbs.; 2nd, 1 ton 3 cwt. 2 qrs. 7 lbs.; 3rd, 15 cwt. 2 qrs. 17 lbs?

21. Give average length of four pieces of cloth—1st, 7 ells. 2 qrs. 1 nl.; 2nd, 26 ells 2 grs. 1 nl.; 3rd, 4 yds. 2 qrs. 2 nls.; 4th, 7 yds. 3 qrs. 2 nls.

22. What is the average length of 3 roads—1st, 7 m. 1446 yds.; 2nd, 3 m. 1896 yds.; 3rd, 1 m. 375 yds.?

23. What is the average contents of four casks—1st containing 124 gals. 3 qts. 1 pt.; 2nd, 216 gals. 3 qts.; 3rd, 207 gals. 1 qt. 1 pt.; 4th, 116 gals. 2 qts. 1 pt.?

24. My income for 1854 was £374 16s. 4d.; for 1855, £107 17s. 0d.; for 1856, £217 17s. 11d.; for 1857, £307 2s. 6d.; for 1858, £287 17s. 9¾d.: what was my average income for those years?

25. How many cart-loads of earth will there be in digging a pit 12 yds. long, 10 yds. broad, and 12 ft. deep, if a cart will contain 18 cubic feet?

26. In walking a journey of 4 miles, I find I walk the first mile in 15 min., the second in 23 min., the third 25 min., and the fourth 36 min.: how long was I walking a mile on an average?

27. What would be the cost of removing a pile of wood 16 feet long, 13 ft. broad, and 9 ft. high, at the rate of 1s. 2½d. per sq. foot?

28. Into how many bottles, each containing 7 drs. 37 minims could I put 7 gallons of tincture of rhubarb?

29. If into 1 pint of water I have to put 7 drs. 3 scr. of carbonate of soda, how much will each drm. contain?

30. How many pills could be made up of 12 oz. of extract of colocynth, if each contain 5 grs.?

31. How much Epsom salts will 15 ozs. 4 drs. contain, if I put 2½ lbs. in a gallon?

WEIGHTS.

AVOIRDUPOIS.

For all Common Goods.

16 Drams	make	1 Ounce (*oz.*)
16 Ounces		1 Pound (*lb.*)
14 Pounds		1 Stone
28 Pounds		1 Quarter
4 Quarters (112 lbs.)		1 Hundredweight (*cwt.*)
20 Hundredweight		1 Ton

TROY.

For Gold, Silver, and Jewellery, and in Philosophical Experiments.

24 Grains	make	1 Pennyweight (*dwt.*)
20 Pennyweights		1 Ounce
12 Ounces		1 Pound

The lb. Av. contains 7000 grs. Troy.

APOTHECARIES.

For mixing and preparing Medical Prescriptions.

20 Grains	make	1 Scruple
3 Scruples		1 Dram
8 Drams		1 Ounce
12 Ounces		1 Pound

The gr. oz. and lb. are the same as in Troy Weight.

MEASURES.

LENGTH.

4 Inches	make	1 Hand
12 Inches		1 Foot
3 Feet		1 Yard
6 Feet		1 Fathom
5½ Yards		1 Rod, Pole, or Perch
40 Poles (220 yds.)		1 Furlong
8 Furlongs (1760 yds.)		1 Mile
3 Miles		1 League
2¼ Inches		1 Nail
4 Nails		1 Quarter
4 Quarters		1 Yard
5 Quarters		1 Ell

Cloth M.

SURFACE.

144 Square Inches	make	1 Square Foot
9 Square Feet		1 Square Yard
30¼ Square Yards		1 Sq. Rod, Pole, or Perch (*P*)
40 Perches		1 Rood (*R*)
4 Roods (4840 sq. yds.)		1 Acre (*A*)
640 Acres		1 Square Mile

SOLIDITY.

1728 Cubic Inches	make	1 Cubic Foot
27 Cubic Feet		1 Cubic Yard

CAPACITY.

4 Gills or Noggins	make	1 Pint
2 Pints		1 Quart
4 Quarts		1 Pottle
2 Gallons		1 Gallon
2 Gallons		1 Peck
4 Pecks		1 Bushel
8 Bushels		1 Quarter
5 Quarters		1 Load
3 Bushels		1 Sack
12 Sacks		1 Chaldron

Coal M.

A Barrel of *Beer* contains	36 Gallons
A Hogshead	54 Gallons
A Hogshead of *Wine*	63 Gallons
A Pipe	2 Hogsheads

THE

STANDARD MANUAL

OF

ARITHMETIC,

(THEORETICAL AND PRACTICAL).

PART VI.

(Corresponding to Standard VI.)

Section XXXVII.

BILLS (or accounts), and PRACTICE.

Example I.—

London, May 1st, 1863.

Mr. John Edwards

To James Weller,

1863			s.	d.
April 24th,	4 *doz eggs, ... at* 4½d		3	0
	3 *doz. new ditto ... at* 1½*d.*		4	6
	3 *lbs. Cheese (Dutch) at* 6*d.*		1	6
„ *27th*	3 *lbs. ditto (Cheshire) at* 9*d.*		2	3
	3 *lbs. ditto (Glo'ster) at* 11*d.*		2	9
			14	0

* *Received, May 2nd*, 1863,

James Weller.

Make out the following after the above model. Supplying other dates and signatures.

1. 3 hams at 8s; 4 lbs bacon at 6d; 3 lbs salt butter at 1s 1d; 3 lbs fresh butter at 1s 4d; 4 lbs do. do. at 1s 4d.

2. 1 set of shoe-brushes 2s 6d; mending a pair of bellows 6s; 1 copper-kettle 15s 6d; 1 fish-kettle 3s 6d; 3 washing tubs 9s; tinning a pot and four saucepans 4s 8d.

3. 1 goose 7s 6d; 2 ducks 6s 4d; 1 turkey 12s 8d; 2 fowls 8s 9d; 1 capon 11s; 1 hare 4s 6d.

4. 4 lbs potatoes at 2d per lb; 5 lbs onions at 1d; 5 lbs apples at 3d; 7 lbs turnips at 3½d; 2 Spanish onions 4d each.

5. 3 doz. tarts at ½d; 3 pots jam at 1s; 3 pots raspberry ditto at 2s; 4 lbs black currant ditto at 1s 4d; 4 buns at 1d.

6. 9 lbs of sugar at 5½d; 6 lbs of soda at 2d; 4 lbs of soap at 3½d; 6 lbs of lard at 10d; 7 lbs of pork at 9d; 8 lbs of currants at 6d.

7. 1000 hob nails at 1½d per hundred; 16 doz hinges at 2½d per pair; 14 doz brass-headed nails at 4½ per doz; 41 doz screws at 3½d per doz.

* Note.—Here a penny receipt stamp should be affixed and written upon, if the amount is £2 0s above.

8. 16 yds calico at 7½d; 17 yds of black ribbon at 1s 1½d; 12 yds of lindsay at 1s 6½d; 6 yds of cambric at 2s 6¾d; 2 doz pairs of gloves at 6¾d per pair.

9. 1 lb of tea at 5s; 5 lbs of sugar at 6d; 6 lbs of cheese at 10d; 10 lbs of salt at ½d; 26 lbs starch at 7½d; 18 lbs of bacon at 10½d.

10. ½ lb of butter at 1s; 2 lbs of sugar at 5d; ¼ lb of tea at 3s 8d; ½ lb of coffee at 1s 8d; 2 lbs of candles at 6½d.

11. 2 lbs of tea at 3s 6d; 2 lbs of coffee at 1s 8d; 4 lbs of candles at 6½d; 15 lbs of sugar at 4½d.

12. 6 lbs of sugar at 4d; 7 lbs of candles at 7d; 5 lbs of soap at 4½d: ½ lb of starch at 8½d.

13. 12 yds of calico at 8½d; 6 yds of flannel at 1s 9d; 4 yds of linen at 1s 7d; 16 cotton handkerchiefs at 5¾d.

14. 8 pairs of stockings at 1s 8d; 2 yds of cloth at 4s 6d; a gross of tape at 1s 6d per doz; 8 doz cottons at 1s per doz; 18 yds of binding at 2d.

15. 8 lbs of bacon at 9¾d; 10 lbs of sugar at 5¾d; 12 lbs starch at 5¾d; 5½ lbs of coffee at 1s 7d: 8 lbs of cocoa at 1s 6d.

16. 9 lbs of cheese at 9½d; 12 lbs of soda at 4d; 10 lbs of currants at 6¾d; 11 lbs of sugar at 5½d: 7 lbs of starch at 6¼d.

17. 6 lbs of soap at 4½d; 4 lbs of tea at 3s 11d; 1¾ lbs of coffee at 1s 8d; 3 lbs of sugar at 6d; 9 lbs of starch at 6¾d; 11 lbs of candles at 10¾d.

18. 12 lbs of currants at 7¾d; ¼ lb of cinnamon at 3s 6d; 11 lbs of sugar at 4d; 9 lbs of bacon at 7½d; 8 lbs of butter at 1s 1½d; 10 lbs of cheese at 9d; 12 lbs of soap at 4¼d; 10 lbs of soda at 2¼d.

19. 1 piece of blond 17 yds, at 1s 10d; 9 yds of linen diaper at 2s; 1 print dress 6s 6d; 3½ yds of ribbon at 11d.

20. 3 quires of note paper, 1s; 200 envelopes at 3d per packet of 50; 3 boxes of pens at 10d; 3 sheets of drawing paper, 9d; box of drawing pencils, 1s 6d.

21. 4 lbs of tea at 4s; 3 lbs of sugar at 6d; 5 lbs of candles at 7d; 6 lbs of sugar at 4d; 3 lbs of coffee at 1s 6d; 4 lbs butter at 1s.

22. 1 pair of men's boots, 16s 4d; 2 pairs of ladies' ditto at 9s 6d; 5 pairs of children's shoes at 2s 6d; 2 pairs of ditto ditto at 3s 6d; 7 pairs of American overshoes at 2s 6d.

23. 3½ lbs of best black congou at 5s; 4½ lbs of best mixed coffee at 2s 1d; 10 lbs of soft sugar at 6d; 2 loaves, 18 lbs, refined sugar at 10d.

24. 3 bushels of beans at 3s 8d; 6 bus of chaff at 6d; 6 bus of bran at 10d; 3 bus of oats at 3s 4d; 5 bus of pollards at 1s.

25. 4½ lbs of beef at 7½d per lb; ½ lb of beef suet at 8d; 1 mutton chop, 5½d; 3 lbs of sugar at 4½d; 2 lbs of butter at 13d; 2 lbs of treacle at 3d.

26. 15 lbs of potatoes at 2d; 5 pks of turnips at 3d; 7 bus of beans at 1s 6d; 3 pks of peas at 5d; 8 lbs of apples at 4d.

27. 7 loaves at 3½d; 19 rolls at 1d; 5 lbs of Scotch meal at 4d; 1 cake, 3 lbs 8 ozs at 6½d per lb; 8 lbs of flour at 1¾d.

28. 5 pks of potatoes at 1s 3d; 15 cabbages at 1½d; 5 lbs of onions at ¾d; 4 pks of apples at 1s 1d: 3 pks of peas at 4½d.

29. 8 lbs of sugar at 6½d: 16 lbs of bacon at 9¼d; 12 doz eggs at 1¼d each; 14 lbs of raisins at 6d; 6 lbs of currants at 3½d; 4 lbs of butter at 1s 2d.

30. 6 yds of muslin at 8½d; 8 yds of calico at 8d; 4 yds of linen at 1s 6d; 6 yds of satin at 6s 6d; 8 yds of silk at 2s 2½d; 4 yds of elastic at 1½d.

31. 6 frying pans at 2s; 4 shovels at 3s 10d; 6 doz nails at 6d per doz; 8 doz hooks at 5d each; 8 iron hoops at 6d; 2 doz knives at 5s per doz.

32. 8 lbs of biscuits at 10d; 6 lbs of butter at 1s 4d; 9 twists at 1½d; 6 small loaves at 3½d; 4 large loaves at 7½d; 15 tarts at 1½d.

EXAMPLE II.—

Tavistock, Xmas, 1863.

Mr. R. Dennis,

To H. T. Doble.

1863.		£	s.	d.
Jan 17	38 *yds of Calico at* 10½*d per yard* ...	1	13	3
Mar 4	23 „ *Sheeting* 1s 3¾*d* „	1	10	2¼
June 13	1 *doz pair of Stockings at* 18½*d per pair*	0	18	6
Aug 12	2 „ „ *ditto* 16¾*d* „	1	13	6
Sept 6	3 *pieces of Tape at* 4½*d per piece*	0	1	0¾
Oct 9	4 *gross of Needles at* 2½ *per doz*	0	10	0
Dec 16	1 *silk Umbrella*, 10/6	0	10	6
„	1 *cotton ditto*, 4/9	0	4	9
		£7	1	9

Received, January 3rd, 1864,

H. T. Doble.

Instead of a bill being receipted as in Examples I. and II., a separate acknowledgment of the payment is often given in the following manner:—

EXAMPLE III.— Tavistock, Jan. 3, 1864.

Received of Mr R. Dennis the sum of seven pounds one shilling and ninepence, due Xmas., 1863.

£7 1s 9d. H. T. Doble.

Receipt every bill in the following exercises after this example.

33. 3 pieces of ribbon, each 9d, 11d, and 1s 1d; 2 yds of ribbon at 9d; 5 yds of calico at 6d; 1 piece of flannel, 15 yds £1 10s 0d.

34. 5 gingham umbrellas at 5s; 4 best do. do. at 6s; 10 best silk do. at £1 1s. 0d; 1 doz. sunshades, each 7s.

35. A new fire-shovel and tongs 8s 6d; 1 large stew-pan 7s 6d; mending the clock 10s 6d; 1 load of straw £1 10s 0d; 1 load of hay £3 15s 0d.

36. 3 yds of calico at 8½d; 7 yds of blond at 4d; 1 print dress 7s 9d: 3 pair of gloves at 2s 6d: 5 pair ditto at 7½d: 13 yds flannel at 2s.

37. 16 pairs of leather gloves at 2s 6d: 16 pairs of leather leggings at 6s 6d: 100 doz shoe nails, 1d per doz: 4 leather aprons at 6s: 3 pairs of wool gloves at 1s: 18 pairs of boot leggings at 4s. 6d: 48 straps at 6d.

38. 7¾ lbs of grapes at 3s 9d: 75 peaches at 3d: 17 bags of potatoes at 7s 6d: 9 bushels of pears at 6s 9d: 11 bush of apples at 3s 6d.

39. 4 doz of pale sherry wine at 30s: 6 doz of best port at 35s: 4 doz of best Madeira at 45s: 4 doz of F. brandy at 41s: 6 doz of Hollands at 45s.

40. 18 lbs of coffee at 1s 2d; 8½ lbs of cheese at 10d; 36 lbs of tea at 4s; 23 lbs of butter at 8½d; 31 lbs of starch at 8d.

41. 25 lbs of butter at 9d; 7 lbs of cheese at 1s 2d; 9 lbs of bacon at 10d: 10 lbs of tea at 4s; 87 lbs of sugar at 6d; 63 lbs of rice at 4d; 29 lbs of starch at 9d; 38 lbs of currants at 5½d; 19 lbs of raisins at 6½d; 1 cwt of treacle at 1½d per lb; ¼ cwt of soda at 1¾d per lb.

42. 23 quires of paper at 2½d; 1200 envelopes at 6½d per hundred; 36 pen-holders at ¼d; 1 box of nibs, 2s 4d; 3 mahogany writing desks at 5s 3d; 3 cigar cases at 1s; 30 order books at 11½d: 1 needle case, 11d; 3 sheets of drawing paper 9d.

43. 3 tons of best coal at 22s; 4 tons of ditto at 23s; ½ ton of ditto at 23s; 3 tons of coke at 1s 4d per cwt.

44. 16 yds of calico at 9½d; 19 yds of sheeting at 11½d; 6 pairs of men's hose at 1s 2½d: 4 women's ditto at 1s 3½d; 2 pieces of tape at 7d; needles 3d; cotton 11d; buttons 1s 4½d.

45. 72 yds of calico at 7d; 3 doz merino hose at 7s 4d per doz; 12 yds of shirting at 8d: 6 doz yds of tweed at 2s per yard; 12 yds of lindsey at 1s 1d; 7 doz white gauntlet gloves at 1s 8d per pair.

46. 7 doz bone-handled knives at 9s per doz; 8 tea-pots at 4s; 14 kettles at 2s 6d: 8 doz pen-knives at 12s per doz: 4 doz knives at 17s 6d per doz.

47. 11 shovels at 5s 9½d: 14 scythes at 10s 9d: 11 bags of nails at 16s 8d: 6 hoes at 4s 3d; 8 rakes at 3s 2d.

48. 9 yds of flannel at 2s 3d: 5 yds of linen at 2s 6d: 10 sheets at 6s 11½d: 12 pairs of blankets at £1 12s per pair.

49. 4½ yds of cloth at 3s 6d: 6½ yds of silk braid at 5s: 4½ yds of calico at 10d: 3⅝ yds of linen at 1s 4d.

50. 17 sacks of barley at 9s 4d: 29 sacks of oats at 7s 5d: 12 sacks of flour at £2 2s 0d: 151 sacks of wheat at 35s: 168 sacks of bran at 19s 6d: 91 sacks of peas at 9s 8d.

51. 118 yds of calico at 8d: 128 yds of muslin at 1s 8d: 256½ yds of shirting at 8½d: 348 silk handkerchiefs at 3s 6d: 129 yds of silk at 2s: 436 yds of merino at 10½d.

52. 6 doz pocket knives at 2s 6d each: 4 doz tea pots at 6s 3d each: 60 doz bone-handled knives at 7s 6d per dozen: 60 doz forks at 5s 6d: 8 doz plated knives at £4 2s 6d per doz: 1 silver tea service, £52 10s. 0d.

53. 13 lbs of moist sugar at 4½: 21½ lbs butter at 15d: 10½ lbs of bacon at 9½d: 32 lbs of currants at 4½d: 22 lbs of plums at 4d: 132 lbs of American cheese at 9½d: 16 lbs of soda at ½d; 33 lbs of mottled soap at 4d: 12 lbs of starch at 3½d: 4 ozs of lemon peel at 1½d: 2 ozs of nutmegs at 1½d: 4½ lbs of best rice at 3½d.

54. 56 sheep at £1 12s 6d: 89 calves at £1 17s 6d: 42 pigs at 12s 8d: 97 cows at £12 10s 6d: 87 horses at £25 10s.

55. 37 yds of Genoa velvet at 27s 6d: 26 yds of satin at 9s 6d: 42 yds of lutestring at 6s 3d: 69 yds of rich brocade at 19s 8d: 21 yds of sarsenet at 3s 2d: 39 yds of flowered silk at 17s 4d.

56. 34 Russia hides at 10s 7d each: 23 sheep skins at 1s 7d: 18 lamb skins at 1s 2½d: 133 colored skins at 1s 8d: 73 calf skins at 3s 9d: 43 buck skins at 11s 6d.

57. 29 cwt of butter at £5 2s 8d: 48 cwt of lard at £4 13s 10d: 57 cwt of cheese at £2 15s 6d: 45 cwt of bacon at £2 12 6: 87 cwt of pork at £2 10s 6d.

58. 147 cwt of sugar at £1 15s 4d per cwt: 236 cwt of Maryland tobacco at £15 14s 6d: 289 cwt of Valencia raisins at £1 19s 6½d: 423 cwt of Jamaica ginger at £7 2s 4½d: 199 cwt of pepper at £5 12s 6d.

59. 825 feet of oak plank at 1s 7½d: 426 feet of mahogany at 2s 6d: 372 feet of elm board at 4½d: 584 feet of beech at 3¾d: 275 feet of ash at 10½d.

60. 263¾ yds of fustian at 2s 9½d: 425 yds of corduroy at 2s 11½d: 324 yds of lining at 5½d: 406½ yds of twill at 1s 4½d: 257¼ yds of calico at 10d.

61. 19¾ galls of rum at £1 3s 10d: 17¼ galls of best brandy at £1 12s 6d: 30¾ galls of Hollands at 17s 6d: 59¾ galls Scotch whiskey at £1 3s. 6d: 42⅛ galls of gin at 15s 6d.

62. 27 ozs of nutmegs at 5½d: 46 ozs of cloves at 10¾d: 38 ozs of ginger at 1½d: 49 ozs of allspice at 1¾d: 79 ozs of mace at 10d.

63. 92 yds of Brussels carpet at 4s 4½d: 67 yds of Wilton carpet at 5s 3½d: 35 yds of Kidderminster ditto at 3s 0¾d: 42 yds of drugget at 2s 9¼d: 57 yds of matting at 1s 4½d.

64. 512 galls of black ink at 2s 1d: 162 galls of red ditto at 3s 5d: 427 galls of blue ditto at 3s 1½d: 371 quires of note paper at 4½d: 826 quires of cream laid ditto at 7½d.

65. 37½ lbs of green paint at 7½d: 42⅝ lbs of black ditto at 4d: 92½ lbs of white lead at 6½d: 47 lbs of blue paint at 7½d: 39½ lbs of yellow paint at 10½d.

66. 324 sacks of flour at £3 15s 6d: 469 do. barley at £1 17s 6d: 742 ditto beans at £1 13s 4d: 559 ditto wheat at £1 18s 4d: 346 ditto oats at 14s 6d.

67. 139 ox' tongues at 3s 9d: 192 York hams at 11s 10½d: 137 Dutch cheeses at 5s 10d: 240 Westphalia hams at 7s 9½d: 139 Truckle cheeses at 5s 4d.

68. 19½ doz of old port at £2 7s 6d: 47¼ doz of sherry at £2 2s. 10d: 32½ doz of Bucellas at £1 15s 6d: 49 doz of Madeira at £2 9s 6d: 37½ doz of claret at £3 12s 4d.

When the correspondent lives at a distance he would write as in Ex. IV., and the receipt would assume the form of Ex. V.

EXAMPLE IV. *Manchester, Jan. 1st, 1863.*

Messrs. Oliver & Brown, London.

Gentlemen,

I beg to enclose a cheque of the amount of £27 10s. 4d., which please place to my credit.*

I remain, yours truly,

Philip Greathurst.

EXAMPLE V. *London, Jan. 2nd, 1863.*

Philip Greathurst, Esq.,

Manchester.

Sir,

We beg to acknowledge the receipt of your cheque of the value of £27 10s. 4d., which amount has been placed to your credit with thanks.*

Yours respectfully,

Oliver & Brown.

Write out forms of remittance and receipt after Examples IV. and V. for every bill whose number has 5 for its unit.

* Or *notes* or *P. O. O.* (Post-office Order), or *bill*, as the case may be.

SECTION XXXVIII.
PRACTICE.

CASE I.—*When the price is less than a penny.*

PRELIMINARY EXERCISES*:—

What parts of 1d are $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$?

What is ($\frac{1}{2}$ of 1d) + ($\frac{1}{3}$ of $\frac{1}{2}$)? Give the aliquot parts of 1d. (parts which will exactly measure 1d).

EX. I.—If one candle cost $\frac{1}{4}$d, what would 984 cost at the same rate?

984 candles at 1d would cost 984 pence.

$\frac{1}{4} = \frac{1}{2} + \frac{1}{4}$ or $\frac{1}{2} + \frac{1}{4}$ of 1d.

∴ 984 at $\frac{1}{4}$ = $\frac{1}{2}$ of 984d.

or 492d.

and as $\frac{1}{4}$d is $\frac{1}{2}$ of $\frac{1}{2}$d, 984 at $\frac{1}{4}$ = $\frac{1}{2}$ of 492d = 246d.

∴ 984 at $\frac{1}{2}$d + $\frac{1}{4}$d = 738d. or £3 1s. 6d.

Such a sum as this is usually worked in the following manner:—

$\frac{1}{2}$d = $\frac{1}{2}$	984d.	
$\frac{1}{4}$d = $\frac{1}{2}$	492	
	246	
12	738	
2,0	6,1	6
	£3 1	6

		(*a*)	(*b*)	(*c*)
(1—3)	Require the cost of 784 eggs	at 1d;	at $\frac{1}{2}$;	at $\frac{1}{3}$.
(4—6)	„ „ 864 pencils	at $\frac{1}{2}$;	at $\frac{3}{4}$;	at $\frac{1}{4}$.
(7—9)	„ „ 754 apples	at $\frac{1}{2}$;	at $\frac{1}{3}$;	at $\frac{2}{3}$.
(10—12)	„ „ 946 „	at $\frac{2}{3}$;	at $\frac{1}{2}$;	at $\frac{3}{4}$.

(13—15) Make three bills: (1) of the entire column (*a*); (2) of the entire column (*b*): (3) of the entire column (*c*).

(16) Make a bill of 846 apples at $\frac{1}{2}$; 107 candles at 1d; 46 pens at $\frac{1}{2}$d: 47 tops at $\frac{1}{4}$d.

(17) What is the value of 86 dozen oranges at 2 for 1$\frac{1}{2}$d.?

(18) How much will be realised by the sale of a ton of salt at $\frac{1}{4}$d per ℔.?

(19) Find the value of a gross of eggs at $\frac{3}{4}$d each.

(20) What is the expense of travelling from Tavistock to London, a distance of 252 miles, at $\frac{2}{3}$d per mile?

(21) How much must I give for 93 stone of potatoes at $\frac{1}{4}$d per ℔?

* NOTE.—Before commencing to write the sums in any *Case*, these and similar questions should be given to the pupil.

(22) What will remain out of a five-pound note after paying for 463 oranges at ½d each?

(23) In a school of 346 children, each child gave a half-penny to the Lancashire Relief Fund: what was the amount collected?

CASE II.—*When the price is less than a shilling.*

PRELIMINARY EXERCISES.—What parts of a *shilling* are the following,—6d., 4d., 3d., 2d., 1½d., 1d., ¾d., ½d., ¼d.?

What parts of *six-pence* are 3d, 2d, 1½d, 1d, ¾d, ½d, ¼d?
" " *four-pence* are 2d, 1d, ½d, ¼d?
" " *three-pence* are 1½d, ¾d, ½d, ¼d?
" " *two-pence* are 1d, ½d, ¼d?

Into what parts would you divide 2d, 2½d, 2¾d, 3½d, 3¾d, 4½d, 5d, 5½d, 6½d, 7d, 7¾d, 8½d, 8¾d, 9½d, 10d, 11d, 11¾d?

EXAMPLE II. What is the value of 468 yds of calico at 9¾d per yd?

468 yds. at 1s. would cost 468s.
9¾d. = 6d. + 3d + ¾d.
6d is ½ of 1s. ∴ 468 yds. at 6d = ½ of 468s = 234s.
3d is ½ of 6d ∴ " at 3d = ½ of 234s = 117s.
¾d is ¼ of 3d ∴ " at ¾d = ¼ of 117s = 29s 3d.
∴ 468 yds. at 9¾d = 380s 3d or £19 0s. 3d.

Usual form—

6d = ½	468s.
3d = ½	234
¾d = ¼	117
	29 3
2,0	38,0 3
	£19 0 3

(24—27) 849 at 1d; 1¼d; 1½d; 1¾d.
(28—31) 760 at 2d; 2¼d; 2½d; 2¾d.
(32—35) 7492 at 3d: 3¼d: 3½d: 3¾d.
(36—39) 9846 at 4d: 4¼d: 4½d: 4¾d.
(40—43) 6108 at 5d: 5¼d: 5½d: 5¾d.
(44—47) 1937 at 6d: 6¼d: 6½d: 6¾d.
(48—51) 8190 at 7d: 7¼d: 7½d: 7¾d.
(52—55) 2468 at 8d: 8¼d: 8½d: 8¾d.
(56—59) 3657 at 9d: 9¼d: 9½d: 9¾d.
(60—63) 7161 at 10d: 10¼d: 10½d: 10¾d.
(64—67) 9826 at 11d: 11¼d: 11½d: 11¾d.

(68—71) 54361 at 3d: 5½d: 1½d: 4½d.
(72—75) 90187 at 8½d: 10½d: 6½d: 8½d.
(76—79) 87654 at 3½d: 2½d: 9½d: 7d.
(80—83) 24680 at 4½d: 3½d: 9d: 10½d.

(84) What will 9 dozen and 7 oranges cost at 1½d each?

(85) What will be the cost of 487 books at 6d each?

(86) Find the value of a pig weighing 7 score 19 lbs at 5½d per lb

(87) What must I pay for 3 cwt. of soap at 4½d per lb?

(88) Find the cost of 4 sacks of flour at 1½d per lb.

(89) What is the value of 3½ gross of knives at 11½d each?

(90) What will a lb of saffron cost at 2½d per dram?

(91) What must I pay for 39 brace and 9 rabbits at 8½d. each?

(92) A glazier agrees to put in 406 panes of glass at 9½d. per pane: how much does he receive?

(93) What will 13 gross of Table books cost at 4½d per dozen?

CASE III.—*When the price is less than a pound.*

PRELIMINARY EXERCISES.—What parts of a *sovereign* are,—10/-, 6/8, 5/-, 4/-, 3/4, 2/6, 2/-, 1/8, 1/6, 1/4, 1/3, 1/-?

What parts of *half-a-sovereign* are 5/-, 3/4, 2/6, 2/-, 1/8, 1/3, 1/-, 6d, 4d, 3d?

What parts of *six-and-eight-pence* are 3/4, 1/8, 10d, 5d, 2½d?

What parts of a *crown* are 2/6, 1/8, 1/3, 1/-, 10d, 7½d, 6d, 4d, 3½d?

What parts of *three-and-four-pence* are 1/8, 10d, 8d, 5d, 4d, 2d?

What parts of *half-a-crown* are 1/3, 10d, 7½d, 6d, 3d, 2½d, 2d, 1½d?

What parts of *one and eight-pence* are 10d, 5d, 2½, 2d, 1d?

What parts of *eighteen-pence* are 9d, 6d, 4½d, 3d, 2d, 1½d, 1d?

What parts of *one and four-pence* are 8d, 4d, 2d, 1d?

What parts of *one and three-pence* are 7½d, 5d, 3d, 1d?

Into what parts would you divide 15/-, 12/6, 16/8, 13/4, 12/-, 14/-

" " " 17/6, 13/-, 14/6, 8/9, 4/8, 11/6.

" " " 3/8, 7/11, 5/9, 6/7, 7/4, 8/3.

" " " 9/9, 10/2, 11/7, 12/1, 13/-, 14/8.

" " " 15/2, 16/3 17/9, 18/10, 19/11.

" " " 3/4½, 2/10½, 4/8½, 9/7, 4/3½.

" " " 7/4½, 8/11½, 16/3½, 19/10½, 18/5½.

EXAMPLE III. What must I pay for 796 sheep at 18/1½ each?

796 sheep at £1 each would cost £796.

18/1½ = 10/- + 5/- + 2/6 + 7½d.

		£	£
10/- is ½ of £1 ∴	796 sheep at 10/-	= ½ of 796	= 398
5/- is ½ of 10/- ∴	„ „ at 5/-	= ½ of 398	= 199
2/6 is ½ of 5/- ∴	„ „ at 2/6	= ½ of 199	= 99 10
7½d is ¼ of 2/6 ∴	„ „ at 7½d	= ¼ of 99 10	= 24 17 6
∴ 796 sheep at 18/1½ =			£721 7 6

Usual form

	£
10/- = ½	796
5/- = ½	398
2/6 = ¼	199
7½d = ¼	99 10
	24 17 6
	£721 7 6

(94—97)	4963 at 1/-:	1/1:	1/1½:	1/1½.
(98—101)	8763 at 1/1½:	1/2:	1/2½:	1/2½.
(102—105)	9093 at 1/2½:	1/3:	1/3½:	1/3½.
(106—109)	8719 at 1/3½:	1/4:	1/4½:	1/4½.
(110—113)	2468 at 1/4½:	1/5:	1/5½:	1/5½.
(114—117)	9876 at 1/5½:	1/6:	1/6½:	1/6½.
(118—121)	9209 at 1/7:	1/8½:	1/9½:	1/10½.
(122—125)	2407 at 1/11:	1/11½:	2/3:	2/4½.
(126—129)	8184 at 2/7½:	2/8½:	2/9½:	2/10½.
(130—133)	3456 at 2/11½:	2/11½:	3/1:	3/2½.
(134—137)	7890 at 3/4½:	3/5½:	3/5½:	3/6.
(138—141)	1234 at 3/7:	3/7½:	3/7½:	3/8.
(142—145)	4321 at 3/9:	3/9½:	3/10½:	3/11½.
(146—149)	8765 at 4/2:	4/2½:	4/3½:	4/4.
(150—153)	2001 at 4/5½:	4/6½:	4/7:	4/8½.
(155—157)	9020 at 4/9:	4/10½:	4/11:	4/11½.
(158—161)	7600 at 5/3:	5/6:	5/8½:	5/10½.
(162—165)	3821 at 6/1:	6/3½:	6/8½:	6/11½.
(166—169)	9971 at 7/6:	7/8½:	7/9½:	7/10.

170. What is the value of 150 dozen pairs of gloves at 2/4½ per pair?

171. What will 5 cwt of tea cost at 3/1¾ per lb.?

172. Find the cost of enclosing a piece of ground a mile in circumference at 1/4½ per yard.

173. A half-a-crown a day is how much a year?

174. What must I give for 148 yrds of carpet at 3/10½ per yrd?

175. Find the wages of 296 men for a week at 15/6 each.

176. What is the value of 3 tuns of wine at 16/6 per gallon?

177. A bankrupt whose debts amount to £10489 pays 13/10½ in the pound: what does he pay altogether?

178. A man bought 469 pairs of boots at 17/9 per pair, and sold them at a guinea per pair: what did he gain on the whole?

179. What will 19/5¾ per week amount to in 7 years, reckoning 52 weeks 1 day in a year?

CASE IV.—*When the price is £1 or upwards.*

EXAMPLE IV. What is the value of 320 ounces of gold at £3 17s. 10½d. per ounce?

320 ozs. of gold at £1, are worth £320

£3 17 10½ = £3 + 10/- + 5/- + 2/6 + 3d + 1½d.

320 ozs. at £3 = 320 × 3 = £960

10/- is ½ of £1 ∴ „ at 10/- = ½ of £320 = £160

5/- is ½ of 10/- ∴ „ at 5/- = ½ of 160 = 80

2/6 is ½ of 5/- ∴ „ at 2/6 = ½ of 80 = 40

3d. is $\frac{1}{10}$ of 2/6 ∴ „ at 3d. = $\frac{1}{10}$ of 40 = 4

1½d is ¼ of 3d. ∴ „ at 1½d = ¼ of 4 = 1

∴ 320 ozs. at £3 17 10½ = £1246

Usual form

	£
10/- = ½	320
	3
	960
5/- = ¼	160
2/6 = ⅛	80
3d. = $\frac{1}{10}$	40
1½d = ¼	4
	2
	£1246

(180—182)	7382	at	£7	10	0;	£3	15	0;	£6	12	6
(183—185)	9146	at	£1	12	3;	£5	11	2;	£3	4	8
(186—188)	2187	at	£6	16	6;	£9	2	4;	£4	18	10
(189—191)	1579	at	£2	10	8;	£7	1	6;	£9	0	9
(192—195)	7845	at	£11	7	6;	£3	18	2;	£1	19	11
(196—198)	6241	at	£10	10	2;	£4	6	8;	£5	11	11
(199—201)	9988	at	£3	6	4½;	£7	14	3¼;	£10	16	8¾
(202—204)	7766	at	£21	2	4;	£17	4	6½;	£12	9	5½
(205—207)	5544	at	£6	6	6;	£4	18	7½;	£1	1	1½
(209—211)	3221	at	£19	18	7½;	£14	13	2½;	£10	9	8¾
(212—214)	9087	at	£1	10	11¾;	£4	8	0½;	£3	10	2¼
(215—217)	6051	at	£13	13	3¾;	£41	19	11½;	£7	16	9½
(218—220)	4030	at	£21	1	10;	£33	0	6;	£40	4	0¾
(221—223)	2191	at	£17	17	5¼;	£15	14	1½;	£11	9	7½
(224—226)	8437	at	£25	15	3¾;	£20	10	8;	£60	8	1¼
(227—229)	6212	at	£9	0	9;	£19	12	6½;	£29	19	0¾
(230—232)	7486	at	£70	7	8;	£50	5	4½;	£30	3	1¼
(233—235)	9273	at	£99	19	9¾;	£87	1	1;	£78	11	2½
(236—238)	8192	at	£1	1	1¼;	£2	2	2½;	£3	3	3¾
(239—241)	7364	at	£64	4	7;	£32	2	3½;	£16	1	4¼
(242—245)	5567	at	£2	1	5½;	£4	2	11;	£8	5	10¾
(246—248)	8010	at	£3	13	10;	£7	17	3;	£11	19	0
(249—252)	2930	at	£18	8	1½;	£81	1	8½;	£8	8	3
(253—255)	5678	at	£100	2	6¾;	£64	19	2½;	£17	12	1¼
(256—258)	9123	at	£144	6	3½;	£95	5	9¼;	£59	9	5½
(259—261)	4490	at	£132	2	3¼;	£23	12	3½;	£70	10	10
(262—264)	7658	at	£91	1	9;	£38	13	2½;	£12	16	4¼
(265—267)	2468	at	£31	1	11¼;	£40	0	8;	£8	4	0¼
(268—270)	9172	at	£91	11	2;	£80	8	6½;	£25	17	3¾
(271—273)	8531	at	£63	8	2½;	£16	6	1½;	£21	2	1¼
(274—276)	7696	at	£19	14	7;	£12	7	4½;	£4	7	9½
(277—279)	4800	at	£54	13	10;	£68	15	8½;	£1	19	3¼
(280—282)	1020	at	£29	11	9¾;	£32	0	1½;	£10	0	0¼
(283—285)	3690	at	£37	19	0¼;	£49	11	8½;	£28	1	3¾

287. What is the value of 6 flocks, each containing 49 sheep, at £1 18s. 6d. each?

288. What is the rent of an estate of 420 ac. at £2 18s. per acre?

289. Find the cost of 329 watches at 7 guineas each.

290. What shall I save in 29 years if I lay by £5 12s. 6½d. annually?

291. If a ship's crew consist of 127 persons, what sum will suffice to pay each of them £6 7s. 10½d. at the end of the voyage?

292. If a rifle is worth £3 12s. 10d., what would be the expense of supplying a regiment of 937 men with rifles?

293. Calculate the value of a cargo of 460 tons of coals at £1 1s. 6½d. per ton.

294. The fourth part of a nugget of gold weighing 67 oz. belongs to me: what is the value of my share, reckoning gold at £3 17s 10½d. per oz.?

Section XXXIX.

Case V.—*When the quantity contains a fraction.**

Preliminary Exercises.—What are $\frac{1}{2}$ of 5/-; $\frac{1}{3}$ of 6/8; $\frac{1}{4}$ of 12/6; $\frac{1}{5}$ of 15/10; $\frac{1}{6}$ of £2 2s. 0d.; $\frac{1}{7}$ of 8/9; $\frac{1}{8}$ of 11/-; $\frac{1}{9}$ of 11/9¾; $\frac{1}{10}$ of 18/7?

What are $\frac{2}{3}$ of 10/-; $\frac{3}{4}$ of £2; $\frac{4}{5}$ of £1 15s.; $\frac{5}{6}$ of £2 14s. 6d.; $\frac{6}{7}$ of £3 3s. 0d.; $\frac{7}{8}$ of 1/-; $\frac{8}{9}$ of 10s. 1½d.; $\frac{9}{10}$ of 12/6?

What are $\frac{6}{8}$ of £1 1s.; $\frac{10}{12}$ of 7/-; $\frac{9}{15}$ of £2 5s.; $\frac{20}{25}$ of £1 5s.; $\frac{63}{72}$ of £8; $\frac{21}{28}$ of £100; $\frac{5}{10}$ of 15s. 10d.; $\frac{17}{34}$ of 4s. 11½d.?

What are $\frac{8}{8}$ of 7/6; $\frac{5}{5}$ of 16s. 8d.; $\frac{8}{8}$ of 19s. 6d.; $\frac{7}{12}$ of 3/9; $\frac{10}{11}$ of £1 2s.; $\frac{30}{50}$ of £3?

Example V.—What is the value of a piece of cloth, measuring $49\frac{3}{7}$ yds., at 10s. 11½d. per yd.?

Having found by *Case III.* that 49 yds. are worth £26 15s. 11½d., we have next to find the value of $\frac{3}{7}$ of a yd.

$\frac{1}{7}$ of a yd. at 10s. 11½d. = 10s. 11½d. ÷ 7 = 1s. 6¾d.

And $\frac{3}{7}$ of „ „ = 1s. 6¾d. × 3 = 4s. 8¼d.

∴ $\frac{3}{7}$ of „ „ = $\frac{10s.\ 11\frac{1}{2}d. \times 3}{7}$ = 4s. 8¼d.

∴ $49\frac{3}{7}$ yds. „ = £26 15s 11½d + 4s 8¼d = £27 0s 7¾d

* This section may, if the teacher think fit, be postponed till Vulgar Fractions are learnt.

(1) 8364½ at £7 5 4½.
(2) 3796½ at £3 6 9½.
(3) 3847½ at £7 5 9½.
(4) 4756¼ at £4 6 7½.
(5) 7750¼ at £3 7 7½.
(6) 3347½ at £3 7 11½.
(7) 8960⅛ at £24 3 5.
(8) 7840⅛ at £33 4 4½.
(9) 7500⅛ at £77 13 8.
(10) 8907⅛ at £8 8 4.
(11) 9754$\frac{1}{10}$ at £4 4 0.
(12) 3168$\frac{1}{11}$ at £17 5 10.
(13) 8794$\frac{1}{5}$ at £8 8 11.
(14) 7506$\frac{4}{16}$ at £54 6 4.
(15) 3847$\frac{5}{10}$ at £7 8 11.
(16) 8864$\frac{6}{12}$ at £5 7 5.

(17) Find the value of a pig, weighing 8¾ score, at 10s. 5½d. per score.

(18) What must I pay for 3 pieces of cloth, each 27⅞ yds. at 4s. 10½d. per yd.?

(19) I bought 976¾ yds. of calico at 10½d. per yard, and sold the whole for 60 guineas: what did I gain?

(20) If 16¾ yds. of silk at 2s. 4½d. per yard are required to make a dress, what would the silk for 25 such dresses cost?

(21) If 5 yds of silk cost 17s. 6d., what will be the cost of 40$\frac{9}{10}$ yd?

(22) Make a bill for the following articles:—27⅞ yds. of linen at 2s. 5d.: 13¼ yds. of cambric at 10s. 6d.; 17⅝ yds. of muslin at 7s. 2½d.; 39$\frac{3}{16}$ yds of Irish cloth at 2s. 4d.

(23) Required the value of 123 $\frac{4}{17}$ cwt. of sugar at £1 19s. 8d. per cwt.

Section XL.

COMPOUND PRACTICE.

Case VI.—Preliminary Exercises:—

What parts of a *ton* are 10 cwt.: 5 cwt.: 4 cwt.: 2 cwt. 2 qrs.: 1 cwt. 1 qr.: 1 cwt.?

" " *cwt.* are 2 qrs.: 1 qr.: 16 lbs.: 14 lbs.: 8 lbs.?

" " *qr.* are 14 lbs.: 7 lbs.: 4 lbs.: 3½ lbs.: 2 lbs.: 1 lb?

" " *lb.* are 8 oz.: 4 oz.: 2 oz.: 1 oz.?

" " *mile* are 4 fur.: 2 fur.: 1 fur.?

" " *yard* are 1½ ft.: 1 ft.: 9 in.: 6 in.: 4½ in.: 3 in.?

" " *yard* are 2 qrs.: 1 qr.: 2 nls?

What parts of a *gallon* are 2 qts.: 1 qt.: 1 pt.?
" " *bushel* are 2 pks.: 1 pk.: ½ gal.?
" " *year* are 6 mths: 4 mths: 3 mths: 2 mths: 1½ mths?
" " *month* are 2 wks.: 1 wk.: 3½ dys.: 2 dys.: 1½ dys?
" " *week* are 3½ dys: 1½ dys: 1 dy?
" " *day* are 12 hrs.: 8 hrs.: 6 hrs.: 4 hrs.: 3 hrs.?

Into what parts would you divide 15 cwt.: 7 cwt. 2 qrs.: 17 cwt. 3 qrs.: 2 qrs. 25 lbs.?
" " " 18 lbs. 10 oz.: 13 lbs. 4 oz.: 15 ozs. 14 drs.?
" " " 8 oz. 13 dwts.: 10 oz. 6 dwts.: 5 oz. 12 dwts.
" " " 4 fur. 20 per.: 15 per. 3½ yds: 7 per. 4 yds.
" " " 2 rds. 28 per.: 5 ft. 120 in.: 7 ft. 116 in.
" " " 2 qrs. 2 nls.: 3 qrs. 3 nls.: 1 qr. 3 nls.
" " " 35 gals. 2 qts.: 15 gals. 1 qt.: 20 gals. 3 qts.
" " " 7 bus. 3 pks.: 5 bus. 2 pks.: 3 pks. 1 gal.
" " " 7 mths. 3 wks.: 5 wks. 4 dys.: 2 wks. 6 dys.
" " " 3 dys. 10 hrs.: 4 dys. 17 hrs.: 5 dys. 23 hrs.
" " " 17 hrs. 30 min.: 15 hrs. 18 min.: 23 hrs. 50 min.

EXAMPLE VI.—What is the value of 5 cwt. 3 qrs. 17 lbs 8 oz. of sugar at £2 16s. 0d. per cwt?

5 cwt. 3 qrs. 17 lbs. 8 oz. = 5 cwt. + 2 qrs. + 1 qr. + 14 lbs. + 3 lbs 8 oz.
1 cwt. at £2 16s. will cost £2 16s. ∴ 5 cwt. will cost £2 16s. × 5 = £14 0 0
2 qrs. are ½ of 1 cwt. ∴ 2 qrs. will cost ½ of £2 16 = £1 8 0
1 qr. is ½ of 2 qrs. ∴ 1 qr. " ½ of £1 8 = 14 0
14 lbs are ½ of 1 qr. ∴ 14 lbs. " ½ of 14 = 7 0
3 lbs 8 oz are ¼ of 14 lbs. ∴ 3 lbs. 8 oz. " ¼ of 7 = 1 9

∴ 5 cwt 3 qrs 17 lbs. 8 oz at £2 16 = £16 10 9

Usual form

	£	s.	
2 qrs. = ½	2	16	
		5	
	14	0	
1 qr. = ¼	1	8	
14 lbs. = ⅛		14	
3 lbs. 8 oz. = ¼		7	
		1	9
	£16	10	9

AVOIRDUPOISE WEIGHT.

(1) 3 tons 14 cwt. 1 qr. 14 lbs. at £5 16 8 per ton.
(2) 17 „ 10 „ 3 „ 27 „ at £6 1 4½ „
(3) 8 „ 19 „ 0 „ 21 „ at £13 5 10 „
(4) 10 „ 0 „ 2 „ 10 „ at £1 19 4½ „
(5) 13 cwt. 1 qr. 23 lbs. 2 oz. at £10 16 3 per cwt.
(6) 6 „ 2 „ 15 „ 10 „ at £3 1 7½ „
(7) 1 „ 1 „ 11 „ 11 „ at £0 16 2¼ „
(8) 5 „ 2 „ 7 „ 15 „ at £7 4 8¾ „
(9) 24 lbs. 13 oz. 8 drs. at £0 1 10 per lb.
(10) 13 „ 10 „ 15 „ at £0 15 2¼ „
(11) 1 „ 12 „ 4 „ at £0 7 11 „
(12) 17 „ 3 „ 10 „ at £1 6 8 „

TROY WEIGHT.

(13) 5 lbs. 9 oz. 18 dwts. at £3 17 10½ per lb.
(14) 17 „ 10 „ 12 „ at £10 1 8 „
(15) 10 „ 5 „ 23 „ at £1 12 4¾ „
(16) 8 oz. 17 dwts. 12 grs. at £0 5 4½ per oz.
(17) 10 „ 12 „ 21 „ at £1 10 6 „
(18) 3 „ 19 „ 4 „ at £5 7 8 „

LONG MEASURE.

(19) 10 mls. 5 fur. 30 po. at £2 4 19 per mile.
(20) 26 „ 3 „ 25 „ at £1 18 4½ „

(21) 15 mls. 1 fur. 3 po. at £0 10 6¼ per mile.
(22) 100 „ 7 „ 39 „ at £12 2 8 „
(23) 3 fur. 24 p. 2½ yds. at £0 17 6 per fur.
(24) 5 „ 10 „ 2 „ at £1 12 1 „
(25) 1 „ 18 „ 1 „ at £0 10 3¼ „
(26) 2 yds. 1 ft. 7 in. at £0 2 4½ per yard.
(27) 29 „ 2 „ 10 „ at £11 6 6¾ „
(28) 11 „ 0 „ 8 „ at £7 17 10 „

LAND OR SQUARE MEASURE.

(29) 2 ac. 2 rd. 28 per. at £2 7 6 per acre.
(30) 163 „ 1 „ 19 „ at £1 2 4 „
(31) 17 „ 0 „ 33 „ at £0 8 10½ „
(32) 6 „ 3 „ 10 „ at £10 19 1 „
(33) 25 yds. 7 ft. 120 in. at £1 2 6 per yard.
(34) 13 „ 8 „ 66 „ at £0 12 10 „
(35) 3 „ 1 „ 140 „ at £5 8 2 „
(36) 21 „ 4 „ 92 „ at £17 14 7 „

CUBIC OR SOLID MEASURE.

(37) 1 yd. 20 ft. 1200 in. at £2 10 3 per yard.
(38) 35 „ 17 „ 1608 „ at £5 7 4½ „
(39) 19 „ 11 „ 144 „ at £10 10 6 „

CLOTH MEASURE.

(40) 15 yds. 2 qrs. 3 nls. at £1 18 6½ per yard.
(41) 1 „ 3 „ 2 „ at £0 17 3¼ „
(42) 24 „ 1 „ 1 „ at £5 4 10½ „
(43) 7 „ 3 „ 3 „ at £0 13 11½ „
(44) 3 qrs. 1 nl. 1 in. at £0 5 6 „
(45) 1 „ 2 „ 2 „ at £1 10 4½ „
(46) 2 „ 0 „ 1¾ „ at £0 12 8 „
(47) 3 „ 3 „ 1½ „ at £4 13 5½ „

WINE AND SPIRIT MEASURE.

(48) 34 hhds. 27 gals. 2 qts. at £17 16 8 per hhd.
(49) 7 „ 39 „ 1 „ at £15 14 6 „
(50) 1 „ 54 „ 3 „ at £21 1 3 „
(51) 14 „ 32 „ 0 „ at £4 19 10 „
(52) 75 „ 48 „ 2 „ at £11 18 5 „
(53) 29 gals. 0 qts. 1 pt. at £44 12 6 „
(54) 13 „ 1 „ 0 „ at £0 18 10½ per gal.
(55) 49 „ 0 „ 1 „ at £1 13 4½ „
(56) 62 „ 3 „ 1 „ at £0 8 11¾ „
(57) 15 „ 2 „ 0 „ at £2 2 2 „

DRY MEASURE.

(58) 27 qr. 5 bush. 3 pks. at £5 2 6 per qr.
(59) 13 „ 7 „ 2 „ at £10 13 9 „
(60) 74 „ 1 „ 1 „ at £3 10 3 „
(61) 98 „ 6 „ 2 „ at £17 5 8 „
(62) 1 bush. 3 pks. 1 gal. at £0 16 10 per bush.
(63) 7 „ 2 „ 0 „ at £0 13 4½ „
(64) 3 pks. 1 gal. 3 qts. at £0 6 8 per pk.
(65) 2 „ 0 „ 2 „ at £0 17 6½ „

TIME.

(66) 9 mths. 2 wks. 5 dys. at £33 10 6 per year.
(67) 7 „ 3 „ 6 „ at £25 14 10 „
(68) 7 „ 2 „ 5 „ at £4 17 6 per month
(69) 3 „ 1 „ 4 „ at £15 4 2 „
(70) 4 wks. 5 dys. 10 hrs. at £0 18 8 per wk.
(71) 2 „ 4 „ 11 „ at £1 13 4 „
(72) 4 dys. 8 hrs. 33 min. at £0 3 10½ per day.
(73) 5 „ 11 „ 49 „ at £0 6 7½ „

74. What is the value of a gold snuff box, weighing 2 oz. 17 dwts 3 grs., at £3 17s. 10½d. per oz.?

75. How much must I pay for 3 chests of tea, each 1 cwt. 2 qrs. 11 lbs., at £20 per cwt.?

76. Find the monthly income of a mine, which yields 200 tons 5 cwt. 3 qrs. of ore, on an average, per month, worth £4 13s. 3d. per ton.

77. 12 men working together found a nugget of gold weighing 10 oz. 15 dwts. 17 grs., which they sold for £3 4s. 6d. per oz.: find each man's share.

78. What will be the expense of laying 90 yds. 2 ft. 9 inches of water-pipe at 6½d. per foot.?

79. Find the worth of 14 acres 2 roods 17 poles of pasture land at £50 10s. per acre.

80. Find the rent of 62 acres 2 roods 35 poles, at £6 5s. 4d. per acre.

81. What is the price of 16 yds. 3 qrs. 2 nls. of broad cloth, at 5s. 6½d. per yard?

82. What cost 1 hogshead, 35 gallons, 3 quarts, 1 pint of wine at 16s. 10d. per gallon?

83. If wheat be worth £2 5s. 0d. per quarter, what is the value of 16 quarters 4 bush. 2 pecks?

84. What quantity of corn will serve 70 horses for a month, if each horse consume 7 bus. 1 pk. 1 gall. 3 qts. per month?

85. A servant went to live with a gentleman for £17 a year, but at the end of 6 mths. 2 wks. 4 dys. he was dismissed: find his wages for that time.

86. Find the rent of a house for 5 yrs. 6 mths. 2 wks. 4 dys. at £2 6s. 0d. per month.

GENERAL MISCELLANEOUS EXERCISES.

1. A farmer has four fields; in the first there are 65 sheep, in the second 83, in the third 98, and in the fourth 106: how many has he altogether?

2. Add together 8 score, 12 dozen, 2 gross, the number of days in six weeks, the number of pence in 10/6, and the number of lbs. in a ton.

3. Add together one thousand and ten, four thousand and twenty three, three hundred thousand and one, seventeen hundred and fifty-three, and fifty thousand and ninety-six.

4. If John has 406 nuts and gives Dick five dozen, Tom four score, and Bill 49: how many will remain?

5. 28 boys have each five and a half-dozen marbles: how many have they together?

6. A boy had 69 marbles—he lost one-third of the whole: how many remained?

7. I was born in 1849, my mother in 1817, my father in 1812, and my sister in 1846: what is our united ages in 1864?

8. If in 6 bags there are 1763 nuts: how many are there in 30, each containing the same number?

9. How many three-pennypieces in £100?

10. If I divide 1 cwt. of sugar into two-ounce parcels: how many shall I have?

11. John goes to bed at ½-past seven, William at ¼-past ten; they both rise at six; how many hours does John sleep more than William in 11 years?

12. A carrier conveys 17 sacks of oats daily to a certain town: how many will he have carried at the end of six months, Sundays omitted?

13. If 39 nutmegs weigh a pound: how many will weigh a cwt?

14. Divide the product of the sum and difference of 2349 and 7019 by 318.

15. A grocer bought three hundred-weight of rice at 1½d. per pound, and sold it at 2d. per pound: what did he gain on the whole?

16. What is the cost of 10 gross of pens at $3\frac{3}{4}$d per dozen?

17. In a heap of 1000 apples, 148 were rotten: what were the remainder worth at $\frac{1}{2}$d. each?

18. If 65 tons of coal cost £69 17s. 6d.: what is the value of 5 cwt.?

19. 7 sheep cost 7 guineas, and 10 oxen cost £100: what did an ox cost more than a sheep?

20. How many half-crowns in £65 17s. 6d.?

21. If a gentleman divided 23048 nuts among 36 boys: how many did each receive?

22. If the wages for 9 men for 6 days is £6 15s.: what does each man earn per day?

23. If a gentleman's income is £420, and he spends £469 15s.: how much would he owe in 6 years?

24. At a school-tea, of which 420 children partook, each child cost $4\frac{1}{2}$d.: what was the total cost?

25. What will a lb. of saffron cost at $2\frac{1}{2}$d. a drm.?

26. What will be the cost of 80 oxen and 30 sheep, if the oxen are valued at £12 each and a sheep is worth $\frac{1}{3}$ of an ox?

27. In 84697 minutes, how many days?

28. Multiply 24618 by 43, and divide the product by the sum of 63 and 49.

29. A little boy took 127 nuts to the Zoological gardens; whilst counting them in his hat, a monkey made off with 13, and whilst pursuing the monkey, a squirrel made off with 5 more, how many had he left?

30. How many minutes in 9 yrs. 5 months 24 hrs.?

31. Take the sum of £59 16s. $10\frac{1}{2}$d., 60 guineas, 2 twenty-pound notes, and 3 half-crowns, from £500.

32. From a piece of cloth measuring 27 yds. 3 qrs., how many jackets can be made, each containing $2\frac{3}{4}$ yds.?

33. In 20060 inches, how many yards?

34. From 600,801 take the 9th part of 800,145.

35. If $\frac{1}{8}$ of a ship be worth £579 18s. 10½d., what is the value of the whole?

36. A gentleman's income is £1000 a year; out of that he spends £2 10s. 6½d. per day: what does he save?

37. How many times does a wheel, 7 feet in circumference, turn round in 3½ miles?

38. In 14612 yds., how many French ells?

39. How many guineas in £29624?

40. How many days from the sixth of April to the fifteenth of January, inclusive?

41. What is the price of 6½ dozen pairs of gloves at 1s. 9½d. per pair?

42. In 5 furlongs how many inches?

43. Multiply $\frac{1}{11}$ of £5 10s. 6d. by 48½.

44. Take 3 miles, 7 furlongs, 12 poles from 1½ leagues.

45. Take from a century, 89 years, 2 months, 3 weeks, 6 days and 48 minutes.

46. If a man waste 1 hour 3 minutes 12 seconds daily, what time will he have wasted in a year?

47. How many coins worth 7½d. each are equal in value to £15?

48. How many perches are there in 96 acres 3 roods?

49. What weight of potatoes does a family consume in a year, if they eat 1½ stone a week?

50. A tailor in making a suit of clothes puts 2½ yds. of cloth in the coat, 1½ yds. in the trowsers, and ¾ yd. in the vest: how much cloth did he use, and what did the suit cost, if he charged for making, lining, and trimmings £1 7s. 6d.?

51. Reduce 29 lbs. 8 ozs. to dwts.

52. If 2 cwt. 3 qrs. 15 lbs. of soap cost £8 10s.: what is the price of 1 lb.?

53. Find the cost of a ton of sugar at 3¼d. a lb.

54. A grocer sells on Monday 5 lbs. 13 ozs. of tea; Tuesday 1 qr. 22 lbs. 9 ozs.; Wednesday 2½ qrs.; Thursday 16¾ lbs.; Friday ½ cwt.; and Saturday as much as he sold on Monday and Thursday together: what quantity did he sell during the week?

55. Of 1¼ cwts. of coffee a man sold 93 lbs. 15 ozs.; what remained?

56. What is the weight of 19½ casks of tobacco, each weighing 4 cwt. 2 qrs. 19 lbs?

57. I bought 9 score and 8 sheep at £1 2s. 6d., and sold them for £150: what did I lose on the transaction?

58. How many farthings could I get for £20?

59. Reduce 8064 guineas to sixpences.

60. How many crowns in £905 10s. 0d.?

61. How many feet in a railway 169¼ miles long?

62. After losing 8 lbs. 6 ozs. 9 grains of silver, I have 16 lbs. 4 ozs. left, what had I at first?

63. If out of a piece of cloth measuring 16 yds. 1 qr. 3 nls., 9 yds. 3 qrs. 2 nls. are sold: how much remains?

64. What is the area of four fields measuring as follows:—16 ac. 2 rds. 32 pls.; 28 ac. 3 rds. 14 pls.; 7 ac. 1 rd. 28 pls.; 9 ac. 2 rd. 14 pls.?

65. A ship containing 8 officers and 150 men, took a prize worth £25784; ⅛ of this was set apart for the officers, and the remainder equally divided among the men: what was each man's share?

66. What is total weight of 87 chests of tea, each containing 2 qrs. 17 lbs.?

67. How much calico at 10½d. per yard, can be bought for £9 18s. 6d.?

68. How many lbs. of sugar worth 4½d. per lb. must be given in exchange for 27 lbs. of tea at 3s. 6d. per lb.?

69. If a man pumps 10 galls. 3 qts. of water in a day, how much would he pump in a year, Sundays excepted?

70. The purchase money of a parcel containing 907 articles of equal value is £1703 9s. 2½d., show the cost price of each article. Test the answer by multiplication and practice.

71. A man spends £155 5s. 7d. per year, how much will he lay by in 37 years out of £200 per annum?

72. How many yards are there in 27 bales of cloth, each containing 15 pieces, and each piece 15¼ yards?

73. How much will the school pence of 312 children amount to in 4½ years, reckoning 45 weeks to the year, and 2d. a week to each child?

74. A man buys 148 yards of cloth at 2s. 7½d. per yard; at what price per yard must he sell it to gain £12 12s. 10d. by the whole?

75. What will be the rent of a house for 3 months, 2 weeks and 4 days at £4 14s. 6d. per month?

76. How much loaf sugar at 11d. per lb. is equal in value to 3 qrs. 7 lbs. of moist sugar at 6½d. per lb?

77. A spoon costs 7s. 9d., how many dozen can be bought for £44 8s. 3d.?

78. A man who owes £2,348, pays 12s. 9½d. for every pound which he owes: how much does he pay in all?

79. Find the amount of land owned by 69 farmers, each having 70 acres, 2 roods, 28 perches.

80. 1175 casks contain each 3 gallons, 3 quarts, 3 pints, and 3 half-pints: how much do they all hold?

81. Find the wages of 17 men for 2 months, 3 weeks, 5 days, at £3 10s. 6d. each per month.

82. Multiply £537 17s. 10½d. by 365, and divide the product by 73.

83. Show how to make out a grocer's bill to a customer who has bought 13 lbs. of sugar at 4½d.; 5½ lbs. of tea at 3s. 8d.; 15 lbs. of rice at 2¾d.; a stone of salt at 1s. 6d. per cwt.; and 3 pints of treacle at 2s. 4d. per gallon.

84. Find, in as many different ways as you can, the price of 56 yards of cloth at 17s. 11¼d. per yard.

85. 108 sheep are bought for £2 2s. 6d. each, and afterwards sold for £2 7s. 9d. each: what is the total gain?

86. If $\frac{1}{10}$ of the rent of a farm be £19 14s. 10½d.: what is the whole rent of the farm?

Section XLI.

MENSURATION OF AREAS.

Definition.—**The extent of any surface in sq. miles, sq. ft., sq. in., &c., is termed its Area.**

Ex. I.—What is the area of a piece of board, 12 ft. long, and 1 ft. wide?

A sq. foot is a square, 1 ft. long and 1 ft. broad, and since the board is 1 ft. broad, the first foot in its length will be a sq. foot, and since there are 12 such lengths, the whole area is 12 times 1 sq. ft., or 12 sq. ft.

1	or,	12
12		1
12		12

Ex II.—What is the area of a board, 16 ft. long, and 2 ft. broad?

By the last example, the part of the board 16 ft. long, and 1 ft. broad, will be 16 sq. ft. The whole board therefore will = 16 sq. ft. × 2 = 32 sq. ft.

16
2
32 sq. ft.

Definition.—**A Rectangle is an area whose opposite sides are parallel, that is, in all places at the same distance from each other.**

Ex. III.—What is the area of a rectangular field, 354 yards long, and 275 broad?

A whole length of the field 1 yd. broad, will equal 354 sq. yds., therefore the whole area will be 354 sq. yds. × 275 = 97,350 sq. yds., or (by reduction) 20a. or. 18 per. 5½ yds.

354
275
1770
2478
708
97350 sq. yds.

Find the area of the following lengths and breadths.

Rule:—Multiply the length by the number of units in the breadth; the result will be the area.

(1)	27 in.	long	16 in.	broad	(6)	210 yds.	long 75 yds. broad
(2)	217 ft.	„	18 ft.	„	(7)	116 „	„ 36 „ „
(3)	364 „	„	21 „	„	(8)	175 „	„ 27 „ „
(4)	184 „	„	109 „	„	(9)	184 „	„ 36 „ „
(5)	31 yds.	„	27 „	„	(10)	3475 ft.	„ 218 ft. „

Ex. IV:—What is the area of a floor, 8 ft. 6 in. long, and 4 ft. broad?

One length of the floor 1 ft. wide = 8 ft. 6 in.; therefore the whole floor = 8 ft. 6 in. × 4 = 34 ft.

ft.	in.
8	6
	4
34	0

Ex. V.—What is the area of a floor, 12 ft. 3 in. long, and 7 ft. 9 in. broad?

The area of a length 1 ft. broad, = 12 sq. ft. 3 sq. in.; therefore the area 7 ft. broad = 12 ft. 3 in. × 7 = 85 ft. 9 in. The area of a length 9 ft. broad = 12 ft. 3 in. × 9. Therefore the area of a length 9 in. broad = 12 ft. 3 in. × 9 and divided by 12 = 9 ft. 2 in. 3^{12ths}. 85 ft. 9 in. + 9 ft. 2 in. 3^{12ths} = 94 sq. ft. 11 in. 3^{12ths}.

ft.	in.	
12	3	
	7	9
85	9	
9	2	3
94	11	3

1 in. ÷ 12 = 1 second or part, (1^{ii}); 1^{ii} ÷ 12 = 1 third (1^{iii}); 1^{iii} ÷ 12 = 1 fourth (1^{iv}); and so on.

This Rule for finding small areas in ft., in., sec., &c., is called Duodecimal Multiplication (Latin, *Duodecim*, twelve).

Ex. VI.—Required the area of a rectangle whose length is 3ft. 4 in. 7^{ii} 5^{iii}, and breadth 2 ft. 3 in. 9^{ii} 7^{iii}.

Since the length of the area is 3ft. 4 in. 9^{ii} 7^{iii}, a length 1 ft. broad would be 3 sq. ft., 4 sq. in., 9 sq. sec., 7 sq. thirds, and the area 2 ft. broad would be twice that extent. We therefore multiply by 2, and place the result exactly under the multiplicand. The area of a length 3 ft. broad would be 3 times the length, and therefore the area of a length 3 in. broad would be 1-12th of 3 times the length. But the quantities decrease by 12ths towards the right; therefore it only remains to place 3 times the top line one space to the right, giving 10 in. 1^{ii} 10^{iii} 3^{iv}. For the same reason, since 1^{ii} is 1-12th of 1 in. in finding the area of a length 9^{ii} broad, it is merely necessary to multiply by 9, and place the result another space to the right; and in finding the area of a length 7^{iii} broad to place 7 times the top line another space to the right*: we therefore get the following

ft.	in.	ii	iii				
3	4	7	5				
			2	3	9	7	
6	9	2	10^{iv}	1_{iv}			
	10	1	10	3	v		
	2	6	5	6	9	vi	
		2	0	8	3	11	
7ft.	10in.	1^{ii}	2^{iii}	6^{iv}	0^{v}	11^{vi}	

* The sum of all these areas will give the area of the whole rectangle.

RULE:—(*a*) Set down the length, and place the figures of the breadth under, so that the number representing the feet of the latter come under the lowest quantity of the former, the other figures of the breadth following in proper order.

(*b*) Beginning with the number which represents the feet of the breadth, multiply by each in succession, placing the first answer of each under the number serving for the time as the multiplier, and in all cases carrying the *twelves* of each product to the next number.

(*c*) Add the different results, and the sum will be the area.

Find the areas of the rectangles of following lengths and breadths.

(1)	3 ft. 9 in. 4^{ii}	long:	5 ft. 3 in. broad
(2)	7 „ 0 „ 3^{ii}	„	7 „ „ 5 7^{ii} „
(3)	3 „ 7 „ 4^{ii} 5^{iii}	„	9 „ 4 „ 5^{ii} „
(4)	16 „ 4 „ 0^{ii} 5^{iii}	„	15 „ 7 „ „
(5)	164 „ 3 „ 7^{ii}	„	19 „ 6 „ „
(6)	54 „ 7 „ 9^{ii}	„	34 „ 0 „ 9^{ii} „
(7)	7 „ 3 „ 4^{ii} 5^{iii}	„	9 „ 7 „ 3^{ii} 4^{iii} „
(8)	16 „ 4 „ 5^{ii}	„	0 „ 7 „ 5^{ii} „
(9)	76 „ 5 „	„	16 „ 11 „ 11^{ii} „
(10)	984 „ 4 „	„	89 „ 11 „ „
(11)	1654 „ 4 „	„	754 „ 5 „ „
(12)	164 „ 7 „	„	94 „ 7 „ 4^{ii} „
(13)	154 „ 4 „	„	64 „ 7 „ 10^{ii} „
(14)	115 „ 4 „	„	16 „ 7 „ „
(15)	64 „ 7 „ 5^{ii}	„	11 „ 7 „ 6^{ii} „
(16)	5 „ 3 „ 6^{ii}	„	9 „ 4 „ „
(17)	5 yds. 2 ft. 2 in.	„	6 „ 11 „ „
(18)	75 yds. 2 ft.	„	19 „ 4 „ „
(19)	217 yds. 4 in.	„	27 yds. 5 in. „
(20)	94 yds. 7 in.	„	24 yds. 5 in. „

A SQUARE is a rectangular figure with four equal sides; therefore to find the area of a square, consider the given quantity as the length, and another like quantity as the breadth, and proceed as before.

Find areas of squares, whose sides are of the following lengths.

(1)	5 ft. 3 in.	(6)	16 ft. 11 in. 5^{ii}
(2)	7 „ 4 „ 3^{ii}	(7)	2464 „ 11 „
(3)	19 „ 11 „	(8)	64 „ 3 „ 7^{ii} 5^{iii}
(4)	27 „ 3 „ 5^{ii}	(9)	9 „ 3 „ 3^{ii} 5^{iii} 4^{iv}
(5)	27 „ 10 „ 11^{ii}	(10)	1117 „ 4 „

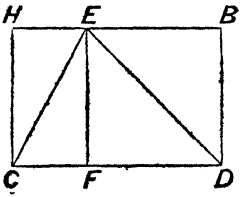
Definition.—A corner formed by two lines touching each other is called an ANGLE.

Definition.—When one line stands upon another exactly upright, it is said to be *perpendicular* to it, and the corners on each side are called RIGHT *angles.*

Definition.—A *rectangle,* or right-angled figure, has four right angles.

Definition.—A *triangle* is a figure with three angles and three sides.

HBDC is a rectangle; EBDF is a square; ECD, CEF, and FED are triangles; EF is perpendicular to CD. To find the area of HBDC, CD is multiplied by EF. But ECF is one half of HECF; and EFD is one half of EFDB, therefore the triangle CED is one half of HBDC, therefore,—



RULE :—To find the area of a triangle, multiply the length of one side by the number representing the length of the perpendicular drawn to it from the opposite angle, and divide the result by 2.

(1)	Side 54 ft. 9 in. 3^{ii}	perpendicular	57 ft. 4 in.
(2)	„ 36 „ 3 „ 4^{ii}	„	84 „ 3 „
(3)	„ 546 yds.	„	75 yds.
(4)	„ 445 „	„	171 „
(5)	„ 7 per. 3 yds.	„	25 „
(6)	„ 26 ft. 3 in.	„	14 ft. 11 in.
(7)	„ 7 „ 3 „ 2^{ii}	„	5 „ 7 „
(8)	„ 19 „ 7 „	„	15 „ 4 „
(9)	„ 216 „ 11 „	„	84 yds.
(10)	„ 764 yds.	„	564 „
(11)	„ 3164 „	„	8427 „
(12)	„ 16 ft. 4 in. 7^{ii}	„	5 ft. 3 in. 7^{ii}

TABLE SHOWING THE PART THAT ¼d., ETC., IS OF £1, ETC.

	of £1.	of 10s.	of 6s. 8d.	of 5s.	of 3s. 4d.	of 2s. 6d.	of 2s.	of 1s. 8d.	of 1s.	of 10d.
s. d.										
10 0	¼	...	...	...	...	...	...	...	...	...
6 8	⅓	...	...	...	...	...	...	...	...	...
5 0	⅖	¼	...	...	...	...	...	...	...	...
3 4	½	⅓	¼	...	...	...	...	...	...	...
2 6	⅔	½	...	¼	...	...	...	...	...	...
2 0	⅘	⅖	⅓	...	...	...	...	...	...	...
1 8	⅚	⅔	½	⅓	¼	...	...	...	...	...
1 4	1/6	⅚	⅔	...	...	...	...	...	...	...
1 3	1/5	¾	...	½	⅜	¼	...	...	...	...
1 0	1/4	1/5	¾	⅗	½	⅖	½	⅓	¼	...
0 10	1/3	1/4	⅚	⅔	½	⅖	½	⅓	¼	...
0 8	1/3	1/3	1/4	⅔	½	⅗	½	⅓	¼	...
0 7½	1/3	1/3	...	¾	½	⅗	½	⅓	¼	...
0 6	1/3	1/3	...	⅘	⅔	¾	½	⅓	¼	...
0 5	1/4	1/4	1/5	1/6	½	⅗	½	⅓	¼	¼
0 4	1/5	1/5	1/6	1/6	⅓	⅖	½	⅓	¼	¼
0 3	1/6	1/6	...	1/6	...	⅓	⅓	⅓	¼	¼
0 2	1/10	1/10	1/10	1/10	1/10	1/6	⅓	⅓	¼	¼
0 1	1/20	1/20	1/20	1/20	1/20	1/10	1/6	⅓	¼	1/10
0 0½	1/40	1/40	1/40	1/40	1/40	1/20	1/10	1/6	1/6	1/10
0 0¼	1/80	1/80	1/80	1/80	1/80	1/40	1/20	1/10	1/6	1/10

TABLE OF WAGES, ETC., FROM £1 TO £150 PER ANNUM.

Y.	Pr M.	Pr W.	Pr D.	Y.	Per M.	Pr. W.	Pr. D	Y.	Per M.	Per W.	Pr. D.
£	s. d.	s. d	s. d	£	£ s. d.	s. d	s. d	£	£ s. d.	£ s. d.	s. d.
1	1 8	0 4½	0 0¼	11	0 18 4	4 2½	0 7½	30	2 10 0	0 11 6½	1 7½
2	3 4	0 9½	0 1½	12	1 0 0	4 7½	0 8	40	3 6 8	0 15 4	2 2½
3	5 0	1 1½	0 2	13	1 1 8	5 0	0 8½	50	4 3 4	0 19 2	2 9
4	6 8	1 6½	0 2½	14	1 3 4	5 4½	0 9½	60	5 0 0	1 3 0	3 3½
5	8 4	1 11	0 3½	15	1 5 0	5 9	0 10	70	5 16 8	1 6 11	3 10
6	10 0	2 3½	0 4	16	1 6 8	6 1½	0 10½	80	6 13 4	1 10 9½	4 4½
7	11 8	2 8½	0 4½	17	1 8 4	6 6½	0 11½	90	7 10 0	1 14 7½	4 11½
8	13 4	3 0½	0 5½	18	1 10 0	6 11	0 11½	100	8 6 8	1 18 5½	5 5½
9	15 0	3 5½	0 6	19	1 11 8	7 3½	1 0½	125	10 8 4	2 8 0½	6 10½
10	16 8	3 10	0 6½	20	1 13 4	7 8½	1 1½	150	12 10 0	2 17 6½	8 2½

THE RATE PER CENT. ON A POUND AND A SHILLING, FROM ¼ TO 10 PER CENT.

Per cent.	In the £.		In the s.	Per cent.	In the £.		In the s.
	s.	d.	d.		s.	d.	d.
¼ is ...	0	0 1/20	1/240	3¼ is ...	0	9	¾
½	0	0 1/10	1/120	5	1	0	1
¾	0	1½	1/80	6¼	1	3	1¼
1	0	2	1/60	7½	1	6	1½
1¼	0	2½	1/48	8¾	1	9	1¾
1½	0	3	1/40	10	2	0	2
1¾	0	3½	1/34				
2	0	4	1/30				
2½	0	5	1/24				
2¾	0	5½	1/22				
3	0	6	1/20				

THE

STANDARD MANUAL

OF

ARITHMETIC,

(THEORETICAL AND PRACTICAL).

PART VII.

(Containing the Higher Rules).

DEFINITIONS OF FRACTIONS.*

If 1 stand for any specific quantity, say 1 lb., it is possible to divide it into parts. Suppose these to be equal; if you divided the whole into 5 parts, two would be represented by $\frac{2}{5}$ (expressed two-fifths), one by $\frac{1}{5}$, and so on; the whole by $\frac{5}{5}$. Each of these parts is called a *fraction*.

☞ A fraction is expressed by two numbers placed one over the other with a line between them: the upper is called the *numerator* and the lower the *denominator*.

The denominator shows into how many equal parts the whole is divided; the numerator, how many of these parts are taken.

For example: $\frac{4}{5}$ shows that the unit is divided into 5 parts; and that 4 of them only are taken.

Also a fraction represents the numerator as being divided by the denominator: that is, $\frac{4}{5}$ is the same as $4 \div 5$.

When the denominator of the fraction may be any number, it is called a *vulgar fraction*; when the denominator is 10 or some multiple of 10, it is called a *decimal fraction*.

Vulgar fractions are divided into **proper fractions; improper fractions; mixed numbers; compound fractions; complex fractions.**

A **proper** fraction is a part of unity, and therefore the numerator is *less* than the denominator, as $\frac{3}{4}$, $\frac{7}{10}$.

An **improper** fraction has its numerator either *equal to* or *greater* than the denominator, as $\frac{8}{8}$, $\frac{9}{5}$.

A **mixed** number is formed of a whole number and a fraction, as, $3\frac{5}{8}$, $14\frac{6}{7}$.

A **compound** fraction is a fraction of a fraction, as $\frac{3}{4}$ of $\frac{5}{6}$.

A **complex** fraction is one in which either the numerator or denominator, or both, are fractions, as $\frac{2\frac{1}{2}}{5}$, $\frac{4}{6\frac{1}{4}}$, $\frac{3\frac{1}{3}}{2\frac{1}{8}}$.

NOTE.—Any whole *number may be expressed in a fractional* form by placing 1 under it, thus $5 = \frac{5}{1}$.

* This page should be written out and learnt by heart.

INTRODUCTION TO VULGAR FRACTIONS.*

GENERAL REMARKS.—In teaching Fractions, the pupil should learn, in the first place, what is the *meaning* of a half, a third, a fourth, a fifth, and so on. This is to be done by drawing under each other on the black board, a number of straight lines of the same length, and dividing the first into two equal parts, the second into three, the third into four, and so on. He will thus *see* that a *third* means one of the parts of a thing which has been divided into three equal parts, just as a *half* means one of the parts of a thing which has been divided into two equal parts, and so on. In the next place, he will perceive that as two halves make a whole, so three thirds make a whole, and four fourths make a whole, and so on. From this he will be led to see that

2 halves
3 thirds
4 fourths
5 fifths
6 sixths
7 sevenths } of the same thing are equal to each other.
8 eighths
9 ninths
10 tenths
11 elevenths
12 twelfths

The pupil should then be exercised in adding, subtracting, multiplying, and dividing fractions, and all this, as yet, orally and without using figures, but constantly referring to the divided lines on the black board. He should be taught to count up (or add) a certain number—say of sevenths—and to state that they make two, three, or four sevenths, as the case may be. He should then be made to take away (or subtract) a certain number—say of sevenths from some other number of sevenths, and to state how many are left. In the next place, he will have no difficulty in seeing that (applying multiplication) twice a seventh means merely two sevenths, and that thrice two sevenths make six sevenths. So, lastly (as to division), he will understand, for example, that $\frac{4}{7} \div \frac{2}{7} = 2$, *i.e.*, that $\frac{2}{7}$ *are contained* twice in $\frac{4}{7}$. These exercises should be continued till the pupil is quite familiar with the expressions two thirds, three fourths, two fifths, &c., which he should then be required to write, in words and figures, on his slate. To add or subtract fractions with *different denominators*, to multiply a fraction by *a fraction*, to divide a fraction by *a whole number*, or by *a fraction with a different denominator* —these and other points should not be explained to the pupil at present.

* These remarks are taken from the Hand-book to the "Calculator," which presents every facility for *securely* effecting the objects alluded to.

Section XLII.

GREATEST COMMON MEASURE.

One number is said to measure another, when it will divide it without a remainder. Thus, 4 is a measure of 8, because 4 is contained twice exactly in 8.

A Common Measure of two or more numbers is one that will divide each of them without a remainder. Thus, 3 is a common measure of 6 and 9, because 3 will divide both numbers without a remainder.

One number is said to be the Greatest Common Measure of two or more numbers, when it is the highest number that will divide each and all of them without a remainder. Thus, 6 is the G.C.M. of 12, 18, 24.

If the G. C. M. cannot be found readily by inspection, then :—

Rule.—**Divide the greater number by the less: if there be any remainder make this the new divisor, and the last divisor the new dividend; and so on till you have no remainder. The last divisor will be the G. C. M.**

Example.—Find the G.C.M. of 825 and 960.

```
825) 960 ( 1
     825
     ---
135) 825 ( 6
     810
     ---
 15) 135 ( 8
     120
     ---
 15) 15 ( 1
     15
     --
```

Therefore 15 is the G.C.M. of 825 and 960.

Find the G. C. M. of

(1)	1254 and 2568.	(12)	119 and 153.
(2)	4170 and 7506.	(13)	208 and 304.
(3)	1725 and 900.	(14)	225 and 285.
(4)	960 and 1152.	(15)	478 and 1190.
(5)	2724 and 4540.	(16)	12699 and 25848.
(6)	1254 and 1518.	(17)	854 and 1974.
(7)	2250 and 5250.	(18)	1811 and 8787.
(8)	3927 and 7293.	(19)	6672 and 11079.
(9)	814 and 1554.	(20)	3223 and 27467.
(10)	270 and 540.	(21)	2736 and 3612.
(11)	361 and 570.	(22)	3717 and 7209.

SECTION XLIII.

LEAST COMMON MULTIPLE.

If one number contains another an exact number of times, it is said to be a Multiple of that number. Thus, 10 is a multiple of 2.

A Common Multiple of two or more numbers is one which contains each of these an exact number of times. Thus, 24 is a common multiple of 2, 3, 4, 6, and 8.

The Least Common Multiple of two or more numbers, is the least number that contains each of these numbers an exact number of times.

Thus, 48 is the Least Common Multiple of 8, 12, and 16.

To find the Least Common Multiple of several numbers:

RULE.—**Arrange the numbers in a line, then strike out all that are contained in any of the others. Next divide all the remaining numbers that have a Common Measure by that Common Measure, and place the Quotients with the undivided numbers in a line below. Proceed thus with the new line; and so on, till you have a line of numbers no two of which have a common measure greater than unity.**

Then the continued product of the divisors and the numbers in the last line will be the L. C. M.

EXAMPLE:—Find the L. C. M. of 5, 6, 12, 15, 24, 30.

6 | [5], [6], [12], [15], 24, 30

4, 5

Having placed the numbers in a row, we find that 5 and 15 are contained in 30, and 6 and 12 in 24; we therefore cross them out. Next, dividing 24 and 30 by the common measure 6, we get 4 and 5, and as these have no common measure greater than unity, we proceed to find the continued product of $4 \times 5 \times 6 = 120$, which is the L. C. M. required.

Find the Least Common Multiple of

(1) 4, 6, 8
(2) 5, 15, 40
(3) 2, 8, 16, 18
(4) 5, 20, 30, 45
(5) 4, 3, 50, 12
(6) 6, 16, 24, 18
(7) 3, 9, 12, 18, 21
(8) 4, 16, 24, 32, 36
(9) 5, 15, 25, 35, 40
(10) 6, 12, 48, 72, 144
(11) 1, 2, 5, 8, 4, 9
(12) 12, 14, 18, 24, 30
(13) 5, 7, 9, 11, 30
(14) 4, 12, 48, 72, 100
(15) 1, 2, 3, 4, 5, 6, 7, 8
(16) 4, 12, 50, 36, 63
(17) 2, 9, 18, 72, 64
(18) 12, 20, 30, 42, 56, 64
(19) 9, 11, 14, 18, 27, 81
(20) 7, 21, 56, 84, 210, 301

SECTION XLIV.

REDUCTION OF FRACTIONS.

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

RULE.—**Multiply the whole number by the denominator, add the numerator, and place the denominator under the sum.**

EX.:—$5\frac{3}{8} = \frac{43}{8}$, for $5 = \frac{5\times8}{8} = \frac{40}{8}$ and $\frac{40+3}{8} = \frac{43}{8}$

Express the following mixed numbers as improper fractions.

(1—4) $4\frac{1}{4}$, $7\frac{5}{6}$, $8\frac{4}{3}$, $9\frac{3}{8}$ (5—8) $12\frac{4}{5}$, $7\frac{4}{11}$, $18\frac{5}{6}$, $19\frac{7}{12}$

(9—12) $24\frac{150}{168}$, $1175\frac{5}{9}$, $141\frac{17}{20}$ (13—16) $141\frac{13}{15}$, $178\frac{12}{19}$, $1000\frac{1}{6}$, $1916\frac{11}{15}$

17. A boy had $90\frac{1}{4}$ oranges: how many quarters could he cut them into?

18. How many children would $1000\frac{2}{3}$ loaves serve, giving each one third of a loaf?

19. It takes one fifth of a yard of cloth to make a soldier's cap: how many caps could you get out of $1120\frac{4}{5}$ yards?

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

RULE.—**Divide the numerator by the denominator; the quotient will be the whole number; and the remainder, if any, the numerator of the fraction.**

EX.:—$\frac{15}{4} = 3$ and $\frac{3}{4}$ over; that is, $\frac{15}{4} = 3\frac{3}{4}$.

Express the following as mixed numbers:—

(1—4) $\frac{44}{5}$, $\frac{81}{6}$, $\frac{174}{8}$, $\frac{200}{4}$.

(5—8) $\frac{109}{7}$, $\frac{830}{5}$, $\frac{1710}{4}$, $\frac{2100}{10}$.

(9—12) $\frac{1008}{15}$, $\frac{6154}{34}$, $\frac{3100}{150}$, $\frac{81176}{170}$.

(13—16) $\frac{9000}{100}$, $\frac{81500}{25}$, $\frac{93685}{1210}$, $\frac{75464}{244}$.

The value of a fraction is not altered by multiplying or dividing both the numerator and denominator by the same quantity.

Thus $\frac{3}{4}\times\frac{2}{2} = \frac{6}{8}$, and $\frac{6}{8}\div\frac{2}{2} = \frac{3}{4}$. But by a reference to the following line it will be seen, that $\frac{6}{8}$ and $\frac{3}{4}$ are the same quantity, for AC is $\frac{3}{4}$ of AB; AC is also $\frac{6}{8}$ of AB; therefore $\frac{6}{8} = \frac{3}{4}$.

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

RULE.—**Divide the numerator and denominator by their G.C.M.; the quotients will form the required fraction.**

EX.:—$\frac{15}{30}$ G.C.M. is 15. $\frac{15}{30} \div \frac{15}{15} = \frac{1}{2}$.

Reduce the following fractions to their lowest terms:—

(1—4) $\frac{6}{12}$, $\frac{9}{15}$, $\frac{12}{18}$, $\frac{15}{35}$.

(5—8) $\frac{17}{34}$, $\frac{21}{81}$, $\frac{45}{150}$, $\frac{81}{900}$.

(9—12) $\frac{72}{364}$, $\frac{52}{104}$, $\frac{63}{840}$, $\frac{90}{1000}$.

(13—16) $\frac{440}{1080}$, $\frac{34655}{85985}$, $\frac{714}{2424}$, $\frac{5000}{08455}$.

Before fractions can be added, subtracted, or in any way compared, it is necessary to reduce them to equivalent fractions having a denominator common to all.

Thus, the sum of $\frac{3}{4}$ and $\frac{2}{3}$ are neither $\frac{5}{4}$ nor $\frac{5}{3}$, and the difference is neither $\frac{1}{4}$ nor $\frac{1}{3}$. But as soon as they are brought to a *common denominator*, and expressed as $\frac{9}{12}$ and $\frac{8}{12}$, we find that their sum is $\frac{17}{12}$ and their difference $\frac{1}{12}$.

CASE IV.—*To reduce fractions to a common denomination.*

Rule.—**Find the least common multiple of all the denominators; this will be the common denominator. Divide the common denominator by the denominator of each fraction, and multiply the numerator of each fraction by the quotient, and the result will be the numerator of the new fraction.**

EX.—Reduce $\frac{3}{4}$, $\frac{5}{6}$ and $\frac{3}{8}$ to a common denominator.

The L. C. M. of 4, 6, and 8 is 24.

Then $\frac{3}{4} = \frac{3 \times 6}{4 \times 6} = \frac{18}{24}$; $\frac{5}{6} = \frac{5 \times 4}{6 \times 4} = \frac{20}{24}$; $\frac{3}{8} = \frac{3 \times 3}{8 \times 3} = \frac{9}{24}$.

$\therefore$ $\frac{3}{4}$, $\frac{5}{6}$ and $\frac{3}{4}$, $= \frac{18}{24}$, $\frac{20}{24}$ and $\frac{9}{24}$.

Note.—From the example it will be seen that this rule is based on a principle already stated, viz.:—*The value of a fraction is not altered by multiplying both numerator and denominator by the same number.* For in each instance *both* terms of the fraction have been multiplied by such a number as will result in a denominator of 24.

Reduce to their least common denominators:—

(1) $\frac{1}{2}$, $\frac{3}{4}$, $\frac{5}{6}$.

(2) $\frac{4}{5}$, $\frac{1}{10}$, $\frac{4}{13}$.

(3) $\frac{5}{6}$, $\frac{1}{3}$, $\frac{3}{4}$, $\frac{7}{5}$.

(4) $\frac{7}{8}$, $\frac{4}{5}$, $\frac{7}{10}$, $\frac{9}{20}$.

(5) $\frac{1}{3}$, $\frac{5}{12}$, $\frac{3}{5}$, $\frac{6}{7}$.

(6) $\frac{9}{10}$, $\frac{14}{15}$, $\frac{19}{20}$, $\frac{4}{5}$.

(7) $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{7}{8}$, $\frac{9}{10}$.

(8) $\frac{17}{90}$, $\frac{7}{80}$, $\frac{18}{21}$, $\frac{140}{144}$.

(9) $\frac{1}{2}$, $\frac{14}{112}$, $\frac{21}{144}$, $\frac{17}{90}$.

(10) $\frac{6}{10}$, $\frac{7}{100}$, $\frac{9}{1000}$, $\frac{17}{10000}$, $\frac{27}{100000}$

Section XLV.

Case V.—ADDITION OF VULGAR FRACTIONS.

Rule.—**Reduce the fractions to their least common denomination, then add together the numerators, and under the sum write the common denominator.**

Ex.:—Find the value of $2\frac{3}{4} + 4\frac{4}{5} + 6\frac{1}{2} + 4$.

By Case IV. we find that $\frac{3}{4} + \frac{4}{5} + \frac{1}{2} = \frac{15}{20} + \frac{16}{20} + \frac{10}{20} = \frac{15+16+10}{20} = \frac{41}{20} = 2\frac{1}{20}$, $\therefore 2 + 4 + 6 + 4 + 2\frac{1}{20} = 18\frac{1}{20}$.

Find the value of the following:—

(1) $\frac{1}{2} + \frac{1}{4} + \frac{4}{5}$. (2) $\frac{3}{5} + \frac{1}{6}$. (3) $\frac{5}{6} + \frac{4}{9}$. (4) $\frac{1}{6} + \frac{3}{4} + \frac{1}{2} + \frac{2}{3}$.

(5) $\frac{1}{12} + \frac{3}{5} + \frac{1}{4} + \frac{2}{3}$. (6) $\frac{41}{15} + \frac{7}{30} + \frac{4}{5} + \frac{3}{10}$. (7) $1\frac{1}{3} + 9\frac{4}{5} + 12$.

(8) $7\frac{1}{6} + 8\frac{5}{8} + \frac{3}{4}$. (9) $1\frac{1}{7} + \frac{3}{21} + 5 + 8\frac{5}{14}$. (10) $9\frac{1}{9} + 18 + 7\frac{7}{18} + 1\frac{1}{6}$.

(11) $\frac{1}{2}$ of $\frac{4}{5}$ of $\frac{5}{6} + \frac{5}{9} + \frac{1}{4}$. (12) $\frac{4}{5} + \frac{1}{2}$ of $\frac{6}{7} + 9 + 1\frac{1}{12}$.

(13) $1\frac{1}{7}$ of $\frac{14}{15} + 4 + 1\frac{1}{8}$.

14. A boy begging received 2 loaves, $1\frac{1}{2}$ loaves, $\frac{5}{8}$ and $\frac{3}{4}$ of a loaf: how much bread had he?

15. A man bought the following lengths of cloth:—$9\frac{1}{8}$ yards, $\frac{1}{2}$ of $\frac{4}{5}$ yd, $17\frac{1}{10}$ yds, and two pieces each half a yard: find the length of cloth bought.

16. A boy had the following parts of an apple:—$\frac{5}{8}$, $\frac{1}{6}$, $\frac{7}{10}$, $\frac{9}{14}$: how many whole ones would these represent?

17. Add together half a crown, $2\frac{4}{5}$d., $18\frac{5}{6}$d., $3\frac{1}{3}$d., and 9s. $6\frac{1}{4}$d., and find the amount.

18. Find the sum of £1 10s. $9\frac{4}{5}$d., £11 16s. $4\frac{3}{4}$d., £17 11s. $8\frac{3}{10}$d., and 10 guineas.

19. Add $16\frac{1}{4}$d., $18\frac{4}{5}$d., $19\frac{11}{12}$d., and $4\frac{1}{10}$d.

20. Find the value of £19 19s $6\frac{1}{2}$d, £18 17s $9\frac{3}{4}$d, £17 11s $11\frac{4}{5}$d, and £18 18s $11\frac{7}{10}$d.

Section XLVI.

SUBTRACTION OF VULGAR FRACTIONS.

Case VI.

Rule.—**Bring the fractions to a common denomination; subtract the less numerator from the greater, and place the common denominator under the difference.**

Ex.—From $12\frac{1}{5}$ take $8\frac{1}{6}$.

$$12\tfrac{1}{5} - 8\tfrac{1}{6} = \tfrac{61}{5} - \tfrac{49}{6} = \tfrac{366}{30} - \tfrac{245}{30} = \tfrac{366-245}{30} = \tfrac{121}{30} = 4\tfrac{1}{30}.$$

Find the value of—

(1—5) $\frac{1}{2} - \frac{1}{10}$; $\frac{5}{6} - \frac{3}{4}$; $\frac{3}{6} - \frac{1}{10}$; $\frac{7}{12} - \frac{3}{4}$; $\frac{4}{5} - \frac{6}{15}$.

(6—10) $1\frac{1}{3} - \frac{4}{5}$; $8 - 1\frac{11}{12}$; $9\frac{9}{10} - 8\frac{4}{5}$; $17\frac{1}{7} - 14\frac{1}{5}$; $19\frac{1}{9} - 12\frac{1}{12}$

(11) A man bought a ship, and sold $\frac{5}{6}$, find what was left.

(12) A boy gathered $9\frac{4}{5}$ pecks of mushrooms, and sold $4\frac{3}{7}$ pecks; how many remained?

(13) A boy bought 5 lbs. of butter at one farm, and $11\frac{3}{5}$ lbs. at another, and then sold $13\frac{1}{3}$ lbs.: how much had he left?

(14) From £119 11s. $8\frac{1}{2}$d. take £17 19s. $8\frac{3}{4}$d.

(15) A boy bought 90 yds. 2 ft. $9\frac{1}{2}$ in. of string for his kite, and sold 20 yds. 1 ft. $10\frac{1}{2}$ in.: what remained?

Section XLVII.

MULTIPLICATION OF VULGAR FRACTIONS.

Case VII.

Rule.—**Multiply all the numerators together for a new numerator, and all the denominators for a new denominator.**

Ex.—Find the value of $1\frac{1}{3} \times \frac{3}{5}$.

$$1\tfrac{1}{3} \times \tfrac{3}{5} = \tfrac{1}{3} \times \tfrac{3}{5} = \tfrac{1 \times 3}{3 \times 5} = \tfrac{12}{15} = \tfrac{4}{5}$$

Note.—The pupil should be taught to *cancel* or cut out the factors common to the numerator and denominator. By doing so, much time and many figures are often saved. Thus, in the example: if the 3, which is common to both terms of the fraction, had been crossed out, the ans. $\frac{4}{5}$ would have been found *at once*.

To understand the rule for Multiplying Vulgar Fractions, it is necessary to remember what it is to multiply, viz.:—*To do to the Multiplicand whatever has been done to unity to make the multiplier.* But to make $\frac{3}{5}$ *one* has been divided by 5 and multiplied by 3. Therefore $\frac{4}{3}$ must be divided by 5 and multiplied by 3. This is what has been done; for we divide a fraction by multiplying its denominator, and we multiply a fraction by multiplying its numerator.

This latter statement may be made clear by a simple example. Take—say $\frac{1}{2}$—multiply the denominator by 4, and we get $\frac{1}{8}$, or the *fourth* part of $\frac{1}{2}$. Again, multiply the numerator by 4, and we get $\frac{4}{2}$, or 2, or *four times* $\frac{1}{2}$.

Find the value of

(1) $1\frac{1}{2} \times \frac{4}{5}$. (2) $\frac{1}{2} \times \frac{4}{9} \times \frac{3}{7}$. (3) $1\frac{1}{7} \times 1\frac{4}{15} \times 1\frac{1}{4}$. (4) $1\frac{7}{9} \times \frac{9}{18} \times \frac{5}{10} \times \frac{5}{9}$.

(5) $7 \times \frac{1}{14} \times 5\frac{1}{2} \times \frac{4}{11} \times \frac{7}{10}$. (6) $8\frac{1}{3} \times \frac{1}{15} \times \frac{9}{10} \times \frac{12}{13}$.

(7) $1\frac{1}{3} \times \frac{1}{8} \times 9 \times \frac{7}{12} \times 9\frac{9}{10}$ (8) $\frac{1}{2}$ of $\frac{1}{6} \times \frac{12}{15}$ of $\frac{3}{7}$ of $1\frac{4}{7}$.

(9) $9\frac{1}{5}$ of $\frac{1}{12}$ of $\frac{7}{10} \times 1\frac{1}{3}$ of $5\frac{1}{8}$ of $7\frac{1}{5}$ of $1\frac{1}{3}$. (10) £6 11s $8\frac{1}{9}$d $\times$ 8.

(11) £17 19s $9\frac{5}{6}$d. $\times$ 12. (12) £18 18s $9\frac{4}{5} \times$ 100. (13) $100\frac{4}{5}$d $\times$ 90.

(14) Increase £17 11s $8\frac{5}{12}$d. eighty times, and subtract the result from £2000.

SECTION XLVIII.

DIVISION OF VULGAR FRACTIONS.

CASE VIII.

RULE.—**Invert the divisor, and proceed as in Multiplication.**

Ex.:—Divide $5\frac{4}{5}$ by $\frac{3}{7}$.

$$5\frac{4}{5} \div \frac{3}{7} = \frac{29}{5} \div \frac{3}{7} = \frac{29}{5} \times \frac{7}{3} = \frac{29 \times 7}{5 \times 3} = \frac{203}{15} = 13\frac{8}{15}.$$

The reason for this rule is evident, if we remember that to divide, *is to find how many times, or parts of a time, the divisor is contained in the dividend.* Now 1 is contained $5\frac{4}{5}$ times in $5\frac{4}{5}$; and, as $\frac{1}{7}$ is contained 7 times in 1, $\frac{1}{7}$ is contained 7 times $5\frac{4}{5}$ in $5\frac{4}{5}$. But $\frac{3}{7}$ is contained in $5\frac{4}{5}$ only $\frac{1}{3}$ as many times as $\frac{1}{7}$. Therefore, to find how many times $\frac{3}{7}$ is contained in $5\frac{4}{5}$ or $\frac{29}{5}$, we must multiply $\frac{29}{5}$ by 7 and divide it by 3, which we do when we invert the divisor, and proceed as in Multiplication.

Find the value of

(1) $\frac{1}{5} \div \frac{9}{15}$ (2) $\frac{7}{10} \div \frac{3}{5}$ (3) $\frac{8}{11} \div \frac{1}{22}$ (4) $\frac{9}{10} \div \frac{6}{20}$ (5) $\frac{3}{8} \div \frac{7}{40}$ (6) $1\frac{1}{3} \div \frac{7}{3}$

(7) $9\frac{7}{10} \div \frac{1}{100}$ (8) $11\frac{1}{5} \div 4\frac{1}{15}$ (9) $9\frac{1}{3} \div \frac{4}{9}$ (10) $112 \div 8\frac{1}{15}$.

(11) $17\frac{1}{4} \div \frac{23}{24}$ (12) $\frac{1}{2}$ of $\frac{4}{5}$ of $\frac{15}{16} \div 9$ (13) $\frac{4}{5}$ of $\frac{10}{12}$ of $\frac{5}{6} \div 1\frac{1}{8}$ of $5\frac{1}{2}$.

(14) Divide $9\frac{1}{3}$ loaves amongst 4 poor boys, and find the share of each.

(15) What fraction of £$100\frac{1}{12}$ would each of 9 boys obtain if it was divided equally among them?

Section XLIX.

Case IX.—*To reduce a complex fraction to a simple one.*

Rule.—**Multiply the extremes together for a new numerator, and the means for a new denominator.**

Ex.—Reduce $\frac{4\frac{1}{5}}{6\frac{3}{4}}$ to a simple fraction.

$$\frac{4\frac{1}{5}}{6\frac{3}{4}} = \frac{\frac{21}{5}}{\frac{27}{4}} = \frac{21 \times 4}{5 \times 27} = \frac{84}{135} = \frac{28}{45}.$$

For $\frac{4\frac{1}{5}}{6\frac{3}{4}} = 4\frac{1}{5} \div 6\frac{3}{4} = \frac{21}{5} \div \frac{27}{4} = \frac{21}{5} \times \frac{4}{27} = \frac{84}{135} = \frac{28}{45}$.

Reduce the following to simple fractions—

(1) $\frac{\frac{1}{2}}{\frac{4}{5}}$ (2) $\frac{\frac{5}{6}}{\frac{7}{8}}$ (3) $\frac{\frac{1}{9}}{\frac{1}{5}}$ (4) $\frac{8\frac{1}{2}}{\frac{3}{5}\frac{4}{5}}$ (5) $\frac{6\frac{1}{2}}{\frac{2}{2}\frac{6}{8}}$ (6) $\frac{4}{9\frac{1}{2}}$ (7) $\frac{8}{9\frac{1}{3}}$ (8) $\frac{4\frac{1}{5}}{2\frac{1}{1}}$ (9) $\frac{7\frac{4}{5}}{8\frac{1}{15}}$

(10) $\frac{1\frac{1}{3} \text{ of } \frac{1}{8}}{6}$ (11) $\frac{\frac{1}{2} \text{ of } \frac{6}{7}}{\frac{3}{4} \text{ of } \frac{8}{9}}$ (12) $\frac{\frac{1}{2} \text{ of } \frac{8}{9} \text{ of } \frac{9}{1}}{12}$ (13) $\frac{6\frac{1}{3} \text{ of } \frac{1}{10} \text{ of } \frac{9}{10} \text{ of } 20}{1\frac{1}{2} \text{ of } \frac{6}{7} \text{ of } 1\frac{4}{15} \text{ of } 5}$

Section L.

Case X.—*To find the value of any fractional part of a given quantity.*

Rule. **Divide the given quantity by the denominator, and multiply by the numerator.**

Ex.—Find the value of $\frac{5}{6}$ of £1.

$\frac{1}{6}$ of £1 = £1 ÷ 6, ∴ $\frac{5}{6}$ of £ = $\frac{1 \times 5}{6}$ = 16s. 8d.

Find the value of

(1) $\frac{1}{8}$ of £1; $\frac{9}{10}$ of 12/-; $\frac{4}{5}$ of £2; $\frac{6}{7}$ of 1 guinea; $\frac{8}{9}$ of 18s. 9d.; $\frac{7}{12}$ of 16s. 0d.

(2) $\frac{5}{8}$ of 30/-; $\frac{5}{11}$ of 22/-; $\frac{8}{9}$ of £10 10s.; $\frac{5}{7}$ of 20 guineas; $\frac{4}{5}$ of £8 10s. 9½d.

(3) $\frac{3}{20}$ of 100 guineas; $\frac{3}{5}$ of £11 9s. 9½d.; $\frac{1}{120}$ of £100.

(4) $4\frac{1}{3}$ of £1; $6\frac{3}{4}$ of 12s. 6d.; $8\frac{1}{8}$ of £9 10s. 9d.; $6\frac{7}{10}$ of £1 12s. 10d.

(5) $\frac{1}{2}$ of $\frac{5}{6}$ of $\frac{8}{10}$ of £1; $6\frac{1}{8}$ of $\frac{1}{38}$ of 2 guineas; $1\frac{1}{4}$ of $5\frac{1}{2}$ of 30/-

(6) $\frac{4}{5}$ ton; $\frac{4}{9}$ of 10 cwt.; $\frac{5}{6}$ of 2 lbs. troy; $\frac{7}{10}$ of 2 oz. troy; $\frac{1}{2}$ of $\frac{4}{5}$ of $\frac{10}{12}$ of 10 tons.

(7) $\frac{3}{4}$ of a mile; $\frac{5}{11}$ of 12 yds. of cloth; $\frac{7}{8}$ of 3 fur.; $\frac{1}{2}$ of $\frac{4}{5}$ of 5 ac.

(8) $\frac{1\frac{1}{2} \text{ of } \frac{1}{6}}{9}$ of £1; $\frac{1\frac{1}{5} \text{ of } \frac{10}{12}}{\frac{3}{4} \text{ of } \frac{8}{9}}$ of £2; $1\frac{1}{6} \times \frac{1}{14}$ of $\frac{12}{15}$ of 10 guineas.

(9) $\frac{1}{2} + \frac{5}{6}$ of 12/- + $\frac{7}{6}$ of 14/-; $\frac{9}{10}$ guinea + $\frac{3}{7}$ of 2 guineas + $1\frac{1}{3}$ of 9/6

(10) $\frac{3}{4}$ of £2 + $\frac{8}{9}$ of 27/9 + $1\frac{1}{5}$ of 10/-: $1\frac{1}{3}$ of 1/- + $1\frac{5}{6}$ of 80/- — $\frac{1}{4}$ of 4d.

(11) $\frac{5}{6}$ of a ton + $\frac{1\frac{1}{2}}{11}$ cwt. + $\frac{4}{10}$ lb.; $1\frac{1}{3}$ yds. + $\frac{5}{6}$ of a mile + $\frac{8}{10}$ of 2 furlongs.

(12) $\frac{4}{9}$ lb. troy + $\frac{4}{5}$ oz. troy + $1\frac{1}{2}$ dwt.; $5\frac{1}{4}$ yds. cloth + $\frac{1}{6}$ qr + $1\frac{1}{3}$ yds

SECTION LI.

CASE XI.—*To reduce one quantity to the fraction of another quantity.*

RULE—**Bring both to the same denomination; then the former will be the numerator and the latter the denominator of the required fraction.**

EX.—Reduce 3s. 5d. to the fraction of 10s.

3/5 = 41 pence; 10/- = 120 pence; ∴ 3/5 is $\frac{41}{120}$ of 10/-

For 1d. is $\frac{1}{120}$ of 10/; ∴ 3/5 or 41d. must be $\frac{41}{120}$ of 10/-

Reduce

(1) 6s. 8d. to the fr. of £1
(2) $1\frac{3}{4}$d. „
(3) £3 15s. „
(4) 15s. $4\frac{3}{4}$d. „
(5) $11\frac{3}{4}$d. „
(6) 27 lbs. „
(7) 27 hrs. to the fr. of 1 week.
3s.4d. (8) 3 gals. 2 qts. „ 1 hhd. of wine.
£1 8s. (9) 4 furlongs „ $17\frac{1}{2}$ miles.
10s. (10) 5 ft. 7 in. „ 1 yard.
£1 7s 6d (11) 7 tons 15 cwt „ 1 qr.
5 cwt. (12) 2 a. 3 r. 27 p. „ 12 acres.

SECTION LII.

CASE XII.—*To reduce a fraction of one given quantity to the fraction of another.*

RULE (*a*).—**If the fraction is to be altered from a lower name to a higher; multiply the denominator by as many of the less as make one of the greater.**

If the fraction is to be altered from a higher name to a lower; multiply the numerator by as many of the less as make one of the greater.

Ex. I.—Reduce $\frac{5}{6}$ of a penny to the fraction of £1.

1d. = $\frac{1}{240}$ of £1 ∴ $\frac{5}{6}$d. = $\frac{5}{6}$ of $\frac{1}{240}$ of £1 = $\frac{5}{6 \times 240}$ = $\frac{5}{1440}$ = $\frac{1}{288}$.

Ex. II.—Reduce $\frac{3}{8}$ of a pound to the fraction of an ounce.

1 lb. = $\frac{16}{1}$ of an ounce ∴ $\frac{3}{8}$ of a pound = $\frac{3}{8}$ of $\frac{16}{1}$ of an ounce = $\frac{3 \times 16}{8}$ = $\frac{48}{8}$ = 6.

RULE (*b*)—**Reduce the given quantity to the fraction of the other given quantity, by Case XI.; then take the fraction of that fraction.**

Ex. Reduce $\frac{3}{4}$ of 4s. 3d. to the fraction of 7s. 8½d.

4s. 3d. = $\frac{102}{185}$ of 7s. 8½d.

∴ $\frac{3}{4}$ of 4s. 3d. = $\frac{3}{4}$ of $\frac{102}{185}$ = $\frac{153}{370}$ of 7s. 8½d.

NOTE.—The second rule must be applied when the one quantity is not contained in the other an exact number of times.

Reduce

(1) $\frac{5}{6}$ of a shilling to the fr. of £1
(2) $\frac{3}{10}$ of a crown „ 15s
(3) $\frac{1}{3}$ of 17s 6d „ 7s 6d
(4) $\frac{5}{8}$ of a day „ 3½ weeks
(5) $\frac{7}{12}$ of a yard „ ⅜ of a ml
(6) $\frac{23}{24}$ of a cwt „ 5¼ tons
(7) $\frac{3}{5}$ of a rood „ 17½ acres
(8) $\frac{1}{6}$ of an acre „ 1 sq mile

(9) $\frac{5}{9}$ of a penny to the fr. of 1 far
(10) $\frac{5}{17}$ of a £ „ 5s
(11) 7¼ of 5s „ 1s 6d
(12) $\frac{4}{7}$ of a mile „ ½ a furl
(13) $\frac{3}{11}$ of a year „ 5 weeks
(14) $\frac{17}{18}$ of a quarter „ 2 pecks
(15) $\frac{5}{6}$ of £1 10s 6d „ $\frac{1}{13}$ of £1 6s
(16) $\frac{19}{20}$ of a mile „ 1 yard

17. If $\frac{3}{7}$ of a ship cost £540$\frac{9}{13}$, what is the value of $\frac{9}{16}$ of the ship?

18. If 2½ lbs. of coffee cost 4s. 2d., what must I pay for 39⅜ lbs.?

19. Two pieces of cloth, each 39$\frac{5}{16}$ yards, cost 3¾d. per yard; what was paid for the whole?

20. Required the value of 123$\frac{4}{17}$ cwts. at £1 18s. 9d. per cwt.

21. Divide £1125$\frac{5}{6}$ among 3 men and a boy, giving a boy $\frac{3}{5}$ of a man's share.

22. What sum of money will be required to pay 49 persons £3 19s. 10$\frac{4}{5}$d. each?

23. The sum realized by a bankrupt's estate is £7848, being $\frac{3}{10}$ of his debts; find the amount of the debts.

24. Of what distance is 4$\frac{1}{2}$ miles seven-tenths?

25. Divide £17 2s. 9d. by 11$\frac{5}{12}$.

26. If $\frac{1}{5}$ of a sheep be worth £$\frac{2}{3}$, and $\frac{3}{7}$ of a sheep be worth $\frac{1}{14}$ of an ox, how much must be given for 100 oxen?

27. Add together $\frac{3}{4}$ of a foot, $\frac{2}{5}$ of a yard, and $\frac{3}{5}$ of a mile.

28. If 47 men take 32$\frac{3}{4}$ days to do a piece of work, how many days will 39 men take to do the same?

29. What is the difference between $\frac{4}{5}$ of 9$\frac{1}{2}$ and $\frac{3}{4}$ of 10$\frac{1}{3}$?

30. If 4$\frac{5}{6}$ lbs. cost £9$\frac{2}{3}$, what is the cost of 7$\frac{1}{2}$ lbs.?

31. A can do a piece of work in 4$\frac{5}{6}$ days: B can do the same in 5 days: how many days will they take working together?

32. A person has $\frac{3}{5}$ of a coal mine, and sells $\frac{3}{4}$ of his share for £171: what is the whole mine worth?

33. If $\frac{3}{5}$ of a yard cost $\frac{7}{12}$ of a £, what will $\frac{6}{15}$ of an English ell cost?

34. Reduce 3s. 7$\frac{1}{2}$d. to the fraction of £3.

35. If $\frac{5}{7}$ of a goose be worth 3$\frac{5}{9}$s., and $\frac{4}{5}$ of a goose be worth $\frac{5}{8}$ of a turkey: what is the worth of a turkey at this rate?

36. Find the value of 9$\frac{4}{11}$ cwt. at £4$\frac{5}{9}$ per cwt.

37. Add together $\frac{1}{2}$, $\frac{5}{9}$, $\frac{3}{4}$, $\frac{1}{3}$; multiply the answer by $\frac{9}{22}$, and subtract that product from 1.

38. What fraction of a foot is $\frac{1}{16}$ of $\frac{3}{20}$ of a yard?

DECIMAL FRACTIONS.

GENERAL REMARKS.—In Decimal Fractions the integer or unit, whether it be a unit of time, weight, or measure, is supposed to be divided into ten equal parts; and each of those parts is supposed to be subdivided into ten equal parts; and so on to infinity according to the powers of ten.

The integer thus divided, is to be considered as the numerator of a fraction; while 10 and its successive powers compose the denominator. Thus $\frac{7}{10}$, $\frac{7}{100}$, $\frac{7}{1,000}$, $\frac{7}{10,000}$, &c.

But in dividing by one with any number of ciphers annexed, it is usual to cut off from the dividend as many places towards the right as there are ciphers in the divisor; therefore, since the denominator of a decimal fraction is always one with some determinate number of ciphers annexed, it may be rejected in every case, and a point or period used in its place; thus $\frac{7}{10}$ may be denoted by ·7, and $\frac{7}{100}$ by ·07. Hence it appears that ciphers placed to the left of a decimal fraction, decrease its value exactly in the same proportion that ciphers placed to the right of whole numbers increase their value; that is, in a proportion rising by the successive powers of 10.*

The following Table will exhibit the relation between the integral and fractional scales.

hundred thousands	ten thousands	thousands	hundreds	tens	units	.	tenths	hundredths	thousandths	ten thousandths	hundred thousandths
6	5	4	3	2	1	.	2	3	4	5	6

From this it appears that Decimal Fractions are really more like whole numbers than Vulgar Fractions are; and the various processes to be performed on them are precisely the same, the place of the point, or period, that marks the fraction, being the only thing requiring special attention.

In *reading* decimals the units should always be the starting point. Thus ·16 is *sixteen hundredths*, and ·034 is *thirty-four thousandths*, &c.

Read off the following.—·16: ·84: 4·2: 16·84: 19·841: 100·482: 82·176: 401·19: 187·7: 14·809: 18·147: 0·1001: 817·00140: 11·910101: 2·33433: 27·0001: ·30004: ·801016: 0·0006: 2·00001.

Write in figures:—4 tenths: 16 hundredths: 16 thousandths: 84 ten thousandths: 29 thousandths: thirty-five and 16 hundredths: 114 and 79 ten thousandths: 71 thousandths: 16 millionths: 621 hundred thousandths: 56 hundredths.

* It should be observed that ciphers added to the right of a decimal do not alter its value: thus ·3 is the same as ·30 or ·300, &c.

SECTION LIII.

ADDITION.

CASE I.

RULE.—**Place the numbers under each other with their decimal points in the same vertical line. Find the sum as in Simple Addition, and set the point in the answer exactly under the other points.**

EX.:—Add together 3·15, ·006, 5·9, 37·8562.

3·15	
·006	
5·9	
37·8562	
46·9122	

Having put down the sum as directed, we begin to add,—first the 2 *ten-thousandths*, which we set down in the *fourth* or *ten thousandths'* place. Then 6 + 6 *thousandths* are 12 *thousandths* or 1 *hundredth* and 2 *thousandths*; therefore we put the 2 *thousandths* in the *thousandths'* place, and carry the 1 *hundredth* to the *hundredths'* place. 1 + 5 + 5 *hundredths* are 11 *hundredths*, or 1 *tenth* and 1 *hundredth*; set down the 1 *hundredth* and carry the 1 *tenth*. 1 + 8 + 9 + 1 *tenths* are 19 *tenths* or 1 *unit* and 9 *tenths*; set down the 9 *tenths* in the *tenths'* place and carry the 1 *unit* to the *units'* place, and then proceed as in Simple Addition.

Add together:—

(1) 376·25 + 86·125 + 637·4725 + 6·5 + 358·865 + 41·02

(2) 3·5 + 47·25 + 927·01 + 2·0073 + 1·5

(3) 276 + 54·321 + ·65 + 112 + 1·25 + ·0463

(4) 16·401 + 26·0014 + ·6481 + 3·71004 + 14·6

(5) 17·4829 + ·100604 + 1·4 + 1·001 + ·4324 + 4·6873

(6) ·4 + ·04 + 44 + ·3432 + ·036 + ·055 + ·06843

(7) 6·84 + ·8871 + 161·412 + ·38017 + ·00196 + 1·1101

(8) 7·1 + 1·7 + 1·17 + 17·1 + 171·4 + ·1741 + 37·61

(9) 26·1 + 100 + 1640 + ·00461 + ·32 + ·021 + ·00614

(10) 5·5 + 55 + ·0005 + 500·67 + ·141 + ·001 + 1·1 + 2·02

(11) 12·2 + 2 + ·34192 + ·0025 + ·725 + ·002.

(12) 4·006 + 11·612 + 2·7 + ·01 + 1·101 + 15·7241.

(13) 25 hundredths, 4 tenths, 82 thousandths, 11 hundredths, and 14 millionths.

(14) 75 thousandths, 61 millionths, 6 tenths, 14 hundredths, and 365 thousandths.

(15) 3 tenths, 75 thousandths, 18 hundredths, 142 tenths, 39 tenths.

(16) 311 hundredths, 4 ten-thousandths, 15 thousandths, 56 tenths.

SECTION LIV.

SUBTRACTION.

CASE II.

RULE.—**Arrange the numbers under each other with their decimal points in the same vertical line. Find the difference as in Simple Subtraction; and set the point in the answer exactly under the other points.**

EX.:—From 31·021 take 15·103.

31·02
15·103
15·917

Having set down the sum, we have first to take 3 *thousandths* from 0 *thousandths*; as we cannot do this, we add 1 *hundredth* or 10 *thousandths* to the top line; then 3 *thousandths* from 10 *thousandths* leave 7 *thousandths*; which we set down in the thousandths' place. 1 *hundredth* from 2 *hundredths* leaves 1 hundredth; set it down in the hundredths' place. 1 *tenth* from 0 *tenths* we cannot; add 1 *unit* or 10 *tenths*; then 1 *tenth* from 10 *tenths* leaves 9 *tenths*; put 9 *tenths* in the tenths' place. Then add one unit to the lower line, and proceed as in Simple Subtraction.

Subtract the following:—

(1) 127·62 — 13·725
(2) 603·5725 — 32·0012
(3) ·65325 — ·0735
(4) 47·406 — 17·4921
(5) 123·45 — 86·41
(6) ·0123 — ·00418
(7) 564·0465 — 364·1246
(8) 27·819 — 13·0146
(9) 81·68241 — 17·681041
(10) ·677682 — ·0041006
(11) 6·99 — 5·909999
(12) 11 — 10·001111
(13) ·999 — ·08999
(14) 8 — ·88888
(15) 1 — ·01
(16) 100 — 1 hundredth
(17) 1 hundredth — 1 thousandth
(18) 1 thousandth — 1 millionth
(19) 105 thous^{ths} — 808 ten thous^{ths}
(20) 35 tenths — 53 hundredths

SECTION LV.

MULTIPLICATION.

CASE III.

RULE.—**Multiply as in whole numbers, and mark off as many decimal places from the product as there are in the multiplier and multiplicand together.**

NOTE.—If the places in the product are less than the number of decimal places in the factors, prefix as many ciphers to the left of the product as are required.

EX.:—Multiply 3·14 by ·002.

3·14
·002
·00628

For $3{\cdot}14 = \frac{314}{100}$, and $\cdot002 = \frac{2}{1000}$; $\frac{314}{100} \times \frac{2}{1000} = \frac{628}{100000} = \cdot00628$

Multiply the following :—

(1) ·0375 × 33·75
(2) ·63478 × ·8204
(3) 12·601 × ·00016
(4) 400·5 × 4·005
(5) 125·7 × 7·521
(6) 8·4 × 9·8 × 6·1 × 3·2
(7) ·03 × ·75 × 7·5 × ·57
(8) ·0048 × 48·1001
(9) ·864 × 5·864
(10) 46·465 × ·43
(11) ·946 × ·34791
(12) 10·210 × 7·8631
(13) 0·0036 × 1863
(14) 178·403 × 824

(15) If a boy can run 3·75 of a mile in one hour, how far can he run in ·5 of an hour?

(16) If in a piece of cloth there are 13·5 feet, how many feet are there in 16·12 such pieces?

(17) In a boy's great coat there are 7·3 ells of cloth; how much cloth will be required for 25·5 coats?

(18) In a cask of treacle there were 16·75 gallons: how many gallons of treacle in 75·16 casks?

(19) How many square yards are there in a play-ground 36·9 yards long and 17·85 yards wide?

Section LVI.

DIVISION.

Case IV.

Rule.—Divide as in common Division. Then :—

(1) If the number of decimal places in the dividend is the same as that in the divisor, the quotient will be a whole number.

(2) If the number of places in the dividend exceeds that in the divisor, mark off in the quotient as many places as make up the difference.

(3) If the number of places in the divisor exceeds that in the dividend, annex as many ciphers as make up the difference.

Ex. I.—Divide 982·8 by 4·2.

```
4·2 ) 982·8 ( 234
      84
     ----
      142
      126
     ----
       168
       168
```

Ex. II.—Divide 9·828 by 4·2.

4·2) 9·828 (2·34
84
142
126
168
168

Ex. III.—Divide 982·8 by ·42.

·42) 982·8 (2340
84
142
126
168
168

In order to carry on the division it is sometimes necessary to annex ciphers to the dividend: every such cipher must be counted as a decimal place in the dividend.

Ex.—Divide 6·42 by 2·5.

2·5) 6·4200 (2·568
50
142
125
170
150
200
200

NOTE.—Sometimes the division will not terminate, but by continuing to annex ciphers we may carry on the quotient to as many decimal places as are required.

Divide the following:—

(1) 234·70525 ÷ 64·25
(2) 217·568 ÷ 1000
(3) ·408408 ÷ 52
(4) 64·29 ÷ 13·8
(5) 78·3 ÷ 1·802
(6) 771·6 ÷ 18·492
(7) 3·7412 ÷ 1·9999
(8) ·6234 ÷ ·10372
(9) 7·6430 ÷ ·02016
(10) 69·081 ÷ 17·81
(11) ·9 ÷ ·00009
(12) ·0234 ÷ 168·7
(13) 5371·2 ÷ 5·61042
(14) 168·54 ÷ 9·70101
(15) 7·8321 ÷ ·3981
(16) 0·0007 ÷ ·002

(17) How many times are 3·21 lbs contained in 5 cwt?

(18) If £34·068 are divided among 43 persons, what is each person's share?

(19) If 3·25 pounds of tea cost 9·75 shillings: what is the value of ·5 of an ounce?

(20) The rent of an estate of 263·4 acres is £500; what is that per acre?

Section LVII.

Case V.—*To reduce any fraction to a decimal.*

Rule I.—**If the denominator be 10 or any power of 10, set down the numerator and mark off as many decimal places as there are ciphers in the denominator.**

Ex. I. $\frac{315}{100} = 3{\cdot}15$. Ex. II. $\frac{4}{1000} = {\cdot}004$.

Note.—A decimal may be expressed as a vulgar fraction by making the given decimal the numerator, and 1 with as many ciphers as there are places in the decimal the denominator.

Rule 2.—**If the denominator be any other number than 10 or some power of 10; divide the numerator by the denominator; add ciphers if required, and mark off in the quotient as many decimal places as there are ciphers annexed.**

Ex.—Reduce $\frac{3}{2}$ to a decimal.

$$\frac{3}{2} = 3 \div 2 = 1{\cdot}5.$$

Many vulgar fractions cannot be expressed *exactly* in a decimal form:* thus $\frac{1}{3} = {\cdot}33333$, &c., and $\frac{3}{11} = {\cdot}2727$, &c. In these and similar examples, however far the division is carried, there will always be a remainder. Such fractions are termed *recurring*, *repeating*, or *circulating* decimals.

Reduce to decimals—

(1—5) $\frac{1}{2}$: $\frac{1}{4}$: $\frac{1}{5}$: $\frac{1}{8}$: $\frac{7}{16}$.

(6—8) $\frac{3}{25}$: $\frac{16}{88}$: $\frac{1}{2}$ of $\frac{2}{3}$

(9) $\frac{2}{3}$ of $\frac{4}{6}$

(10) $\frac{1}{2}$ of $\frac{5}{12} \times 7$

(11) $\frac{2}{3} - \frac{2}{5} + \frac{1}{6}$

(12) $\frac{7}{6} + \frac{5}{9} - \frac{1}{4}$

(13) $\frac{18}{19} + \frac{1}{7} + \frac{3}{4}$

(14) $2\frac{1}{3} \times 3\frac{1}{4}$ of 11

*On this account decimals are less generally applicable than vulgar fractions.

Section LVIII.

Case VI.—*To find the value of any decimal of a given quantity.*

Rule.—**Multiply the decimal by as many of the next lower denomination as make one of the given denomination. Mark off as many decimal places as there are in the given decimal. Continue this process to the lowest denomination; then the numbers to the left of the decimal points will form the Answer.**

Ex:—Find the value of ·42 of a £1.

·42 of £1
20
8·40 shillings
12
4·80 pence
4
3·20 farthings

Here we find that ·42 of £1 = 8·40 shillings; that ·40 shillings = 4·80 pence; that ·80 pence = 3·20 farthings

∴ ·42 of £1 = 8s 4⅘d.

Find the value of

(1) ·625 of £1 (2) ·75 of a foot (3) .125 of a foot
(4) ·0375 of £1 (5) ·3 of a foot
(6) ·5£; ·9£; ·11£; £213·6 (7) ·116 of a crown; ·375 of a shilling
(8) ·174 of a ton; ·15 of 3 tons; ·812 of a cwt.
(9) ·1406 of a hhd of wine; ·4816 of a barrel; ·644 of a tun
(10) ·174 of a gallon; ·148 of an acre; ·321 of a league
(11) ·118 of a mile; ·127 of a furlong; ·185 of a sq. mile
(12) ·14 of an hour; ·0101 of a day; ·1468 of a week
(13) ·75 of a bushel; ·1094 of a chaldron; ·1468 of a ton
(14) ·142 of a lb Troy; ·1406 of a lb avoir.
(15) ·0099 of a mile; ·24009 of an acre; ·30001 of a sq. mile.

Section LIX.

Case VII.—*To reduce one quantity to the decimal of another quantity.*

Rule.—**Write the different parts of the given quantity under each other, beginning with the lowest; then divide by as many of the lower as make one of the higher.**

Ex.—Reduce £3 10s 6¾d to the decimal of £10

4	3·00
12	6·7500
20	10·56250
10	3·528125
	·3528125

Here we first find that ¾ = ·75 of a penny; then that 6·75d = ·5625 of a shilling; next that 10·56258. = ·528125 of £1; and lastly that £3.528125 = ·3528125 of £10

Reduce

(1)	9s	to the decimal of	£1	(11)	14 lbs	to the decimal of	1½ cwts
(2)	2 ft 6 in	„	a yard	(12)	£18 14s 2d	„	£1
(3)	6 in	„	a foot	(13)	17 gills	„	a gallon
(4)	9d	„	a shilling	(14)	16 gallons	„	3 barrels
(5)	2s 6d	„	£1 5s	(15)	13 ins	„	a yard
(6)	4s 9d	„	£1	(16)	3 oz Troy	„	58 lbs
(7)	4½ yards	„	a mile	(17)	14 pecks	„	a quarter
(8)	6s 8d	„	a crown	(18)	2mls 660yds	„	a league
(9)	1s 9d	„	£1 7s	(19)	13 ozs	„	1 qr of cwt
(10)	18 minutes	„	3 hours	(20)	17 pints	„	a barrel

MISCELLANEOUS EXERCISES.

1. What is the product of $7\frac{1}{16}$ and $9\frac{1}{10}$? (found by decimals).

2. Find the value of ·178 of a mile.

3. If ·625 of a mile of railway cost £5400; what will one foot of it cost?

4. Multiply ·3076 by 1·072, and divide the product by ·008.

5. Subtract $3\frac{3}{8}$ guineas from 4·09372 guineas.

6. Find the value of $\frac{·035 \times ·0056}{·00007}$.

7. Divide ·420 by $\frac{5·04}{·012}$.

8. Divide £4 18s. 10½d. by 3·15, and reduce the result to the decimal of £10.

9. A owns ·375 of a ship worth £10,000; B owns the remainder: what is the value of B's share?

10. If I take ·056 of a cwt from a ton, what weight remains?

11. If ·5 of a cwt of sugar cost £1 8s.; what will ·75 of a lb cost?

12. Find the value of 3·5s. + 5·25d. + £13·025.

13. Divide £19 15s. 6d. by 13·46.

14. Multiply 1s. 10½d. by 63·125.

15. What decimal multiplied by 90 will give the sum of $\frac{1}{2} + \frac{9}{10} + \frac{1}{2}\frac{3}{0}$.

16. Subtract $\frac{3}{5}$ from 1·1 and divide the remainder by 0·1.

17. If A can do a piece of work in 10·5 days, which A and B together can do in 7·75 days; in what time would B alone do it?

18. If a man spends ·742 of his income and saves £128; what is his income?

19. If ·3 of an estate is worth £3000; what is the value of ·001 of the estate?

20. If a workman earns £17·3 in 102·5 days; how long will he be in earning £52·5?

21. If cloth is bought at 3·625s. per yd. and sold at 4·125s. per yard; what is gained by selling 29·5 pieces each measuring 13·25 yd.?

22. A bankrupt owes £2360, but can only pay £1325; what decimal of the whole does he pay?

23. Multiply 2 cwt. 1 qr. 16 lbs. by 39·125.

24. How many French metres, each 39·371 English inches in length, are there in 3 mls. 5 fur. 110 yds.?

Section LX.

PROPORTION.

In dealing with numbers it is often necessary to *compare* one with another.* This may be done in two ways; either by finding *how much* one number is greater than another, or *how many times* one contains the other. Take, for example, the numbers 3 and 9: by subtraction we find that 9 is 6 more than 3; and by division that 3 is contained in 9, 3 times, or that 3 is $\frac{1}{3}$ of 9.

The latter of these relations, which expresses what fraction one number is of another, or how many times one number is contained in another, is termed **ratio**; and is expressed by putting (:) between the numbers.

Thus 3 : 9 = the ratio of 3 to 9.

* *Concrete* quantities can only be compared when they are of the same *kind*. Thus we cannot compare 8 yards and 16 lbs. Also in comparing two concrete quantities of the same kind, they must be in the same *denomination*. Thus, to compare two sums of money we must reduce both to shillings or pence, &c.

The relation subsisting between two numbers may also hold good of two other numbers. Thus, the ratio of 6 and 18 is the same as the ratio of 3 and 9; 18 being 3 times 6 as 9 is 3 times 3, or 6 being $\frac{1}{3}$ of 18 as 3 is $\frac{1}{3}$ of 9. When, as in this example, two ratios are equal, they form a **proportion,** and the four numbers are thus expressed—

$$3 : 9 :: 6 : 18.$$

Here the 3 and 18 are called the *extremes*, and the 9 and 6 the *means*; and, in every instance, **the product of the extremes equals the product of the means.** Thus $3 \times 18 = 54$ and $9 \times 6 = 54$.

Hence if any three terms of a proportion be given, we can easily find the fourth. For, if the required term be a mean, *find the product of the extremes and divide by the given mean*; or, if the required term be an extreme, *find the product of the means, and divide by the given extreme.*

Ex. Find x in the following proportion :—$6 : 12 :: 10 : x$.

Here $6 \times x = 12 \times 10$ $\therefore x = \frac{12 \times 10}{6} = 20$.

Find the value of x in the following :—

(1) $x : 9 :: 6 : 18$
(2) $4 : 28 :: x : 63$
(3) $7 : 70 :: 10 : x$
(4) $12 : x :: 144 : 24$
(5) $8 : 20 :: x : 15$
(6) $15 : x :: 30 : 2$
(7) $14 : 77 :: x : 22$
(8) $x : 50 :: 7 : 1$
(9) $6 : 29 :: 171 : x$
(10) $15 : x :: 7 : 70$
(11) $100 : 20 :: x : 100$
(12) $176 : 1760 :: 349 : x$

SECTION LXI.

SIMPLE PROPORTION OR RULE OF THREE.*

RULE.—**1st; Set the single term, which is of the same kind as the Answer, in the third place. 2nd: Put the greater or less of the remaining terms in the second place, according as the answer is to be greater or less than the third term. 3rd: Put the remaining term in the first place. 4th: Reduce the first and second terms, if necessary, to the same denomination. 5th: Multiply the second and third terms together, and divide by the first: the quotient will be the required Answer.**

* This rule is so called because in it *three* quantities are given, and it is required to find a fourth.

Ex.—If 15 yards of cloth cost £3 1s 3d; what will 35 yards cost?

			£	s.	d.
15	: 35	::	3	1	3
					5
			15	6	3
					7
		15)	107	3	9
			£7	2	11

Here the Answer will be in money, we therefore put £3 1 3 in the third term. Then as the answer will be more than the third term, 35 yds costing more than 15 yds, we put the 35 in the second place and 15 in the first. Then multiplying £3 1s 3d by 35 and dividing the product by 15, we get £7 2s 11d, the required Answer.

From the above example it will readily be seen that this rule is simply the application of the principles of Proportion to the working of practical sums. For, of course, the cost of 35 yds will be as much more than £3 1s 3d, as 35 is more than 15; so that what we require is,—to find a sum of money which shall bear the same ratio to £3 1s 3d, that 35 bears to 15: or in other words,—given the first three terms of a proportion, to find the fourth. But we have already seen that this is done by multiplying the means together, and dividing by the extreme, which we do when we multiply the second and third terms together and divide by the first.

NOTE.—Before proceeding to multiply and divide, it is best to cancel any number that is contained *both* in the first term *and* in the second or third.

1. If 18 yards of cloth cost £4 10s; what will 57 yards cost?

2. I bought 5 sheep for £3 15s; how many shall I get for £37 10s?

3. If 12 lbs of tea cost £2 10s 6d; find the price of 120 lbs at the same rate.

4. If 18 men lift 1200 lbs; how many men would be required to raise 10,000 lbs?

5. If 120 yds of cloth cost £38 10s 0d, what is the cost of 90 yds?

6. 120 horses eat 5 tons of hay; how much hay would be consumed by 920 horses?

7. How many men would be required to cut 1200 acres of grass, if 240 acres are mown by 80 men?

8. If 10 tons of coal cost 9 guineas; find the cost of 30½ tons at the same rate.

9. A nugget weighing 10 lbs sold for 90 guineas; what weight of gold at the same price would £150 10s 6d buy?

10. A servant's wages amount to £45 10s. 6d. a year: what is that for a fortnight?

11. If £350 10s. produces an income of £21: how much would 1000 guineas produce at the same rate?

12. A tax of $5\frac{3}{4}$d. in the £ is levied: what would that amount to on an income of £500 10s. 6d.?

13. A man owes £900 12s. $8\frac{1}{2}$d. and can only pay at the rate of 5s 6d in the £; what would that be on the whole sum: and what amount would a creditor for 100 guineas receive?

14. If $1\frac{1}{4}$ lbs of sugar cost $8\frac{1}{2}$d: find the cost of $1\frac{1}{2}$ tons.

15. Two miles of telegraph wire cost £90 10s $6\frac{1}{2}$d: find the cost of a fathom.

16. A man receives 50s 6d for 3 weeks' wages: what would he receive for 2 years?

17. What would a hogshead of wine realize if sold at $3/5\frac{1}{2}$ per pint?

18. If an army of 12,000 men consume 8 ton 16 cwt of biscuit daily, how many men would 300 ton supply for a day?

19. An acre of ground pays $6\frac{1}{2}$d. per week rent; what would be the rent of a farm of 1,100 acres for 1 year?

20. A steam pump raises 1150 gallons a day; how long would it be in raising 10900 gallons at the same rate?

21. A night's lodging cost 1/8; how many nights would 12 guineas provide for at that rate?

22. A gave B 21 yards of carpet for 101 yards of broad cloth at 5s $4\frac{1}{2}$d per yard; what was the value of the carpet per yard?

23. If a fortnight's living cost me £14 10s 6d, what must my income be to save £100 annually?

24. I bought 950 gallons of vinegar for 21 guineas; but lost 50 gallons by leakage: how must I sell the remainder so as not to lose by my bargain?

25. What is the half-year's rent of an estate of 1002 acres, at £2 10s $8\frac{1}{2}$d per acre yearly?

26. If $4\frac{1}{2}$ yds of silk cost £1 11s; what will be the cost of $40\frac{7}{8}$ yds?

27. What is the value of 100,000 oranges at 3 for 2d?

28. What must I pay for 85,700 bricks at the rate of 35s per thous?

29. If a horse go 14 m 3 fur in 3 hr 26 m; how long will he be in going 23 miles?

30. How long would 6 men be in reaping a field of 24 acres, if each did one rood a day?

31. How much may a person spend in 73 days, if he wishes to save 100 guineas a year out of an income of £900?

32. From 5 tons 17 cwt take 1 ton 18 cwt 2 qrs; and find the value of the remainder at £1 10s. 6d. per half cwt.

33. A servant's wages are £18 a year; how much is due for seven weeks and three days' service?

34. Find the rent for 3 months, 1 week, 4 days, at £5 12s 6d per month.

35. If 19 cwt 3 qrs 7 lbs of soda cost £9 15s 6d; how much may be bought for £3 8s at the same rate?

36. If candles sell for 7s 6d per dozen pounds; how much will 580 lbs cost?

37. If I buy 5¾ yds of cloth for £1 5s 6d; how much must I pay for 15 pieces each containing 23½ yds?

38. How much must be paid for 1305½ bus of wheat, at £4 8s per quarter?

39. A bankrupt has but £126; to pay debts to the amount of £4065; what can he pay in the pound?

40. If a workman earns £14 6s 10d in 102½ days: how long will he be in earning 45 guineas?

41. Bought a flock of sheep for £409 11s 6d; and gave at the rate of £22 4s 6d for 7; how many sheep did the flock contain?

42. A clerk is in receipt of £3 15s per week: what will he have to pay in income tax at 7d in the pound?

43. If $\frac{7}{16}$ of a pound cost $\frac{4}{11}$ of a shilling, what will $\frac{6}{7}$ of a cwt cost?

44. If I lend £200 for 6 months, how much should the borrower lend me for 4 months, to repay the loan?

45. If after paying an income tax at 1s 2d in the pound, a gentleman has £400 18s 6d remaining, what is his income?

46. If $1\frac{5}{6}$ cwts of cheese cost £5, what will $27\frac{1}{4}$ lbs cost?

47. The ages of 2 persons are as 25 to 4: and the elder is 80 years old; what is the age of the younger?

48. If $\frac{3}{8}$ of a cwt cost $\frac{5}{9}$ of £100, what is the cost of $\frac{4}{7}$ of a qr?

49. If $\frac{3}{7}$ of a yard cost $£1\frac{7}{2}$, what will $\frac{11}{15}$ of an English ell cost?

50. It costs a tradesman £7 7s 6d to insure his goods at 7s 6d per cent.: for what sum is he insured?

Section LXII.

COMPOUND PROPORTION OR DOUBLE RULE OF THREE.

We have seen that by Simple Proportion, when *three* quantities are given we are able to find a *fourth*. But sometimes *five* or *seven* quantities are given, and it is required to find a *sixth* or *eighth*. For example,—*If 7 oxen are kept 42 days for £14; how many oxen may be kept 21 days for £56?* The answer to this and similar questions, might be found by a series of Simple Proportion sums; but it is more convenient to work them by the following rule.

Rule I.—Place that number in the third term, which is of the same kind as the answer. 2nd, take any two numbers of the same kind, and arrange them as you would in Simple Proportion. 3rd, repeat this process with all the remaining pairs of numbers. 4th, having taken care to arrange the various terms one under the other, find the product of all the first terms for a new first term, and of all the second terms for a new second term. 5th, proceed to find the answer as in Simple Proportion.

Ex.—If 3 men earn £7 in 5 days; how much will 7 men earn in 8 days?

3 men : 7 men : : £7
5 days : 8 days

15 : 56 : : 7
7

15 | 392

£26 2 8

Here the answer will be in money; we therefore put £7 in the third term. Then taking any two numbers *of the same kind*, say, the 3 men and 7 men: as 7 men will earn more than 3 men, we put 7 in the second place and 3 in the first. Then, taking the next two numbers—5 days and 8 days: as more money would be earned in 8 days than in 5 days, we set down 8 in the second place and 5 in the first. Having arranged all the pairs of numbers in this way; we find the product of 3×5 for a new first term, and of 7×8 for a new second term, and proceed to find the answer as in Simple Proportion.

This process is equivalent to finding the answer by a series of Simple Proportion sums. For it is evident, that if we multiply the third term by the product of all the second terms, and divide by the product of all the first terms, we have done the same as if we had multiplied by each of the second terms and then divided by each of the first terms.

Exercises in Compound Proportion.

1. If 8 horses eat 12 qrs of oats in 36 days; how many qrs will 12 horses eat in 48 days?

2. If 15 masons build 37 roods in 27 days, in what time will 20 masons build 148 roods?

3. If £100 gains £5 in a year, what will £650 gain in 219 days?

4. If a man travels 90 miles in 3 days by walking 8 hours a day; in what time will he travel 540 miles by walking 6 hours a day?

5. If 15 reapers in 12 days earn £27; in what time will 6 reapers earn £18?

6. If 10 horses plough 18 acres of land in 7 days: how many horses would be required to plough 171 acres in 35 days?

7. If 17 men earn £249 18s in 21 weeks; in what time will 19 men earn £438 18s 0d.?

8. If 6 persons are boarded 5 months for £53; how long should 19 persons be boarded for £116?

9. If 30 cwt are carried 15 miles for £5 8s 9d; how far ought 80 cwt to be carried for £29?

10. If 8 horses can plough 25 acres in 3 days; how many acres can 30 horses plough in 5 days?

11. If 200 men can finish a piece of work in 3·5 days; how many would do $\frac{1}{5}$ of the same work in 10 days?

12. If it cost £10 15s 6d to print 4 pamphlets of 16 pages each; what would be the expense of printing 6 pamphlets of 12 pages each?

13. If the carriage of 60 cwt through 20 miles cost £14 10s; what weight ought to be carried 39 miles for £5 8s 9d?

14. What interest will £1200 gain in 14 months, if £1500 gain £80 in ten months?

15. If £13½ be the wages of 13 men for 7½ days; what will be the wages of 20 men for 17½ days?

16. If the expenses of 3 tourists for 5 months be £123 8s 0d; what will 2 persons spend in 9 months?

17. If a cask of beer last 8 persons 14 days; how many casks will serve 2 persons 365 days?

18. How long will it take 17 men to earn £50; if 12 men in 6½ days can earn 13 guineas?

19. If 14 men can mow 168 acres in 12 days of 8¼ hours each; how many can be mowed by 20 men in 11 days of 7½ hours each?

20. If £100 in 2 years gain £12 interest, what principal will gain £6 15s. in 4½ months?

21. If a six-penny loaf weigh 4·35 lbs, when wheat is 5·75s a bushel; what must be paid for 49·3 lbs of bread when wheat is at 18·4 shillings a bushel?

Section LXII.

INTEREST.

Interest is money paid for the loan of other money. The money lent is called the **principal.** The principal and interest together are called the **amount.** Thus, if £20 are paid for the loan of £400 for a certain time; £20 would be the **interest,** £400 the **principal,** and £400 + £20 or £420 the **amount.**

Interest is generally reckoned at so much *per cent. per annum*: this is called the *rate per cent.* Thus, what is the interest on £500 for 7 years, at 5 per cent. per annum? means,—what is the interest on £500 for 7 years, at the rate of £5 a year for every £100 lent?

Interest is either **simple** or **compound.** A transaction is said to be one in *simple* interest, when the interest is paid year by year as it becomes due. But, if instead of paying the interest due at the end of the year, it be added to the principal, and this amount taken as the principal for the next year, and so on, it is termed *compound* interest.

In all interest sums *four* things have to be considered,—the **principal, rate per cent., time,** and **total interest;** and any three of these being given we can find the fourth.

Case I.—*The principal, time, and rate per cent. being given, to find the total interest.*

Rule.—**Multiply the principal by the rate per cent. and the number of years, and divide by 100.***

Ex.—What is the interest on £415 for 7 years at 4 per cent.?

415	Here we first multiply 415 by the rate per cent., = 4;
4	then by the number of years,—7: this gives 11,620.
1660	Having divided by 100, or what is the same thing,
7	marked off two decimal places, we get £116·2, which, by
116·20	the ordinary method, we find to be £116 4s.
20	
4·00	

£116·4 ans.

* A more logical method would be to multiply first by the rate per cent., then divide by 100, and afterwards multiply by the number of years. But the above rule is practically the same, and *more convenient.*

Find the interest on :—

(1)	£300			for	5 years		at	4		per cent.		
(2)	£728	10	8	„	9	„	„	$3\frac{1}{2}$		„		
(3)	£99	13	4	„	5	„	„	6		„		
(4)	£132	6	8	„	$2\frac{1}{4}$	„	„	5		„		
(5)	£60	15		„	8	„	„	$2\frac{3}{4}$		„		
(6)	£109	17	6	„	$12\frac{1}{2}$	„	„	£7	10	„		
(7)	£225	10		„	2 yrs. 5 mo.		„	6		„		
(8)	£350	12		„	1 yr. 310 dys		„	$£4\frac{1}{2}$		„		
(9)	£1300	5		„	3 yrs 75 dys		„	$£2\frac{1}{4}$		„		
(10)	£719	8		„	$5\frac{1}{4}$ yrs		„	£5	2	6	„	
(11)	£81	12	6	„	20	„	„	£3	15		„	
(12)	£1000			„	$14\frac{1}{2}$	„	„	£2	17	6	„	
(13)	£76	16	8	„	2 yrs 10 mo.		„	$5\frac{7}{8}$			„	
(14)	£290	15		„	7 „ 5 „		„	£3	13	4	„	
(15)	£2100			„	$19\frac{1}{2}$	„	„	$1\frac{7}{6}$			„	

CASE II.—*The principal, interest, and rate being given, to find the time.*

RULE.—**Find the interest for one year, then, as the interest for one year is to the total interest, so is one year to the required time.**

EX.—In what time will £120 amount to £150 at 5 per cent.?

Here the total interest = £150 − £120 = £30. Then by Case I. we find the interest on £120 for one year at 5 per cent. to be £6.

∴ As £6 : £30 : : 1 year : the required time.

In what time will :—

(1)	£200			amount to	£260			at	4		per cent.?	
(2)	£900			„	£1000			„	6		„	
(3)	£320	10		„	£415	15		„	$2\frac{1}{2}$		„	
(4)	£1	6	8	„	£2	13	4	„	5		„	
(5)	£768	13	4	„	£820			„	$3\frac{1}{4}$		„	
(6)	£418	17	6	„	£500			„	$4\frac{1}{2}$		„	
(7)	£70	16	8	„	£150			„	£3	10	„	
(8)	£3	17	6	„	£20			„	£4	16	8	„

CASE III.—*The interest, rate, and time being given, to find the principal.*

RULE.—**Find the interest on £100 at the given time and rate then, as the interest on £100 is to the given interest, so is £100 to the required principal.**

EX.—What principal will realize £25 in 2 years at 5 per cent.?

Here, by Case I., we find the interest on £100 for 2 yrs. at 5 per cent. to be £10. Then, as £10 : £25 :: £100 : the required principal.

What principal will realize:—

(1)	£27 10	in	4 years	at	5	per cent?
(2)	£120	„	6 „	„	6	„
(3)	£18 15	„	2½ „	„	5½	„
(4)	£68 6 8	„	3¼ „	„	£4 10	„
(5)	£170 13 4	„	1 yr 8 mo	„	£2 15	„
(6)	£57 18	„	2 yrs 11 mo	„	£3 12 6	„
(7)	£164 10	„	7½ „	„	4½	„
(8)	£85 12 6	„	2 yrs 73 dys	„	£5 16 8	„

CASE IV.—*The principal, interest, and time being given, find the rate.*

RULE.—**First find the interest on the given principal for the given time at 1 per cent then, as the interest at 1 per cent is to the given interest, so is 1 to the required rate.**

EX.—At what rate per cent. will £120 10s. amount to £180 10s. in 5 years?

Here the total interest = £180 10s − £120 10s = £60. Then, by Case I., we find, that the interest on £120 10s for 5 years at 1 per cent. is £6 0s 6d. ∴ as £6 0s 6d : £60 :: 1 : the required rate.

At what rate per cent. will,—

(1)	£560	amount to	£700	in	6 years?
(2)	£398	„ „	£500	„	4½ „
(3)	£418 10	„ „	£508	„	7 „
(4)	£87 15 6	„ „	£100	„	1½ „

(5)	£1	16	8	„	„	£2	5	„	5 yrs. 8 mo.
(6)	£29	3	4	„	„	£33		„	4 yrs. 5 mo.
(7)	£14	6	8	„	„	£18	10	„	2 yrs. 300 dys.
(8)	£20			„	„	£21		„	219 dys.

CASE V.—*To find the* COMPOUND INTEREST *on any sum of money for a given time, at a given rate per cent.*

RULE.—Find by Case I. the first year's interest, and add it to the principal; this amount will be the principal for the second year; and this with its interest will be the principal for the third year, and so on for the given time; or

Find by the above rule the Compound Interest on £100 for the given time, and then,—as £100 is to the principal so is the interest on £100 to the required interest.

EX.—What is the Compound Interest on £300 for 3 years at 5 per cent.?

Interest for 1st yr.—$\frac{300}{100} \times 5 = £15$ ∴ principal for 2nd yr.—£300 + £15 = £315.

„ 2nd yr. $\frac{315}{100} \times 5 = £15\ 15s.$ ∴ „ for 3rd yr.—£315 + £15 15s.—£330 15s.

„ 3rd yr.—$\frac{330\frac{1}{2}}{100} \times 5 = £16\ 1s\ 9d.$ ∴ amount at end of 3rd yr. £330 15s. + £16 1s 9d. £347 5s. 9d.

∴ Compound interest—£347 5s. 9d.—£300—**£47 5s. 9d.**

Or, having found, by the above method, that the compound interest on £1 for 3 years at 5 per cent. is £15 15s. 3d.,—

As £100 : £300 : : £15 15s. 3d. : the required interest.

Find the Compound Interest on:—

(1)	£400	for	2 years	at	6	per cent.
(2)	£7 0	„	3 „	„	4	„
(3)	£1000	„	2½ „	„	3	„
(4)	£680	„	3½ „	„	2½	„
(5)	£250	„	1½ „	„	£3 15	„
(6)	£375	„	3 „	„	£4 10	„
(7)	£800	„	4 „	„	5	„
(8)	£480	„	3½ „	„	1½	„

Miscellaneous Exercises in Interest.

1. If £250 gain £12 10s in one year; in what time will £640 10s gain an equal sum?

2. What is the difference between the interest of £80 10s for 5 years at 4 per cent., and for 3½ years at 6 per cent?

3. At what rate will £140 become £200 in 3½ years?

4. Find the difference between the simple and compound interest on £184 10s for three years at 4½ per cent?

5. Find the interest on £68 6s 8d from April 1, 1860, to June 1, 1863, at 3½ per cent.

6. Find the interest on £287 15s from June 10 to September 24 at 2½ per cent.

7. What sum must I invest, at 3½ per cent., to secure an income of £500 a year?

8. In what time will £500 double itself at 4¾ per cent., simple interest?

9. What is the compound interest on £1000 for 5 years at 5 per cent?

12. What will be the compound interest on £48 10s for two years, at 3½ per cent., the interest being paid half-yearly?

11. A person placed £500 in the bank on May 5, and withdrew it on November 20; what interest should he receive at 3½ per cent?

12. If £100 in 3 years gain 15 guineas; what principal in 3¾ months will gain £20?

13. To what sum will £184 12s 6d amount in 4 years at 3½ per cent., compound interest?

14. Find the interest on £639 10s from Jan 1, 1850, to May 6, 1860, at £3 10s per cent.

15. At what rate per cent. will a sum of money, put out at simple interest, double itself in 16 years?

16. Find the interest on £436 10s for 3 yrs 6 m, at £2 13s 4d per cent. Work this by decimals.

SECTION LXIII.
DISCOUNT.

Discount is an allowance made for the payment of money before it is due. For example:—If, say at Lady-day, I buy goods worth £100, the tradesman would probably be willing to receive £95 in ready money, rather than wait till Christmas to get the bill paid: that is, he would take 5 per cent. off the bill in consideration of its being paid at once. This is called *ordinary* discount.

True discount differs from *ordinary* discount, inasmuch as while the latter is calculated on the *whole amount* of the debt, the former is reckoned on its *present value.*

By the *present value* of a sum of money, due at some future time, is understood, that sum, which if put out at interest would amount to the given sum at the end of that time. Thus, the *present value* of £100, payable 12 months hence, is that sum, which if put out at interest for 12 months would amount to £100.

Hence, to find the *ordinary* discount on a sum of money, we have simply to find the interest on that sum, for the given time, at the given rate per cent. But to find the *true* discount on a sum of money, we must first find its present value, and then calculate the interest on that, or, what is the same thing,—take the present value from the total amount.

The *present value* of a sum of money is found by taking, say, £100 and finding its interest for the given time. Then:—

As £100 + *its interest* : *the given sum* :: £100 : *the present value.*

EX.:—What is the ordinary and true discount on £205 payable 6 months hence, at 5 per cent?

Here the *ordinary* discount would be £5 2s 6d, or the interest on £205 for 6 months at 5 per cent. But the *true* discount will only be £5, or the interest on £200 for 6 months at 5 per cent: £200 being the present value of £205.

Transactions in discount occur most frequently in connection with BILLS or PROMISSORY NOTES, which are written agreements to pay a certain sum, at some future date. For instance:—A person owing me £50, gives me a bill by which he binds himself to pay me 6 months hence. But possibly at the end of 3 months I may want the money; so I go to a banker, and ask him to advance the money or "discount the bill." This he will do, if the person who owes the money is likely to pay it when the bill falls due. Of course the banker will not pay me the whole amount of the bill, but only what remains after deducting the ordinary discount—he getting the advantage of the difference between true and ordinary discount.

Three days are allowed by law, after the time that a bill is nominally due, before it is legally due. Thus, a bill drawn on January 1 for three months would be *nominally* due on April 1, but not *legally* due till April 4.

Find the *true* discount on

(1) £150 due in 8 m. at 4 per cent
(2) £94 10s „ 5 „ 3 „
(3) £78 16s „ 10 „ 2½ „
(4) £1000 „ 3 „ 3½ „
(5) £50 6s 8d due in 4 m at 5 per cent
(6) £94 11s 6d „ 11 „ 6 „
(7) £210 „ 2 „ 2 „
(8) £66 6s 6d „ 4½ „ 3⅝ „

Find the *true* discount and the *banker's* discount on the following bills :—

(9) £100 drawn March 5 at 4 m. discounted May 17 at 3 per cent.
(10) £650 „ June 10 „ 5 „ „ Aug. 8 „ 5 „
(11) £198 10s „ Aug. 4 „ 8 „ „ Dec. 24 „ 2¾ „
(12) £48 15s „ Sep. 12 „ 2 „ „ Sep. 20 „ 4½ „
(13) What sum invested at 3½ per cent. will amount to £1000 in 4 years?
(14) What is the difference between the true and ordinary discount on £500 due 8 months hence at 5½ per cent.?
(15) What would a banker gain by discounting on Nov. 14, a bill of £800 dated Oct. 8, at 4 months, at 4 per cent.?
(16) What is the present worth of £600, payable in two sums at 3 and 6 months, discounting at 4½ per cent.?

Section LXIV.

STOCKS AND SHARES.

Stocks :—The British and other governments have, at various times, borrowed large sums of money,* chiefly for the purpose of carrying on war. This money, termed *Stock*, is owed to a number of individuals who receive interest twice a year. As the rate of interest is fixed, stock varies in value at different times. Thus, when money is scarce, people will not give the full value for stock which only yields 3 or 3½ per cent., as they can get 4 or 5 per cent. elsewhere. Consequently, stock, nominally worth £100, will then sell for £80 or £90. On the other hand, when money is plentiful and good investments scarce, many persons are willing to purchase, and then the *Funds* go up. When £100 stock will sell for £100, the Funds are said to be at *par*. This however is not often the case, the price of stock being on an average about 95.

* The amount of our National Debt is about £750,000,000.

Shares:—Railway and other public companies obtain money for constructing their lines, &c., by issuing *Shares*. These are purchased by individuals, who have money, which they are willing to invest in this way. At certain fixed times the profits of the concern are divided among the Shareholders. If the dividends are large in proportion to what can be got elsewhere, the shares will increase in value. On the contrary, if the dividends are small, or, as sometimes happens, no dividends are paid, the shares will sell for less than their original value.

Brokerage is a small per centage paid to a *Broker* for transacting business in Stocks and Shares.

The following are specimens of the class of questions occurring in Stocks and Shares.

Ex. I.—What sum will purchase £1000 stock when the funds are at 95?

Here £95 will purchase £100 stock.

∴ As 100 : 95 :: 1000 : the answer.

Ex. II.—What per centage will be realised by purchasing into the 3½ per cents at 96?

This is equivalent to asking what £100 will realise if £96 realise £3½

∴ As 96 : 100 :: 3½ : the answer.

Ex. III.—What income will be derived from investing £5000 in the 3 per cents at 94?

Here as many £100 stock will be purchased as there are 94s in 5000, and for every £100 stock £3 are paid.

∴ Income = $\frac{5000}{94}$ × 3 = £159 11s 5$\frac{4}{47}$d.

What sum will purchase

(1) £1000 stock at 91
(2) £760 „ „ 97
(3) £1400 „ „ 94¼
(4) £2000 stock at 96¾
(5) £1500 „ „ 101
(6) £3560 „ „ 99⅞

What per centage will be realised by purchasing

(7) 3½ per cents at 90
(8) 3 „ „ „ 86
(9) 4 „ „ „ 92¾
(10) 4½ per cents at 97½
(11) 5 „ „ „ 103
(12) 4¾ „ „ „ 98¼

What income will be realised by investing:—

13. £10000 in the 3 per cents. at 85
14. £1780 „ 4 „ 90
15. £5000 „ 3½ „ 88
16. £1520 in the 4½ per cents. at 96⅛
17. £4600 „ 3¾ „ 91⅜
18. £12000 „ 4¾ „ 95⅝

19. A person investing in the 3 per cents receives 5 per cent. interest for his money; what is the price of the stock?

20. A canal company paid a half-yearly dividend of 7/6 per share of £25; what is that per cent. per annum?

21. If £5000 be invested in the 3 per cents at 95½: what income will be derived from this investment after deducting 7d. in the £1 income tax?

22. If I lay out £1900 in the purchase of stock at 85¾, and sell out at 90⅜; what is my gain?

23. What is the difference in income from investing £4000 in the 3 per cents at 81, and the 4½ per cents at 92½?

24. A person having £6000 in the Danish 3 per cents at 74¾, transfers his money to the Russian 5 per cents, at 105⅜; what is the alteration in his income?

25. When the 3 per cents are at 82, what should be the price of the 3½ per cents, that an investment may be made with equal advantage in either stock?

MISCELLANEOUS PERCENTAGES.

Commission is a percentage paid to travellers and other agents on the amount of goods they sell or money they collect.

Profit and Loss.—Persons in trade calculate their profit or loss at so much per cent. on the money invested in their business.

Life Insurance.—Many persons insure their lives; that is, pay a sum of money annually to some company, which engages in return, to pay a certain sum to the insurer's friends at his death. The sum paid year by year is a percentage on the sum insured.

General Insurance.—Property of any kind, such as houses, furniture, farm stock, ships, &c. may also be insured against fire and other accidents, on the same principle as lives are insured.

Statistics.—All kinds of statistical tables relating to population, occupations, &c., are framed on the basis of £100, and reckoned at per cent.

Ex. I.—A man bought cloth at 12s. a yard, and sold it for 16s. a yard; what did he gain per cent.?

Here the profit is 4s. on 12s., and we want to find the profit on £100 at the same rate.

∴ As 12s. : £100 :: 4s. : the Ans.

Ex. II.—What is the insurance on £1000 at £1 7s. 6d. per cent.?

Here £1 7s. 6d. is paid for every £100 insured.

∴ As £100 : £1000 : : £1 7s. 6d. : the Answer.

Ex. III.—In a town of 10000 inhabitants there are 4936 males; what per centage of the whole are the females?

Here the number of females in 10000 − 4936 = 5064.

∴ As 10000 : 100 : : 5064 : the Answer.

1. If tea be purchased at 2s. 9d. per lb. and sold at 3s. 4d., what is the gain per cent?

2. Between 1801 and 1811 the population of Edinburgh increased by 24¾ per cent. and in the latter year it was 102,987; what was it in 1801?

3. Bought at £5 per cwt.—how must the same be sold per lb. to gain 12 per cent?

4. Having bought goods for £18, I sell them four months afterwards for £25; what is the gain per cent per annum?

5. What is the commission on £510 6s. 8d. at 1¾ per cent?

6. What is the brokerage on £416 at ⅛ per cent?

7. What would be the expense of insuring a house and furniture valued at £759 16s. 8d. at 1¼ per cent?

8. A town containing 8,500 inhabitants increases to 10,000; find the increase per cent.

9. If 236 yards of cambric are bought at 7s 10½d per yard, and sold one-fourth at 10s 3d, one-third at 8s 6d, and the remainder at 7s per yard; what will be the loss or profit per cent. on the whole outlay?

10. If 12 per cent be gained upon silk by selling it at 11s 8d per yard: at what price per yard should it be sold to clear 25 per cent?

11. An agent who is paid 2½ per cent, receives £89 as commission for collecting money: how much has he collected?

12. A cwt of sugar cost £2 16s 6d: how much must it be sold at per lb to gain 15 per cent?

13. By selling a piece of cloth measuring 39 yards for £5 10s, a draper gained 12 per cent: what did it cost him per yard?

14. In 1841 Ireland contained 8,175,124 inhabitants; in 1861 only 5,798,967; what was the decrease per cent?

15. In a school of 250 children, 219 can write their names: what per centage of the whole cannot write their names?

16. A man sells a horse for 100 guineas and gains 50 per cent: what did it cost him?

17. A reservoir containing 1,000,000 gallons, leaked 7½ per cent.: how much remained in the reservoir?

18. After paying an income tax of 7½ per cent, a gentleman has £1500 a year: what is his gross income?

19. £5000 are left to three individuals in the proportion of 1, 2, and 3: what did each receive after deducting a legacy duty of 10 per cent?

20. The population of a city is 520,000; it rises 2½ per cent for 3 years successively: what was the population at the end of that time?

Section LXV.

SQUARE ROOT.

The square of a number is the product of that number multiplied by itself. Thus, the square of 8 is 8 × 8 or 64.

The square root of a number is that number, which, when multiplied by itself, will produce the given number. Thus, 8 is the square root of 64; because 8 × 8 will produce 64.

Find the square root of 5345344.

```
 .  .  .  .
5345344(2312
4
43) 134
    129
461) 553
     461
4622)9244
     9244
     ....
```

First divide the number into periods, by placing a point over the units, and then over every alternate figure. Find the highest number whose square can be subtracted from 5; this is 2. Place this in the quotient and subtract 4, its square, from 5. Take down the next period, 34. Place 4, the *double* of the square already found in the divisor, and see how many times it is contained in 13. Put 3, the number of times 4 is contained in 13, in both divisor and quotient; multiply 43 by 3 and subtract the product, 129, from 134. Bring down the next period and proceed as before till all the periods have been taken down. If after all the periods have been taken down, there be no remainder, the number in the quotient is the square root of the given number. But if there be a remainder, periods of ciphers may be annexed, and the resulting figures will be decimals.

Note:—The root of a vulgar fraction is obtained by finding the sq. root of the numerator for a new numerator, and the sq. root of the denominator for a new denominator. If, however, this cannot be done; reduce the vulgar to a decimal fraction, and find the root as above.

Find the square root of:—

(1—5) 361; 1,369; 7,056; 9,801; 15,625.

(6—10) 589,824; 242,064; 121,801; 1,024,144; 3,790,809.

(11—15) 858.64; 9,274.8; 386.001; 727.098; 6,960.641.

(16—20) $\frac{16}{28}$; $\frac{36}{121}$; $\frac{361}{1225}$; $\frac{2025}{3249}$; $\frac{768}{1911}$.

Section LXVII.

CUBE ROOT.

The Cube of a number is the product of that number multiplied by itself twice. Thus, 8 × 8 × 8 or 512 is the cube of 8.

The Cube Root of a number, is that number, which, when multiplied by itself twice, will produce the given number. Thus, 8 is the Cube Root of 512, because 8 × 8 × 8 will produce 512.

Find the Cube Root of 12326391.

		. . .	
		12326391	(231
		8	
63	1200	4326	
	189		
	1389	4167	
691	158700	159391	
	691		
	159391	159391	

First divide the number into periods by placing a point over the units and then over every *third* figure. Find the highest number whose cube can be subtracted from 12; this is 2. Place it in the quotient, and subtract 8, its cube, from 12. Take down the next period, 326. Place 6, the *triple* of the cube already found, in the left hand margin. Multiply this 6 by the first figure of the root, 2; and place the product, 12, with two ciphers annexed, as in the example. See how many times 1200 is contained in 4326; 3 times. Place the 3 in the quotient and also after the 6. Multiply 63 by 3, add the product 189 to 1200, and having multiplied 1389, the sum, by 3, subtract the product from 4326. Take down the next period, 391. Set 3 times the quotient in the margin. Add 9, the square of the last figure placed in the quotient, to 1389 + 189. Place 1587, the sum, with 2 ciphers annexed, as in the Example, and proceed as before.

Find the cube root of:—

(1—4) 50,653; 117,649; 614,125; 1,860,867.

(5—8) 60,236,288; 103,823,000; 952,763,904; 1,024,192,512.

(9—12) 5.832; 31.554496; 64.481201; 9,663.597.

(13—16) 4,680,635; 702,468; 92,476.35; 4,219.064.

(17—20) $\frac{64}{729}$; $\frac{343}{4096}$; $\frac{9261}{148877}$; $\frac{97654}{716184}$.

MISCELLANEOUS EXERCISES.

1. If $6\frac{1}{2}$ million visitors enter the Crystal Palace in 26 weeks, what is the average per day?

2. Find the sum, difference, product, and quotient of $6\frac{5}{9}$ and $2\frac{1}{3}\frac{1}{5}$

3. Add together $\frac{1}{1}\frac{1}{8}$ of £29, $\frac{1}{1}\frac{1}{5}$ of £33, and $\frac{1}{7}\frac{1}{5}$ of £100.

4. Find the value of ·846 of a mile.

5. If a pair of trowsers take $2\frac{1}{4}$ yds., a waistcoat $\frac{3}{4}$ of a yd., a coat $1\frac{3}{4}$ yds.; what quantity of cloth would be required to make 84 pairs of trowsers, 63 coats, and 12 waistcoats?

6. If a boy saves 10d. per week from 14 to 18 years of age, and 1s. 8d. per week from 18 to 21; what will he be worth at that time?

7. If 75 yds. of carpet $\frac{3}{4}$ wide will cover a floor, how much $\frac{5}{4}$ wide will be sufficient?

8. What is the insurance at 5/3 per cent. on £4,968 15s.?

9. If £150 pay for 6 boys 10r a year, what sum will pay for 25 boys for half-a-year?

10. Extract the cube root of 7 to 4 places of decimals, and square the result.

11. Find the compound interest on £2000 for 5 years at $3\frac{1}{2}$ per cent.

12. At what per cent., simple interest, will £625 amount to £715 in 3 years 168 days?

13. What fractional part of 7 miles, 3 furlongs, is 239 yds.?

14. What rate of interest is derived by purchasing in the $3\frac{1}{2}$ per cents. at $79\frac{1}{2}$?

15. Multiply 8 ft. 4 in. 7′ by 15 ft. 3 in. 9′.

16. Lent £250 for 292 days and received £14 interest; what was the rate per cent.?

17. What will $8\frac{5}{8}$ yds. cost, when $9\frac{5}{6}$ yds. cost $£2\frac{3}{5}$?

18. If 12 per cent. be gained by selling silk at 10s. 6d. per yard, at what price per yard should it be sold to clear 25 per cent.?

19. Add together the cube roots of ·007301384 and 32768, and divide the result by the square root of $72\frac{1}{4}$.

20. £1280 is divided among three persons, so that their portions are as 5, 3, and 2 respectively: how much did each receive?

21. How long will it be before £520 10s. put out at interest at $4\frac{1}{2}$ per cent. will amount to £600?

22. The present worth of a debt payable 6 months hence is £25 10s.; rate of discount 6 per cent.; what is the amount of the debt?

23. In a school of 480 children 16·9 per cent. are generally absent; what is the average attendance?

24. I bought soap at 33s. 6d. per cwt. and sold it at $5\frac{3}{4}$d. per lb; what was the gain per cent.?

25. A, B and C together can build a wall in 12 weeks, C can do it alone in 24 weeks, A in 34 weeks: in what time could B do it?

26. What principal will amount to £1000 in 3 years at 5 per cent., compound interest?

27. What is the value of a five-franc piece if a sovereign be worth $25\frac{1}{4}$ francs?

28. Find the discount on £103 13s. 6d. due two years hence at 4 per cent.

29. How many bushels of wheat are worth 16 bushels of barley, when wheat is 53s. per quarter and barley 27s.?

30. If $\frac{4}{5}$ of a house are worth £75, what is the value of $\frac{3}{16}$ of the house?

31. If $2\frac{1}{2}$ oz. of sugar cost ·5s., what is the value of ·63 cwt.?

32. A person investing in the $3\frac{1}{2}$ per cents. gets $4\frac{3}{4}$ per cent. for his money; what was the price of stock?

33. If I mix 15 lbs. of tea at 4/8 per lb. with $7\frac{1}{2}$ lbs. at 3/10 per lb.; what is the value of an ounce of the mixture?

34. A ship worth £5000 was lost; $\frac{1}{4}$ of it belonged to A, $\frac{1}{8}$ to B, the remainder to C: what did each lose if she was insured for £3000?

35. After doing $\frac{2}{5}$ of a piece of work in 30 days, A calls B to assist him, and together they finish it in 5 days: in what time would B do the whole?

36. If 6 men, working 8 hours daily, reap 19 acres in 15 days; in what time will 20 men, working 12 hours a day, reap 100·63 ac.?

37. Find the cost of paving a street 1·85 miles long, and 17·9 feet wide at $3\frac{1}{2}$d. per square foot.

38. What sum is the same fraction of a guinea that 3/6 is of £1?

39. If I buy £5000 $3\frac{1}{2}$ per cents at $95\frac{1}{8}$, and sell out again at $87\frac{3}{4}$, what shall I lose by the transaction?

40. A travels 4 miles an hour, B travels $4\frac{1}{2}$ miles an hour, and starts 3 hours after A: in what time will B overtake A?

41. If 180 gallons of wine cost £100, what is that per dozen bottles, supposing a gallon to fill 6·75 bottles?

42. The side of a cube is 6 ft. 11 in.: find its contents.

43. Find the difference between the interest and true discount on £84 10s. for 180 days at 4½ per cent.

44. Find the cost of painting the walls of a room 18 ft. 6 in. long, 14 ft. 10 broad, and 8 ft. 4 high, at 3½d. per sq. foot.

45. In a battle $\frac{1}{25}$ of the men were killed, $\frac{3}{16}$ wounded, and 10768 were uninjured: how many were engaged?

46. Add together $\frac{5}{160}$ of a shilling; ·25 of a crown; $\frac{4}{11}$ of £5; $\frac{2}{99}$ of £1 16s. 8d., and ·875 of £10.

47. A man increases his capital by $\frac{1}{10}$ annually for four years, when he possesses £5000: what had he at first?

48. What is the length of a square field whose area is 15·5 ac.?

49. One tap fills a cistern in 12 minutes, and another fills it in 20 minutes; if both be opened when the cistern is empty, in what time will it be filled?

50. Find that number, which if multiplied by $\frac{3}{14}$ of 56, will produce 37·8.

51. Find the side of a square whose area is equal to that of a rectangle 38·4 ft. long and 19·27 ft. broad.

52. If 12 men or 24 boys do a piece of work in ten hours, in what time would 8 men and 16 boys do half the work?

53. What is the value of £149 in the 4¼ per cents, when the 3¾ per cents are at 87½?

54. Divide £1000 among 25 men, 50 women, and 100 children, so that each man may have twice as much as a woman, and each woman twice as much as a child.

55. If the hands of a clock be together at 12 o'clock, when will they be together again?

56. What is the value of a square field whose side is 40·85 chains at £150 per acre.

57. What is the depth of a cubical box that contains 840,000 cubic inches?

58. How long is a post of which ¼ is in the mud, ⅔ in the water, and 7½ feet above the water?

59. A man bought 1000 oranges at 3 for two-pence, the same number at 4 for two-pence, and sold them all at 7 for four-pence: what did he gain or lose?

60. What will remain of a piece of carpet 100 yards long, after covering a floor 14¼ ft. long by 12¾ wide?

TABLE OF FOREIGN MONEY.

Country.	Coins.	Value in Eng Money, nearly.
		s. d.
France, Belgium, and Switzerland	1 *Franc* or 10 decimes or 100 centimes	0 $9\frac{3}{4}$
Germany:—		
Austria	1 *Florin* or 100 Kreutzers	1 $11\frac{1}{4}$
Zollverein (North)	1 *Thaler* or 30 silber groschen	2 $10\frac{3}{4}$
Zollverein (South)	1 *Florin* or 60 Kreutzers	1 8
Denmark	1 *Rigsdaler* or 96 skilling.	2 $2\frac{1}{2}$
Spain	1 *Dollar* or 20 reals or 10 decimas or 100 centenas	4 2
Russia	1 *Rouble* or 100 copecks	3 2
Italy:—		
Sardinia, &c.	1 *Lira* or 100 centesimi	0 $9\frac{1}{2}$
Naples, &c.	1 *Ducat* or 5 tari or 10 carlini	3 4
Roman States	1 *Scudo* or 10 paoli or 100 bayocchi	4 2
United States	1 *Dollar* or 100 cents	4 2
East Indies	1 *Rupee* or 16 annas or 192 pice	2 0
China	1 *Tael* or 10 mace	6 0

TABLE OF FOREIGN DISTANCES.

Country.	Length In Yards.	Proportion to Eng. Mile.
English Mile	1760	1·000
French League*	4860	2·761
German „	8102	4·603
Spanish „	7418	4·214
Italian mile	2025	1·15
Russian Verst	1167	0·663
Chinese Li	632	0·355

* The real standard French measure of length is *Metre* = 39·37 in. (Eng.) [Decametre = 10; Hectometre = 100: Kilometre = 1000, &c.]

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KEY

TO

THE 'STANDARD' MANUAL

OF

ARITHMETIC

(THEORETICAL AND PRACTICAL).

EDITED BY

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The Editor will feel greatly obliged if any teacher who may happen to meet with errors in this Key, will kindly communicate them to Mr. Marshall, Tavistock.

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80. 290	81. 66	82. 178	83. 81
84. 370	85. 210	86. 322	87. 270
88. 57.			

SECTION V. (page 14—16).

SIMPLE ADDITION (hundreds).

1. 145	2. 376	3. 744	4. 222
5. 194	6. 722	7. 2,195	8. 3,277
9. 2,619	10. 2,573	11. 2,385	12. 2,413
13. 957	14. 1,151	15. 204	16. 776
17. 1,402	18. 1,588	19. 883	20. 1,569
21. 521	22. 1,508	23. 554	24. 801
25. 621	26. 1,615	27. 742	28. 664
29. 1,027	30. 1,883	31. 2,410	32. 1,180
33. 1,618	34. 1,151	35. 1,923	36. 920
37. 1,263	38. 1,850	39. 1,605	40. 1,362
41. 2,222	42. 2,646	43. 3,031	44. 2,183
45. 1,041	46. 2,610	47. 2,713	48. 1,788
49. 1,661	50. 1,122	51. 985	52. 326
53. 1,818	54. 308	55. 2,383	56. 1,013
57. 3,738	58. 1,207	59. 2,725.	60. 3,182
61. 83	62. 3,188	63. 1,434	64. 1,095
65. 750	66. 396	67. 2,745	68. 2,016
69. 2,897	70. 2,119	71. 2,213	72. 1,080
73. 2,420	74. 2,757	75. 2,528	76. 2,312

SECTION VI. (page 16—18).

SIMPLE ADDITION (thousands).

1.	8,891	2.	6,955	3.	24,943
4.	16,986	5.	28,287	6.	18,410
7.	20,095	8.	15,977	9.	32,529
10.	13,546	11.	26,489	12.	18,586
13.	25,999	14.	23,954	15.	22,550
16.	34,897	17.	21,000	18.	8,844
19.	177	20.	36,498	21.	25,345
22.	193,664	23.	25,257	24.	105,962
25.	57,152	26.	10,967	27.	17,505
28.	26,177	29.	140,855	30.	16,303
31.	1,634	32.	36,467	33.	115,325
34.	976	35.	203,326	36.	17,143
37.	23,214	38.	20,077	39.	20,004
40.	15,368	41.	10,641	42.	105,614
43.	87,694	44.	101,030	45.	102,310
46.	14,329	47.	20,585	48.	21,947
49.	18,933	50.	24,520	51.	3,319
52.	30,858	53.	2,245	54.	273,147
55.	91,458	56.	13,269	57.	146,066
58.	11,440	59.	27,271	60.	18,510
61.	100,962	62.	14,549	63.	12,093
64.	7,447	65.	110,058	66.	18,196
67.	102,059	68.	275,242	69.	16,898
70.	2,251	71.	20,329	72.	17,782

73.	14,279	74.	17,752	75.	0
76.	95,961	77.	20,706	78.	98,846
79.	18,701	80.	11,327	81.	9,456
82.	114,828	83.	19,475	84.	100,075
85.	118,246	86.	16,855	87.	194,803
88.	11,596	89.	197,783	90.	28,192
91.	118,536	92.	37,150	93.	2,706
94.	1,246,161	95.	1,764,230	96.	853,437
97.	1,012,107	98.	1,625,314	99.	390,152
100.	1,665,577	101.	1,194,892	102.	2,586,191
103.	1,594,408	104.	2,713,413	105.	159,713
106.	2,040,907	107.	907,670	108.	1,881,077
109.	1,904,645				

Section VII. (page 19).

SIMPLE SUBTRACTION.

1.	24	2.	43	3.	14	4.	14
5.	11	6.	13	7.	1	8.	14
9.	42	10.	34	11.	31	12.	54
13.	33	14.	14	15.	31	16.	83
17.	113	18.	844	19.	626	20.	711
21.	851	22.	521	23.	233	24.	810
25.	333	26.	4,441	27.	1,422	28.	541
29.	7,233	30.	3,716	31.	1,724	32.	1,301
33.	1,103	34.	1,000	35.	1,033	36.	100
37.	32	38.	64	39.	6,000	40.	3,322
41.	2,811	42.	7,130	43.	3,115	44.	18
45.	11	46.	22	47.	21	48.	3,263
49.	1,307	50.	36	51.	196	52.	43

PART III.

SECTION XI. (page 27).

SIMPLE MULTIPLICATION.

1.	14812	2.	27252	3.	21744
4.	170375	5.	485784	6.	698929
7.	31712	8.	89136	9.	23547
10.	44136	11.	7916780835	12.	6157496205
13.	2638926945	14.	1759284630	15.	7037138520
16.	5277853890	17.	4398211575	18.	3518569260
19.	3756623490	20.	4507948188	21.	6010597584
22.	3005298792	23.	1502649396	24.	2253974094
25.	5259272886	26.	6761922282	27.	1728912591
28.	740962539	29.	493975026	30.	2222887617
31.	987950052	32.	1975900104	33.	1481925078
34.	1234937565	35.	7422238413	36.	5772852099
37.	2474079471	38.	1649386314	39.	3298772628
40.	6597545256	41.	4948158942	42.	4123465785
43.	8888888889	44.	7901234568	45.	1975308642
46.	6913580247	47.	2962962963	48.	5925925926
49.	3950617284	50.	4938271605	51.	4519737684
52.	3766448070	53.	6026316912	54.	3013158456
55.	1506579228	56.	2259868842	57.	5273027298
58.	6779606526	59.	4792885909	60.	4108187922
61.	6162281883	62.	2738791948	63.	2054093961
64.	1369395974	65.	5477583896	66.	3423489935
67.	119487820	68.	95590256	69.	143385384
70.	215078076	71.	191180512	72.	71692692

73.	167282948	74.	47795128	75.	155193886
76.	387984715	77.	543178601	78.	698372487
79.	465581658	80.	232790829	81.	620775544
82.	310387772	83.	2699081640	84.	2399183680
85.	2099285720	86.	1499489800	87.	1799387760
88.	1199591840	89.	599795920	90.	899693880
91.	706184883	92.	470789922	93.	549254909
94.	627719896	95.	392324935	96.	276331776
97.	355283712	98.	157903872	99.	315807744
100.	236855808	101.	31784869 6	102.	635697392
103.	953546088	104.	476773044	105.	556235218
106.	273798490	107.	492837282	108.	547596980
109.	438077584	110.	602356678		

111.	7628372856;	2542790952;	5933178888;	4237984920
112.	8107206822;	2702402274;	6305605306;	4504003790
113.	458862246;	152954082;	356892858;	254923470
114.	872108856;	290702952;	678306888;	484504920
115.	728779464;	242926488;	566828472;	404877480
116.	898875864;	299625288;	699125672;	499375480
117.	763110864;	254370288;	593530672;	423950480
118.	805373712;	268457904;	626401776;	447429840
119.	7627914036;	2542638012;	5932822028;	423773 co2
120.	492259347;	164086449;	382868381;	27347715
121.	6775576;	3387788;	5081682;	7622523
122.	776064768;	388032384;	582048576;	873072864
123.	47575576;	23787788;	3568168 2;	53522523

124.	718037520;	359018760;	538528140;	807792210
125.	718000688;	359000344;	538500516;	807750774
126.	720787832;	360393916;	540590874;	810886311
127.	78278048;	39139024;	58708536;	88062804
128.	78403968;	39201984;	58802976;	88204464
129.	678031800;	339015900:	508523850;	76278517
130.	38053552;	19026776;	28540164;	42810246

131.	427189597128		132.	16943283	
133.	14012280		134.	893973780	
135.	211952608		136.	39061680	
137.	12533472		138.	35483616	
139.	36586080		140.	34410600	
141.	9316340;	10163280	142.	98714044;	107688048
143.	6608250;	7209000	144.	8624759;	9408828
145.	3810455;	4156860	146.	7770477;	8476884
147.	3381004;	3688368	148.	9877604;	10775568
149.	1098317;	1198164	150.	601117;	655764
151.	921294;	1005048	152.	4626	
153.	8672		154.	3504	
155.	7872		156.	2296	

SECTION XII. (pages 30—32)

SIMPLE SUBTRACTION.

1.	16	2.	7	3.	18	4.	13
5.	9	6.	6	7.	3	8.	26
9.	8	10.	5	11.	24	12.	35
13.	57	14.	27	15.	14	16.	17

17.	34	18.	21	19.	53	20.	54
21.	16	22.	376	23.	527	24.	514
25.	347	26.	58	27.	121	28.	338
29.	431	30.	41	31.	14	32.	18
33.	429	34.	9	35.	498	36.	605
37.	548	38.	190	39.	161	40.	63
41.	311	42.	4554	43.	52	44.	4875
45.	1820	46.	2969	47.	2136	48.	191
49.	5181	50.	5526	51.	1918	52.	192
53.	8425	54.	1158	55.	261	56.	1951
57.	1036	58.	2816	59.	cannot*	60.	cannot*

61.	28936	62.	18556	63.	12690
64.	27908	65.	5980	66.	75008
67.	83376	68.	74588	69.	7797
70.	84111	71.	98841	72.	7001
73.	256660	74.	65728	75.	385248
76.	6699016	77.	7894232	78.	5879642
79.	363760	80.	81020	81.	3524649
82.	3668949	83.	3737579	84.	3745934
85.	1389585	86.	2152663	87.	2164765
88.	2173765	89.	2250993	90.	2949838
91.	3044373	92.	3047186	93.	7829105
94.	7969405	95.	8039433	96.	8046142
97.	1375997	98.	2154206	99.	2172262

* These are introduced for reasons which will be obvious to the experienced teacher.

100.	2175108	101.	2280314	102.	3040315
103.	3065025	104.	3074215	105.	6916936
106.	7677074	107.	7747116	108.	7754116
109.	7564362	110.	7749465	111.	7774253
112.	7783567	113.	1401113	114.	2028369
115.	2110220	116.	2117245	117.	8635110
118.	8794506	119.	8855595	120.	8863705
121.	144300	122.	212930	123.	221285
124.	763078	125.	775180	126.	784180
127.	698845	128.	793380	129.	796193
130.	140300	131.	210328	132.	217037
133.	778209	134.	796265	135.	799111
136.	760001	137.	784711	138.	793901
139.	760138	140.	830180	141.	837180
142.	185103	143.	209891	144.	219205
145.	627256	146.	709107	147.	716132
148.	159396	149.	220485	150.	228595
151.	68630	152.	76985	153.	12102
154.	21102	155.	94535	156.	97348
157.	70028	158.	76737	159.	18056
160.	20902	161.	24710	162.	33900
163.	70042	164.	77042	165.	24788
166.	34102	167.	81851	168.	88876
169.	61089	170.	69199	171.	5947407
172.	824794096	173.	25317231	174.	19621431
175.	6306469	176.	10621942.	177.	1877374

178.	669902998	179.	601013503	180.	5999
181.	36999660	182.	12799908	183.	37000514
184.	719838	185.	5370422	186.	7766507
187.	3538468	188.	99152	189.	77512153
190.	1375360	191.	2414	192.	12583
193.	4903	194.	1157	195.	81186
196.	9074	197.	8574	198.	35389
199.	91381	200.	36011		

Section XIII. (page 33).

SIMPLE MULTIPLICATION (with ciphers).

1.	84060	2.	8934000	3.	5462000
4.	7540000	5.	169000	6.	268350
7.	794720	8.	678600	9.	49230000
10.	8047890	11.	299200	12.	3725000
13.	3636000	14.	771760000	15.	69200
16.	693000	17.	378000	18.	66980
19.	909000	20.	75400	21.	249200

Section XIV. (page 34).

MULTIPLICATION BY FACTORS.

1.	4886	2.	5235	3.	5584	4.	6282
5.	17450	6.	2960	7.	3108	8.	9256
9.	3552	10.	6216	11.	64225	12.	69363
13.	71932	14.	77070	15.	161847	16.	65472
17.	69440	18.	71424	19.	79360	20.	142848

21.	305298	22.	319836	23.	327105	24.	356181
25.	610596	26.	468100	27.	505548	28.	524272
29.	561720	30.	898752	31.	155484	32.	172760
33.	177696	34.	190036	35.	120932	36.	638400
37.	670320	38.	718200	39.	766080	40.	263340
41.	310700	42.	341770	43.	372840	44.	375947
45.	167778	46.	1221528	47.	1332576	48.	888384
49.	999432	50.	555240				

Section XV. (page 36).

LONG MULTIPLICATION.

1.	71032	2.	118650	3.	141945
4.	148988	5.	179712	6.	144210
7.	168987	8.	227400	9.	228015
10.	334702	11.	215554	12.	251850
13.	371200	14.	543058	15.	339891
16.	203742	17.	271656	18.	316932
19.	565950	20.	633864	21.	321840
22.	187740	23.	420180	24.	482760
25.	554280	26.	588879	27.	778518
28.	838404	29.	708651	30.	888309
31.	224672	32.	155288	33.	327096
34.	287448	35.	178416	36.	619318
37.	749179	38.	479472	39.	639296
40.	769153	41.	1066392	42.	582566
43.	681306	44.	740550	45.	5934274
46.	5988192	47.	5734960	48.	43943[illegible]

49.	580944	50.	4870992	51.	8704464
52.	6634500	53.	8527544	54.	663450
55.	44230	56.	5436722	57.	5327676
58.	584175	59.	747744	60.	545230
61.	4803980	62.	4768040	63.	3534100
64.	359400	65.	503160	66.	675300
67.	8679856	68.	693308	69.	5123276
70.	612272	71.	591864	72.	5284500
73.	697554	74.	5347914	75.	42276
76.	312900	77.	8931060	78.	670500
79.	7590060	80.	598980	81.	6937320
82.	524746	83.	5781100	84.	373548
85.	62258	86.	3362040	87.	382050
88.	499212	89.	35703846	90.	213948
91.	82337376	92.	6813000	93.	81756
94.	726720	95.	71282148	96.	1569575
97.	538140	98.	62783	99.	72595086
100.	62262798	101.	1929625	102.	71800
103.	6767150	104.	80775	105.	88376825
106.	14763	107.	17863230	108.	14952810
109.	20767373	110.	12654	111.	349416
112.	476016	113.	273456	114.	40998144
115.	35903760	116.	8145714024	117.	8113949424
118.	6850262880	119.	9053092512	120.	63892224
121.	1860134976	122.	712162332	123.	541268784
124.	9061351308	125.	817167024	126.	8172305532

127. 814535100
128. 54810624
129. 6534432
130. 5417951688
131. 799288092
132. 626579424
133. 68883804
134. 80954352
135. 6815412576
136. 8383788
137. 50103480
138. 6382656
139. 5435136
140. 83233584
141. 7485525
142. 44735250
143. 5698800
144. 4852800
145. 74315700
146. 60782463
147. 363250230
148. 46274256
149. 39404736
150. 603443484
151. 845864325
152. 5055083250
153. 643964400
154. 548366400
155. 8397674100
156. 693359229
157. 4143677090
158. 527860848
159. 449498688
160. 6883615572
161. 8443871814
162. 50462554940
163. 6428398368
164. 5474087808
165. 83830091352
166. 892073229
167. 5336617090
168. 679828848
169. 578906688
170. 8865367572
171. 894669948o
172. 53467570800
173. 6811205760
174. 5800066560
175. 888222124640
176. 50602149
177. 302410290
178. 38523888
179. 32804928
180. 502374132
181. 8383788
182. 50103480
183. 6382656
184. 5435136
185. 83233584
186. 905249490
187. 5409982900
188. 689174880
189. 586865280
190. 8987245320
191. 86303512128
192. 515769994880
193. 65703668736
194. 55949807616
195. 856814440704
196. 274868478
197. 1642678380
198. 209259936
199. 178194816
200. 2728872504
201. 216481383
202. 1293743430
203. 164809296
204. 140342976

205.	2149210044	206.	1996140	207.	11929400
208.	1519680	209.	1294080	210.	19817520
211.	89526879	212.	535033590	213.	68157648
214.	58039488	215.	888815772	216.	8240465148
217.	49246949080	218.	6273542976	219.	53422221056
220.	81810686064	221.	507235143 12	222.	303135597520
223.	38616284544	224.	32883608064	225.	5035790372 16
226.	774402513	227.	46280107 30	228.	589556856
229.	502038336	230.	76882068 84	231.	640860747
232.	38299338 70	233.	4878932 64	234.	41546438 4
235.	6362414796	236.	6886683	237.	41156430
238.	5242896	239.	4464576	240.	68370444
241.	78195790 29	242.	467316350 90	243.	5753118448
244.	50693642 88	245.	77632161972	246.	693409132 50
247.	414397532500	248.	527898840 00	249.	44963104000
250.	6884111010 00	251.	59924122 8	252.	3581205880
253.	456207936	254.	38848281 6	255.	59492195 04
256.	8853779163	257.	529122572 30	258.	67404646 56
259.	5739827136	260.	878996190 84	261.	693359229
262.	4143677090	263.	52786084 8	264.	449498688
265.	6883615572	266.	5080176 3	267.	30360323 0
268.	38675856	269.	3293433 6	270.	504355884
271.	645751290	272.	3859160900	273.	49161648 0
274.	418634880	275.	6410967720	276.	8248749129
277.	49296456090	278.	6279849648	279.	5347591488
280.	81892928772	281.	9062874828	282.	5416186188 0

SECTION XVII (page 42).

SHORT DIVISION.

1.	2825001 + 1	2.	1084956 + 4
3.	673546	4.	957017 + 4
5.	1077229 + 1	6.	1874900 + 4
7.	105755	8.	10052 + 7
9.	120996	10.	43445 + 4
11.	24053 + 3	12.	54118 + 2
13.	70079 + 5	14.	46843 + 7
15.	73689 + 3	16.	49567 + 1
17.	155695 + 4	18.	104594 + 6
19.	141079 + 1	20.	115847
21.	83849 + 6	22.	94330 + 7
23.	377323 + 1	24.	754647
25.	107806 + 5	26.	163773
27.	36394	28.	46792 + 2
29.	54591	30.	65509 + 1
31.	723349	32.	542511 + 3
33.	241116 + 3	34.	361674 + 3
35.	271255 + 7	36.	1257673 + 3
37.	943255 + 1	38.	1886510 + 1
39.	1078005 + 6	40.	838449
41.	3154900 + 1	42.	1352100 + 1
43.	1183087 + 5	44.	1051633 + 4
45.	1577450 + 1	46.	4710750 + 1
47.	1046833 + 4	48.	1570250 + 1

49.	2355375 + 1	50.	1345928 + 5
51.	454917	52.	151639
53.	682375 + 1	54.	170593 + 7
55.	227458 + 3	56.	3892158
57.	864924	58.	973039 + 4
59.	1946079	60.	1112045 + 1
61.	8385445 + 3	62.	37734504
63.	9433626	64.	12578168
65.	10867252	66.	10781286 + 6
67.	6289084	68.	25156336
69.	6860818 + 10	70.	15093801 + 3
71.	104171352 + 7	72.	468771087 + 1
73.	117192771 + 7	74.	156257029 + 1
75.	234385543 + 3	76.	133934596 + 3
77.	78128514 + 7	78.	312514058 + 1
79.	85231106 + 9	80.	187508435
81.	45134778 + 2	82.	203106502
83.	50776625 + 4	84.	67702167 + 2
85.	101553251	86.	58030429 + 1
87.	33851083 + 8	88.	135404334 + 2
89.	36928454 + 10	90.	81242600 + 4
91.	8438455 + 7	92.	37973051
93.	9493262 + 6	94.	12657683 + 4
95.	18986525 + 2	96.	10849443 + 1
97.	6328841 + 10	98.	25315367 + 1
99.	6904191 + 1	100.	15189220 + 2

101. 41720532 + 7
102. 187742397 + 1
103. 46935599 + 3
104. 62580799 + 1
105. 93871198 + 3
106. 53640685
107. 31290399 + 7
108. 125161598 + 1
109. 34134981 + 4
110. 75096959
111. 7175700
112. 32290650
113. 8072662 + 4
114. 10763550
115. 16145325
116. 9225900
117. 5381775
118. 21527100
119. 5871027 + 3
120. 12916260
121. 2417178 + 8
122. 10877305
123. 2719326 + 2
124. 3625768 + 2
125. 5438652 + 2
126. 3107801 + 3
127. 1812884 + 2
128. 7251536 + 2
129. 1977691 + 9
130. 4350922
131. 2416218 + 2
132. 10872982
133. 2718245 + 4
134. 3624327 + 2
135. 5436491
136. 3106566 + 2
137. 1812163 + 8
138. 7248654 + 2
139. 1976905 + 9
140. 4349192 + 4
141. 9357512
142. 42108804
143. 10527201
144. 14036268
145. 21054402
146. 12031086 + 6
147. 7018134
148. 28072536
149. 7656146 + 2
150. 16843521 + 3
151. 861662 + 6
152. 3877482

153. 969370 + 4

154. 1292494

155. 1938741

156. 1107852

157. 646247

158. 2584988

159. 704996 + 8

160. 1550992 + 4

161. 9667760 + 7

162. 43504923 + 1

163. 10876230 + 7

164. 14501641 + 1

165. 21752461 + 3

166. 12429978 + 1

167. 7250820 + 7

168. 29003282 + 1

169. 7909986 + 1

170. 17401969 + 2

171. 6627579 + 6

172. 29824108 + 1

173. 7456027 + 1

174. 9941369 + 3

175. 14912054 + 1

176. 8521173 + 6

177. 4970684 + 9

178. 19882739

179. 5422565 + 2

180. 11929643 + 2

181. 3760840 + 4

182. 16923782

183. 4230945 + 4

184. 5641260 + 4

185. 8461891

186. 4835366 + 2

187. 2820630 + 4

188. 11282521 + 1

189. 3077051 + 3

190. 6769512 + 4

191. 2417607 + 6

192. 10879234 + 1

193. 2719808 + 5

194. 3626411 + 3

195. 5439617 + 1

196. 3108352 + 5

197. 1813205 + 9

198. 7252823

199. 1978042 + 7

200. 4351693 + 4

201. 4162686 + 1

202. 18732087 + 1

203. 4683021 + 7

204. 6244029 + 1

205. 9366043 + 3
206. 5352025
207. 3122014 + 7
208. 12488058 + 1
209. 3405834 + 1
210. 7492835
211. 9417380 + 1
212. 42378210 + 1
213. 10594552 + 5
214. 14126070 + 1
215. 21189105 + 1
216. 12108060 + 1
217. 7063035 + 1
218. 28252140 + 1
219. 7705129 + 2
220. 16951284 + 1
221. 9421823 + 3
222. 42398205
223. 10599551 + 2
224. 14132735
225. 21199102 + 2
226. 12113772 + 6
227. 7066367 + 6
228. 28265470
229. 7708764 + 6
230. 16959282
231. 2222266 + 6
232. 10000200
233. 2500050
234. 3333400
235. 5000100
236. 2857200
237. 1666700
238. 6666800
239. 1818218 + 2
240. 4000080
241. 838497 + 2
242. 3773237 + 1
243. 943309 + 3
244. 1257745 + 5
245. 1886618 + 3
246. 1078067 + 6
247. 628872 + 11
248. 2515491 + 2
249. 686043 + 2
250. 1509295
251. 9421824 + 5
252. 42398210 + 1
253. 10599552 + 5
254. 14132736 + 5
255. 21199105 + 1
256. 12113274 + 3

257. 7066368 + 5
258. 28265473 + 2
259. 7708765 + 6
260. 16959284 + 1
261. 8621778 + 2
262. 38798002
263. 9699500 + 4
264. 12932667 + 2
265. 19399001
266. 11085143 + 3
267. 6466333 + 8
268. 25865334 + 2
269. 7054182 + 2
270. 15519200 + 4
271. 888718 + 7
272. 3999234 + 1
273. 999808 + 5
274. 1333078 + 1
275. 1999617 + 1
276. 1142638 + 3
277. 666539 + 1
278. 2666156 + 1
279. 727133 + 6
280. 1599693 + 4
281. 8719515 + 6
282. 39237820 + 1
283. 9809455 + 1
284. 13079273 + 3
285. 19618910 + 1
286. 11210805 + 6
287. 6539636 + 9
288. 26158547
289. 7134149 + 2
290. 15695128 + 1
291. 4275071 + 3
292. 19237821
293. 4809455 + 2
294. 6412607
295. 9618910 + 2
296. 5496520 + 2
297. 3206303 + 6
298. 12825214
299. 3497785 + 7
300. 7695128 + 2

SECTION XVIII (pages 43—44).

DIVISION BY FACTORS.

1.	286 + 6	2.	455 + 10	3.	2283 + 4
4.	620 + 9	5.	590 + 19	6.	564 + 1
7.	517 + 1	8.	496 + 9	9.	2802 + 16
10.	2702 + 14	11.	2522 + 10	12.	2293 + 1
13.	2162	14.	1945 + 34	15.	1751 + 14
16.	1667 + 40	17.	1592 + 6	18.	1459 + 22
19.	7536	20.	6977 + 42	21.	6850 + 50
22.	6728 + 32	23.	6280	24.	14128 + 59
25.	13908 + 11	26.	13486 + 47	27.	12716 + 3
28.	12362 + 59	29.	8233 + 59	30.	7925
31.	7547 + 52	32.	7204 + 48	33.	7044 + 40
34.	2789 + 4	35.	2704 + 52	36.	2677 + 48
37.	2479 + 16	38.	2434 + 8	39.	4528 + 112
40.	4491 + 61	41.	4117 + 28	42.	3774 + 16
43.	1234	44.	822 + 20	45.	617
46.	411 + 20	47.	308 + 40	48.	274 + 20
49.	7634	50.	636 + 200	51.	2120 + 200
52.	1090 + 400	53.	908 + 680	54.	848 + 200
55.	1733 + 100	56.	43 + 4000	57.	32 + 8000
58.	52	59.	551 + 460	60.	93 + 400
61.	310 + 400	62.	42 + 4000	63.	2 + 98000

SECTION XIX (page 45).

SIMPLE LONG DIVISION.

1.	52284 + 4	2.	37107 + 22	3.	13540 + 46
4.	49285 + 6	5.	41176 + 16	6.	23445 + 4
7	68850 + 4	8.	29577 + 20	9.	11067 + 48
10.	37859 + 8	11.	25580 + 23	12.	16042 + 5
13.	10755 + 43	14.	72806 + 5	15.	59155 + 3
16.	12619 + 58	17.	55675 + 8	18.	24268 + 31
19.	45070 + 13	20.	9606 + 13	21.	20813 + 13
22.	4568 + 71	23.	5132 + 11	24.	22038 + 1
25.	26760 + 7	26.	24976 + 7	27.	23415 + 7
28.	19718 + 5	29.	14985 + 22	30.	13166 + 21
31.	69882 + 9	32.	24553 + 14	33.	14194 + 59
34.	47814 + 9	35.	56779 + 11	36.	64891 + 1
37.	53439 + 12	38.	25956 + 15	39.	37853 + 3
40.	15108 + 30	41.	14048 + 18	42.	19530 + 24
43.	15399 + 6	44.	38131 + 3	45.	27612 + 6
46.	22243 + 6	47.	18198 + 42	48.	42144 + 18
49.	25830 + 24	50.	22971 + 2	51.	24738 + 2
52.	22971 + 2	53.	22436 + 36	54.	28376
55.	21439 + 29	56.	17228 + 16	57.	20527 + 15
58.	53599 + 2	59.	50778 + 2	60.	14000 + 4
61.	13125 + 4	62.	3559 + 23	63.	2592 + 52
64.	2282 + 60	65.	6176 + 20	66.	4565 + 14
67.	3088 + 20	68.	9545 + 14	69.	8750 + 4

SECTION XX (pages 47—48).

SIMPLE LONG DIVISION.

1.	104 + 14	2. 111 + 11	3. 192 + 22
4.	325 + 11	5. 373 + 4	6. 222 + 27
7.	210 + 11	8. 113 + 2	9. 21 + 31
10.	118 + 35	11. 104 + 60	12. 98 + 54
13.	657 + 23;	450 + 50; 549 + 23;	409 + 18
14.	1497 + 8;	620 + 66; 759 + 53;	1755 + 11
15.	699 + 49;	351 + 79;	146 + 382
16.	429 + 60;	127 + 234;	246 + 360
17.	76 + 590;	221 + 219;	154 + 106
18.	33 + 42;	65 + 188;	40 + 363
19.	76 + 648;	64 + 64;	50 + 248
20.	64 + 66;	42 + 28;	56 + 266
21.	1389 + 86;	1178 + 271;	869 + 94
22.	716 + 663;	1002 + 7;	1383 + 79
23.	558 + 120;	254 + 340;	782 + 26
24.	1390 + 238;	3735 + 113;	866 + 32
25.	883 + 140;	784 + 156;	974 + 390
26.	505 + 580;	1646 + 171;	480 + 645
27.	7335 + 92;	844 + 461;	1591 + 387
28.	1427 + 140;	1290 + 614;	1113 + 791
29.	1950	1043 + 47;	1323 + 12
30.	231 + 145;	113 + 752;	242 + 156
31.	1095 + 120;	970 + 90;	1240 + 360
32.	129 + 791;	62 + 199;	16 + 3081

33.	413 + 421;	131 + 1952;	77 + 3032
34.	217 + 1430;	57 + 1653;	189 + 1542
35.	111 + 4113;	78 + 3795;	96 + 5781
36.	120 + 3000;	401 + 900;	105 + 1320
37.	52 + 346;	24 + 570;	19 + 1148
38.	129 + 961;	963 + 292;	3492 + 49
39.	69 + 7800;	170 + 2130;	69 + 6006
40.	72 + 145;	27 + 109;	17 + 137
41.	825 + 423;	104 + 4938;	755 + 453
42.	5457 + 149;	3114 + 77;	4934 + 89
43.	11915 + 161;	9127 + 344;	2490 + 56
44.	6860 + 65;	470 + 2285;	1498 + 261
45.	388 + 1503;	204 + 4663;	152 + 5815
46.	4418 + 120;	32706 + 224;	2091 + 4142
47.	7784 + 457;	2549 + 442;	5175 + 956
48.	1249 + 1505;	963 + 847;	2839 + 440
49.	2215 + 17;	267 + 4082;	4824 + 182
50.	1423 + 828;	2813 + 327;	691 + 302
51.	11188 + 1020;	9048 + 300;	2121 + 3690
52.	8916 + 4396;	39251 + 374;	8530 + 2768
53.	90361 + 859;	145671 + 494;	10078 + 1032
54.	84613 + 293;	4649 + 4659;	95812 + 188
55.	6184 + 2882;	73738 + 240;	52519 + 3
56.	17710 + 3090;	123234 + 192;	9321 + 810
57.	8104 + 885;	330049 + 62;	6532 + 1905
58.	112406 + 102;	8954 + 176;	63818 + 532

59. 19227 + 657; 3045 + 1962; 2098 + 234

60. 138890 + 2; 55116 + 752; 39601 + 1433

61. 50600 62. 114 63. 1740

64. 76924 65. 10380 66. 289

67. 1588 68. $35714\frac{2}{7}$ 69. 125

70. 3508 71. 24690 72. 14209

73. 9806 74. 4464 75. 82626 + 14

76. 2564 + 4 77. 24312 + 1422

PART IV.

Miscellaneous Exercises in Addition, Subtraction, Multiplication, and Division.

(Pages 51—57.)

1.	96	2.	144
3.	43	4.	313770
5.	harness £19, gig £31, horse £14	6.	741
7.	13880	8.	495
9.	56	10.	572 + 42
11.	44 + 1	12.	5
13.	16	14.	783
15.	340	16.	9
17.	£11	18.	177660
19.	96000	20.	3276
21.	1728	22.	90
23.	72	24.	1470
25.	1290	26.	10
27.	192	28.	1008
29.	84	30.	1634
31.	144	32.	3394702080
33.	£10585	34.	423
35.	27 + 1	36.	4526 + 2
37.	2 and 6	38.	19 + 26
39.	25½ each	40.	930
41.	197 pence.	42.	60
43.	1352	44.	4788

45. £1782
46. 1596
47. 8460
48. 8096
49. 833
50. 6444
51. 9576
52. 2106
53. 72 + 1
54. 1508
55. 12 + 7
56. 198
57. 142 + 1
58. 1184 + 1
59. 9 + 15
60. 26
61. 24
62. 5
63. 28 + 20
64. 567
65. 22464
66. 22
67 527
63. 624
69. 7696
70. 13849038
71. 501 and 1770
72. 250
73. 27375
74. 5
75. 1662
76. 6495
77. 285
78. 748
79. 242
80. 22
81. 79
82. 1056
83. 3432
84. 227664
85. 12816
85. 28
87. 467
88. 78
89. 571
90. 41 and 19
91. 54 + 3
92. 43
93. 53
94. 32
95. 95 + 1751
96. £5

97.	13	98.	£73
99.	20808	100.	900
101.	2088	102.	10368
103.	11 + 5	104.	5267
105.	78	106.	713
107.	270	108.	£3810
109.	120304	110.	315
111.	48	112.	£274
113.	226 + 1	114.	£588905
115.	49647	116.	4038150
117.	13322022	118.	6201856
119.	70814	120.	247833 + 1

Section XXI. (pages 58—61).

COMPOUND ADDITION.

(a)	£51	8	2	(b)	£51 17 11½
(c)	£117	17	3½	(d)	£155 9 6½
(e)	£45	8	4½	(f)	£92 15 1½
(g)	£75	1	0½	(h)	£112 7 5½
(i)	£35	4	1½	(j)	£49 8 4½
1.	£15	1	10½	2.	£37 17 3½
3.	£39	0	3½	4.	£29 13 8½
5.	£20	5	4½	6.	£36 3 2½
7.	£62	7	11½	8.	£98 10 6½
9.	£297	18	5½	10.	£169 17 1½
11.	£234	10	5½	12.	£225 8 9½

13.	£1327	9	$11\frac{3}{4}$	14.	£602	10	1
15.	£1380	0	$2\frac{1}{2}$	16.	£1368	2	0
17.	£1645	7	$0\frac{1}{4}$	18.	£1528	15	$10\frac{3}{4}$
19.	£2087	9	10	20.	£1380	15	$4\frac{3}{4}$
21.	£1680	11	$11\frac{1}{2}$	22.	£1046	2	[illegible]
23.	£1376	6	$4\frac{3}{4}$	24.	£2265	10	$11\frac{3}{4}$
25.	£730	18	$0\frac{3}{4}$	26.	£370	6	2
27.	£1023	4	$7\frac{3}{4}$	28.	£185	14	$5\frac{3}{4}$
29.	£550	13	$5\frac{1}{2}$	30.	£685	5	$10\frac{1}{4}$
31.	£4321	17	0	32.	£4547	6	5
33.	£3971	6	$0\frac{1}{4}$	34.	£6068	2	2
35.	£5272	17	$3\frac{1}{2}$	36.	£3760	7	$11\frac{3}{4}$
37.	£2753	6	3	38.	£5994	2	$4\frac{1}{2}$
39.	£4705	9	$1\frac{3}{4}$	40.	£3664	6	$11\frac{3}{4}$
41.	£5336	13	$3\frac{3}{4}$	42.	£3940	10	$3\frac{1}{2}$
43.	£4586	14	$1\frac{3}{4}$	44.	£5730	10	9
45.	£5710	12	$5\frac{1}{4}$	46.	£4649	11	11
47.	£3403	14	$4\frac{3}{4}$	48.	£2628	3	$6\frac{1}{4}$
49.	£5667	16	$3\frac{1}{4}$	50.	£10041	7	$3\frac{1}{4}$
51.	£12479	17	$10\frac{1}{2}$	52.	£8381	9	$4\frac{1}{2}$
53.	£22954	12	$5\frac{3}{4}$	54.	£25684	2	$8\frac{1}{2}$
55.	£32823	4	$10\frac{1}{4}$	56.	£42824	17	$5\frac{1}{4}$
57.	£16124	0	$6\frac{1}{4}$	58.	£5207	9	$0\frac{1}{4}$
59.	£9060	17	$9\frac{1}{4}$	60.	£3736	8	$2\frac{3}{4}$
61.	£0	15	$6\frac{1}{2}$	62.	£1000	0	0
63.	£36	1	$8\frac{3}{4}$	64.	£1	7	$4\frac{1}{4}$
65.	£14132	5	$4\frac{1}{4}$	66.	£2	19	$0\frac{1}{4}$
67.	£82	4	6	68.	£24	19	6
69.	£23	11	0	70.	£0	3	11

Section XXII (pages 62—64).

COMPOUND SUBTRACTION.

1.	£2	16	$1\frac{3}{4}$	2.	£8	12	$11\frac{1}{2}$
3.	£6	13	$1\frac{1}{2}$	4.	£10	8	$1\frac{3}{4}$
5.	£8	11	$6\frac{1}{4}$	6.	£57	6	$8\frac{1}{4}$
7.	£13	10	$5\frac{3}{4}$	8.	£11	12	$3\frac{1}{4}$
9.	£18	17	$7\frac{1}{4}$	10	£26	2	$10\frac{1}{2}$
11.	£268	7	$10\frac{3}{4}$	12.	£235	18	$5\frac{1}{2}$
13.	£301	12	$1\frac{3}{4}$	14.	£891	17	$7\frac{1}{4}$
15.	£576	2	$5\frac{3}{4}$	16.	£326	8	$6\frac{1}{2}$
17.	£29	6	$11\frac{1}{4}$	18.	£832	5	$10\frac{3}{4}$
19.	£133	14	$3\frac{3}{4}$	20.	£611	2	$9\frac{1}{2}$
21.	£8826	14	$0\frac{1}{2}$	22.	£222	2	$3\frac{3}{4}$
23.	£9402	15	1	24.	£4350	18	11
25.	£8474	14	$2\frac{1}{4}$	26.	£3439	4	$1\frac{3}{4}$
27.	£7969	0	$11\frac{3}{4}$	28.	£7305	19	$0\frac{3}{4}$
29.	£7428	10	$11\frac{1}{4}$	30.	£1628	18	$6\frac{1}{2}$
31.	£1875	13	1	32.	£1892	0	$9\frac{3}{4}$
33.	£3792	3	$6\frac{1}{4}$	34.	£4361	19	$11\frac{3}{4}$
35.	£958	15	$4\frac{1}{4}$	36.	£2694	12	$11\frac{1}{4}$
37.	£4096	0	$5\frac{1}{4}$	38.	£3238	12	$8\frac{1}{4}$
39.	£6992	8	$9\frac{3}{4}$	40.	£3511	12	2
41.	£94491	12	$7\frac{1}{2}$	42.	£5758	9	2
43.	£76632	3	$10\frac{1}{4}$	44.	£44712	18	$10\frac{3}{4}$
45.	£43	2	$9\frac{3}{4}$	46.	£45206	7	8
47.	£24265	3	$5\frac{3}{4}$	48.	£30238	8	$2\frac{3}{4}$

49.	£7541	3	$2\frac{1}{4}$	50.	£14842	14	6
51.	£68619	18	$1\frac{1}{2}$	52.	£242589	12	$3\frac{3}{4}$
53.	£100783	9	$2\frac{1}{4}$	54.	£329643	9	$9\frac{1}{2}$
55.	£554274	9	$1\frac{1}{2}$	56.	£899854	9	$1\frac{1}{4}$
57.	£369643	16	$0\frac{1}{2}$	58.	£511790	0	$9\frac{1}{4}$
59.	£349972	5	$3\frac{3}{4}$	60.	£199389	2	[illegible]
61.	£9	10	0	62.	£24	1	$5\frac{1}{2}$
63.	£117	14	10	64.	£2029	4	$7\frac{3}{4}$
65.	£7	14	$9\frac{3}{4}$	66.	£31	2	6
67.	£1	13	$6\frac{3}{4}$	68.	£8	12	$10\frac{1}{4}$
69.	£7	19	$5\frac{3}{4}$	70.	£4	12	0
71.	£6	17	$7\frac{1}{2}$	72.	The first, by 4*s.* $11\frac{1}{4}$*d.*		
73.	£23	13	$4\frac{1}{2}$	74.	£32	14	6
75.	£0	7	$5\frac{1}{2}$	76.	£5	7	$4\frac{1}{2}$
77.	£11411	5	$6\frac{1}{2}$	78.	£750	2	$5\frac{1}{2}$
79.	£60	0	$0\frac{1}{2}$	80.	£9	11	6

Section XXIII (pages 65—67).

COMPOUND MULTIPLICATION.

1.	£29	17	4	2.	£21	4	0
3.	£36	11	6	4.	£52	13	4
5.	£503	8	0	6.	£25	12	$5\frac{1}{4}$
7.	£8787	9	0	8.	£48308	16	0
9.	£5008	19	$6\frac{1}{2}$	10.	£14511	5	$10\frac{1}{4}$
11.	£39831	4	$5\frac{3}{4}$	12.	£5304	6	$1\frac{1}{4}$
13.	£14156	5	0	14.	£226500	0	0

15.	£19818	15	0	16.	£28312	10	0
17.	£1698750	0	0	18.	£19818 75	0	0
19.	£25481	5	0	20.	£198187	10	0
21.	£11325	0	0	22.	£169875	0	0
23.	£54762	10	6	24.	£4761	12	4½
25.	£68054	8	0	26.	£50618	11	9
27.	£63097	6	3	28.	£46943	15	6
29.	£77468	3	6	30.	£290153	16	3
31.	£86014	1	4½	32.	£867889	1	4½

SECTION XXIV (pages 67—68).

1.	£4	6	8½	2.	£16	12	1½
3.	£42	10	11	4.	£78	12	8½
5.	£117	13	10½	6.	£90	18	11¾
7.	£135	6	6	8.	£160	2	1½
9.	£285	19	9½	10.	£710	14	0¾
11.	£1017	4	9	12.	£1199	17	3
13.	£972	19	8¼	14.	£1037	17	0
15.	£1167	11	7½	16.	£1297	6	3
17.	£3269	19	1½	18.	£3567	4	6
19.	£3715	17	2¼	20.	£4161	15	3
21.	£2999	18	9	22.	£3199	18	8
23.	£3299	18	7½	24.	£3499	18	6½
25.	£6864	6	9	26.	£7627	0	10
27.	£8008	7	10½	28.	£8389	14	11
29.	£13648	10	10	30.	£13927	1	8
31.	£15041	5	0	32.	£15319	15	10

33.	£26503	1	0	34.	£29815	18	$7\frac{1}{2}$
35.	£30289	4	0	36.	£30762	9	$4\frac{1}{2}$
37.	£48944	8	0	38.	£52343	6	4
39.	£54382	13	4	40.	£57101	16	0
41.	£94172	18	0	42.	£98096	15	5
43.	£105944	10	3	44.	£117716	2	6
45.	£56353	4	7	46.	£61476	5	0
47.	£67065	0	0	48.	£12188	10	$5\frac{1}{4}$
49.	£13622	9	$3\frac{3}{4}$	50.	£16490	7	$0\frac{3}{4}$
51.	£18641	5	$4\frac{1}{2}$	52.	£8715	0	$10\frac{1}{2}$
53.	£9316	1	$7\frac{1}{2}$	54.	£10217	12	9
55.	£11119	3	$10\frac{1}{2}$	56.	£19696	0	$3\frac{3}{4}$
57.	£20706	1	$4\frac{1}{4}$	58.	£21716	2	$4\frac{3}{4}$
59.	£23231	3	$11\frac{1}{2}$	60.	£4728	5	$11\frac{1}{2}$
61.	£5130	14	$1\frac{1}{2}$	62.	£5231	6	2
63.	£5432	10	3	64.	£11944	12	$11\frac{1}{4}$
65.	£12363	15	$1\frac{3}{4}$	66.	£12992	8	$5\frac{1}{2}$
67.	£14040	3	$11\frac{3}{4}$	68.	£12291	14	2
69.	£12472	9	$4\frac{1}{2}$	70.	£13195	10	$2\frac{1}{2}$
71.	£13376	5	5	72.	£47071	15	9
73.	£48310	10	$4\frac{1}{2}$	74.	£50787	19	$7\frac{1}{2}$
75.	£53265	8	$10\frac{1}{2}$	76.	£14123	13	$0\frac{1}{4}$
77.	£14441	0	$8\frac{3}{4}$	78.	£14599	14	7
79.	£14758	8	$5\frac{1}{4}$	80.	£92120	3	11
81.	£93100	3	$11\frac{1}{2}$	82.	£95060	4	$0\frac{1}{2}$
83.	£96040	4	1	84.	£6654	8	$6\frac{1}{2}$
85.	£7181	10	$2\frac{1}{2}$	86.	£7576	16	$5\frac{1}{2}$

87.	£15736	17	$7\frac{3}{4}$	88.	£21687	16	1
89.	£23803	13	9	90.	£3736	8	9
91.	£4205	18	9	92.	£5986	2	6
93.	£264785	19	3	94.	£321984	17	$5\frac{1}{4}$
95.	£396536	5	$2\frac{1}{4}$	96.	£688913	0	$5\frac{1}{2}$
97.	£283834	19	$4\frac{1}{2}$	98.	£229170	9	$1\frac{1}{2}$
99.	£156262	17	$7\frac{1}{2}$	100.	£129517	1	$6\frac{3}{4}$
101.	£65285	0	$7\frac{1}{2}$	102.	£48528	10	$1\frac{1}{2}$
103.	£20159	9	$9\frac{1}{2}$	104.	£8792	9	$0\frac{1}{2}$
105.	£68177	13	4	106.	£125915	12	$6\frac{3}{4}$
107.	£150843	1	9	108.	£436768	1	3
109.	£490371	8	$3\frac{3}{4}$	110.	£254119	12	0
111.	£126697	14	$2\frac{1}{2}$	112.	£297768	16	3
113.	£64808	10	$1\frac{1}{2}$	114.	£215380	4	2
115.	£239287	8	$2\frac{3}{4}$	116.	£271379	1	3
117.	£208806	9	7	118.	£347845	17	$3\frac{1}{2}$
119.	£147549	19	$7\frac{1}{2}$	120.	£937898	1	3
121.	£1299168	5	$7\frac{1}{2}$	122.	£404575	16	$6\frac{3}{4}$
123.	£3053296	13	6	124.	£653478	14	$4\frac{1}{2}$
125.	£696704	18	9	126.	£1420336	17	$11\frac{1}{4}$
127.	£2200421	19	7	128.	£3701677	12	$4\frac{3}{4}$
129.	£2011118	5	0	130.	£511301	5	0
131.	£2102300	6	$1\frac{1}{2}$	132.	£157245	18	0
133.	£397092	13	$11\frac{1}{4}$	134.	£135718	3	9
135.	£386256	7	8	136.	£894691	0	0
137.	£480776	3	2	138.	£3667630	15	$7\frac{1}{2}$
139.	£4837968	9	$2\frac{1}{4}$	140.	£1044118	6	3
141.	£771288	3	$10\frac{1}{2}$	142.	£526752	3	$1\frac{1}{2}$
143.	£1153471	17	6	144.	£8893425	7	8
145.	£2318414	6	$8\frac{1}{2}$	146.	£5214180	17	7

SECTION XXV (page 70).
COMPOUND DIVISION.*

1.	£5	2	$9\frac{1}{4}$	2.	£8	9	$5\frac{1}{2}$
3.	£4	2	$3\frac{1}{2}$	4.	£16	6	$1\frac{1}{4}$
5.	£7	8	$6\frac{3}{4}$	6.	£13	14	2
7.	£15	4	$6\frac{3}{4}$	8.	£15	8	$0\frac{1}{2}$
9.	£21	13	$6\frac{1}{4}$	10.	£58	18	$1\frac{1}{4}$
11.	£71	2	$10\frac{1}{4}$	12.	£49	4	$11\frac{3}{4}$
13.	£24	19	10	14.	£21	17	$4\frac{1}{4}$
15.	£19	8	9	16.	£17	9	$10\frac{1}{2}$
17.	£46	9	4	18.	£44	7	1
19.	£40	13	2	20.	£39	0	$7\frac{3}{4}$
21.	£40	14	$10\frac{1}{2}$	22.	£39	5	$9\frac{1}{4}$
23.	£36	13	$4\frac{1}{2}$	24.	£34	7	$6\frac{1}{2}$
25.	£187	12	$5\frac{3}{4}$	26.	£176	18	$0\frac{1}{2}$
27.	£171	19	$9\frac{1}{2}$	28.	£154	15	$9\frac{1}{2}$
29.	£17	2	$8\frac{1}{4}$	30.	£16	7	$1\frac{1}{2}$
31.	£15	19	$10\frac{1}{4}$	32.	£14	19	$10\frac{1}{4}$
33.	£35	16	$2\frac{1}{2}$	34.	£33	3	$1\frac{3}{4}$
35.	£31	19	$5\frac{3}{4}$	36.	£28	8	5
37.	£57	18	1	38.	£52	18	$9\frac{3}{4}$
39.	£51	9	5	40.	£48	2	$6\frac{1}{4}$
41.	£347	0	$7\frac{1}{4}$	42.	£323	17	$10\frac{1}{4}$
43.	£303	13	$0\frac{1}{4}$	44.	£294	9	0
45.	£521	0	2	46.	£482	8	$3\frac{1}{2}$
47.	£434	3	$5\frac{3}{4}$	48.	£2480	19	$10\frac{1}{2}$

* These answers are correct to the nearest farthing.

49.	£671	13	11½	50.	£615	14	5¾
51.	£923	11	8½	52.	£17	9	5¼
53.	£15	9	1½	54.	£13	17	1¾
55.	£12	19	3	56.	£22	13	10¾
57.	£21	10	7¼	58.	£20	9	7¼
59.	£19	10	6¾	60.	£15	15	9¾
61.	£15	9	1¼	62.	£14	16	5¾
63.	£14	4	10¼	64.	£6	2	11
65.	£6	0	7¼	66.	£5	12	1¾
67.	£5	8	4	68.	£13	16	4
69.	£13	11	10½	70.	£12	19	4
71.	£12	11	7	72.	£11	9	3½
73.	£11	2	10	74.	£10	16	8¾
75.	£10	13	9½	76.	£1	5	9¾
77.	£1	5	1¾	78.	£1	4	10
79.	£1	3	11¼	80.	£1	13	9
81.	£1	12	11½	82.	£1	12	6¾
83.	£1	12	2¼	84.	£0	11	9½
85.	£0	11	6¼	86.	£0	11	4¾
87.	£0	11	3¼	88.	£5	19	11½
89.	£5	18	8½	90.	£5	16	3
91.	£5	15	0¾	92.	£2	14	4½
93.	£2	10	4½	94.	£2	7	9
95.	£2	8	4¾	96.	£1	5	0
97.	£0	16	5¼	98.	£0	18	7¾
99.	£2	8	5½	100.	£1	10	8¾

101.	£1	5	7	102.	£1	2	$2\frac{1}{2}$
103.	£2	11	$7\frac{3}{4}$	104.	£26	1	$9\frac{1}{2}$
105.	£28	6	$0\frac{3}{4}$	106.	£50	7	$4\frac{1}{2}$
107.	£32	7	$6\frac{3}{4}$	108.	£100	0	$2\frac{1}{4}$
109.	£40	2	$1\frac{1}{2}$	110.	£26	11	$9\frac{1}{4}$
111.	£3	8	$11\frac{1}{4}$	112.	£65	6	$11\frac{1}{2}$
113.	£15	16	2	114.	£19	7	$5\frac{3}{4}$
115.	£134	7	$6\frac{1}{4}$	116.	£0	11	7
117.	£1	1	$8\frac{1}{4}$	118.	£14	7	$7\frac{1}{2}$
119.	£24	8	$3\frac{1}{4}$	120.	£20	8	$11\frac{1}{2}$
121.	£110	7	$9\frac{3}{4}$				

MISCELLANEOUS QUESTIONS.

(page 71).

1.	20776615	2.	118
3.	85	4.	637, 488, 1125
5.	114362, 231079, 116717	6.	1996876
7.	2263550	8.	414772
9.	1659330	10.	Sum, 1475231 dif. 694281
11.	Sum, 504383 dif. 70279	12.	„ 3623617 „ 1425891
13.	13854681	14.	2756212
15.	9837176	16.	97966
17.	£1166 14 $8\frac{1}{2}$	18.	£92 13 0

PART V.

REDUCTION OF MONEY.

SECTION XXVI (*a*) (pages 75—77).

1.	510	shillings	2.	593	shillings
3.	314	,,	4.	573	,,
5.	1179	,,	6.	1737	,,
7.	18117	,,	8.	1291	,,
9.	10392	,,	10.	19697	,,
11.	17115	,,	12.	5691	,,
13.	1716	,,	14.	10822	,,
15.	480	,,	16.	3575	,,
17.	4540	,,	18.	10084	,,
19.	1150	,,	20.	9090	,,
21.	209	pence	22.	232	pence
23.	155	,,	24.	206	,,
25.	1449	,,	26.	9053	,,
27.	655	,,	28.	1348	,,
29.	351	,,	30.	1174	,,
31.	31	farthings	32.	39	farthings
33.	46	,,	34.	70	,,
35.	761	,,	36.	867	,,
37.	686	,,	38.	1968	,,
39.	192	,,	40.	18620	,,
41.	26590	,,	42.	52656	,,
43.	92160	,,	44.	33478	,,
45.	52583	,,	46.	1295	,,

47. 18285f.
48. 51843f.
49. £1 19
50. £42 7
51. £48 5
52. £39 4
53. £48 4
54. £42 6
55. 459 6 guineas
56. 403 13 guineas
57. 284 „
58. 10 0 „
59. 4 12 gui.
60. 825
61. 808 4d
62. 7088 8d
63. 64638 8d
64. 8328 3d
65. 18 8d
66. 438 3d
67. 6458 6d
68. 41678 3d
69. 82538 11d
70. 2116d.
71. 226½d
72. 1266d
73. 76¾d
74. 2424d
75. 2982d
76. 4203d
77. 4524½d
78. 420d
79. 552½d
80. £10 3 5
81. £325 0 4
82. £138 15 0
83. £97 18 6
84. £83 16 6¾
85. £7 17 7
86. £450 4 0
87. £35 6 3
88. £102 15 0
89. £80 15 5½

SECTION XXVI. (*b*) (pages 77—78).

1. £377 6
2. £453 14
3. £423 15
4. £35 6 3
5. £37 13 10
6. £35 6 3
7. £9 8 5¾
8. £8 16 6¾
9. £104 0 1¾

10. £8 3 5½	11. £1369 0 0	12. £1059 7 6
13. £847 10 0	14. 59424d.	15. 2124d
16. 15158h.	17. 218130d.	18. 813573f.
19. 13439 h.p.	20. 908534f.	21. 107 crs.
22. 959 h.crs.	23. 435 h.crs.	24. 757 h. crs
25. 169156d	26. 203852d	27. 23279d
28. 20244d	29. 193871d	30. 217120d
31. 813982f	32. 52576f	33. 869760f
34. £8 16 4	35. £28 2 10	36. £448 16 0
37. £226 3 6	38. £1130 17 6	39. 1678 7¾d
40. 1888. 5½	41. 1678. 7¾	42. 2078. 7.
43. 2898. 7	44. 23090d	45. 80997f
46. 383 groats 3	47. 98fl.	48. 13776 h.f.
49. 1070 th. pences	50. 6747 th. pences	51. 3981 groats
52. 3775 six-pences	53. 111 h. sov	54. 192 h.sov 7 5
55. 108 h.sov 7 10	56. 135 h.crs.	57. 47776f
58. £39 8 8	59. 789s. 1d	60. 25425od

SECTION XXVI. (*c*) (page 78).

1 £10241 14	2. £4877 5	3. 7447g 9s 7d
4. 520g 7s	5. 9188g 5s	6. 7105g 7s 6d
7. £9948 15	8. £9131 17	9. £573 6 0
10. £8898 15		

AVOIRDUPOIS WEIGHT.

SECTION XXVII (pages 79—81).

1. 1568 ozs	2. 96 ozs
3. 18 qrs	4. 448 ozs

5. 33 lbs 1 oz 1 dr
6. 20944 lbs
7. 12768 ozs
8. 1094 lbs
9. 424 qrs
10. 980 lbs
11. 686 tons 6 cwt 2 qrs
12. 801 cwt 1 qr 14 lbs
13. 10304 ozs
14. 231 ozs
15. 1245 ozs
16. 1408 ozs
17. 471 ozs 10 drs
18. 382 ozs
19. 1096 ozs 10 drs
20. 184590 ozs
21. 9548 lbs
22. 21 lbs 5 ozs 9 dms
23. 529 lbs 11 ozs
24. 11956 lbs
25. 848 stones
26. 605 stones 5 lbs
27. 31 stones 3 ozs
28. 72 stones
29. 63 qrs
30. 175 qrs 4 lbs 5 ozs.
31. 302 qrs. 9 lbs
32. 223 qrs
33. 327 cwt
34. 48 cwt 3 qrs 9 lbs
35. 42 cwt 12 lbs 7 ozs
36. 2 cwt 3 qrs 23 lbs 1 oz 4 drs
37. 273 tons 4 cwt.
38. 2 tons 8 cwt 3 qrs 23 lbs
39. 2 ton 9 cwt 3 qrs 11 lbs 6 ozs
40. 0 ton 1 cwt 0 qrs 23 lbs 12 ozs 2 drs
41. 1 ton 16 cwt
42. 28 tons 4 cwt 2 qrs 10 lbs
43. 1 cwt 2 qrs 23 lbs 14 ozs
44. 1 qr. 14 lbs 7 ozs
45. 10 tons 11 cwt 2 qrs 14 lbs
46. 280 tons 6 cwt 2 qrs. 24 lbs
47. 4 tons 15 cwt 1 qr 15 lbs
48. 7 ton 4 cwt 3 qrs 4 lbs 9 ozs
49. 1 ton 12 cwt 1 st 11 lbs 9 ozs 1 dm
50. 10 tons 17 cwt 2 qrs 12 lbs 13 oz 7 drs
51. 1 ton 12 cwt 1 qr
52. 2 cwt 0 qrs 15 lbs
53. 1 qr 20 lbs 15 ozs
54. 1 qr 15 lbs 3 ozs 1 dr

55. 3 cwt 15 lbs 13 ozs

56. 12 cwt 2 qrs 25 lbs 9 ozs

57. Cannot

58. 2 qrs 22 lbs 8 ozs 12 drs

59. 47 tons 7 cwt 1 qr 21 lbs 8 ozs

60. 6 cwt 10 lbs 1 oz 4 drs

61. 1 cwt 3 qrs 13 lbs 5 ozs 14 drs

62. 8 cwt 2 qrs 10 lbs 13 ozs 8 drs

63. 3 tons 2 cwt 1 qr 10 lbs

64. 11 cwt 3 qrs 1 lb 7 ozs

65. 1 ton 1 cwt 2 qrs 2 lbs 5 ozs

66. 3 tons 18 cwt 3 qrs 20 lbs

67. 5 tons 10 cwt 2 qrs

68. 3 tons 3 cwt 16 lbs

69. 4 tons 14 cwt 2 qrs 24 lbs

70. 9 tons 9 cwt 1 qr 20 lbs

71. 2 tons 7 cwt 1 qr 2 lbs

72. 6 tons 6 cwt 1 qr 4 lbs

73. 7 tons 2 cwt 8 lbs

74. 7 tons 17 cwt 3 qrs 12 lbs

75. 8 tons 13 cwt 2 qrs 16 lbs

76. 75 tons 8 cwt 2 qrs

77. 145 tons 9 cwt 1 qr

78. 193 tons 19 cwt

79. 129 tons 6 cwt

80. 226 tons 5 cwt 2 qrs

81. 452 tons 11 cwt

82. 323 tons 5 cwt

83. 387 tons 18 cwt

84. 86 tons 4 cwt

85. 431 tons

86. 3 qrs 10 lbs 2 ozs 6 drs

87. 1 cwt 11 lbs 1 oz 14 drs

88. 1 cwt 3 qrs 14 lbs 6 drs

89. 2 cwt 1 qr 15 lbs 15 ozs 6 drs

90. 3 cwt 1 qr 19 lbs 13 ozs 6 drs

91. 3 cwt 4 lbs 6 ozs 2 drs

92. 4 cwt 1 qr 23 lbs 11 ozs 6 drs

93. 4 cwt 2 qrs 24 lbs 10 ozs 14 drs

94. 5 cwt 2 qrs 14 lbs 1 oz 2 drs

95. 5 cwt 1 lb 8 ozs 6 drs

96. 18 cwt 1 qr 9 lbs 2 ozs $14\frac{6}{11}$ drs

97. 22 cwt 1 qr 17 lbs 7 ozs $1\frac{7}{9}$ drs

98. 67 cwt 24 lbs 5 ozs $5\frac{1}{8}$ drs

99. 100 cwt 3 qrs 8 lbs 8 ozs

100. 40 cwt 1 qr 9 lbs

101. 33 cwt 2 qrs 12 lbs 2 ozs $10\frac{3}{4}$ drs

102. 25 cwt 23 lbs 2 ozs

103. 16 cwt 3 qrs 6 lbs 1 oz $5\frac{1}{3}$ drs

104. 0

105. 0

106 1 ton 14 cwt 2 qrs 24 lbs 8 ozs

107. 1 ton 10 cwt 3 qrs 12 lbs 7 ozs $1\frac{2}{9}$ drs

108. 1 ton 3 cwt 16 lbs 5 ozs $5\frac{1}{3}$ drs

109. 19 cwt 3 qrs 10 lbs

110. 18 cwt 2 qrs 1 lb 13 ozs $13\frac{13}{15}$ drs

111. 16 cwt 3 qrs 9 lbs 5 ozs $5\frac{1}{3}$ drs

112. 15 cwt 1 qr 20 lbs 3 ozs $8\frac{8}{9}$ drs

113. 12 cwt 1 qr 10 lbs 9 ozs $3\frac{41}{45}$ drs

114. 8 cwt 1 qr 18 lbs 10 ozs $10\frac{2}{3}$ drs

115. 7 cwt 2 qrs 24 lbs 1 oz $12\frac{4}{9}$ drs

116. 19 cwt 1 qr 18 lbs 15 ozs $6\frac{2}{13}$ drs

117. 29 cwt 2 qrs 22 lbs 6 ozs $9\frac{7}{17}$ drs

118. 13 cwt 2 qrs 16 lbs 5 ozs $9\frac{35}{7}$ drs

119. 11 cwt 2 qrs 27 lbs 1 oz $7\frac{35}{43}$ drs

120. 8 cwt 2 qrs 6 lbs 7 ozs $5\frac{9}{9}$ drs

121. 5 cwt 22 lbs 15 ozs $10\frac{70}{97}$ drs

122. 6 cwt 1 qr 15 lbs 12 ozs $15\frac{31}{70}$ drs

123. 38 cwt. 3 qrs 9 lbs 14 ozs $12\frac{4}{13}$ drs

124. 26 cwt 2 qrs 8 lbs 4 ozs $3\frac{7}{19}$ drs

125. 21 cwt 3 qrs 22 lbs 10 ozs $6\frac{22}{23}$ drs

Section XXVIII (pages 81—82).

TROY WEIGHT.

1. 353 dwt. 3 grs
2. 18119 grs
3. 163 oz 4 dwt
4. 1299 dwt
5. 643 lbs 5 ozs
6. 443 ozs
7. 19 lbs 4 ozs 1 dwt
8. 112140 dwt
9. 115 ozs 11 dwt
10. 17397 grs
11. 12 lbs 2 ozs 15 dwt 20 grs
12. 30641 grs

13. 69168 grs
14. 6740 grs
15. 89760 grs
16. 1180800 grs
17. 1020 dwt
18. 49680 dwt
19. 3525 dwt 4 grs
20. 1356 dwt
21. 1405 ozs
22. 176 ozs 11 dwt 6 grs
23. 130 ozs 5 dwt
24. 220 ozs
25. 3 lbs 6 ozs 14 dwt 5 grs
26. 33 lbs 6 ozs
27. 18 lbs
28. 106 lbs 10 ozs 4 dwt
29. 49 lb 1 oz 14 dwt
30. 33 ozs 8 dwt 8 grs
31. 71 lbs 2 ozs 14 dwt 18 grs
32. 707 lbs 3 ozs 12 dwt
33. 22 lbs 3 ozs 14 dwt 7 grs
34. 261 lbs 11 ozs 12 dwt
35. 35 lbs 1 oz 8 dwt 23 grs
36. 8 lbs 5 ozs 2 dwt 17 grs
37. 10 ozs 7 dwt 17 grs
38. 107 lbs 4 ozs 14 dwt 4 grs
39. 1 lb 7 ozs 13 dwt 2 grs
40. 692 lbs 1 oz 15 dwt 6 grs
41. 49 lbs 1 oz 14 dwt
42. 171 lbs 11 ozs 19 dwt
43. 122 lbs 10 ozs 5 dwt
44. 221 lbs 1 oz 13 dwt
45. 147 lbs 5 ozs 2 dwt
46. 98 lbs 3 ozs 8 dwt
47. 73 lbs 8 ozs 11 dwt
48. 294 lbs 10 ozs 4 dwt
49. 245 lbs 8 ozs 10 dwt
50. 196 lbs 6 ozs 16 dwt
51. 28 lbs 8 ozs 12 dwt 12 grs
52. 22 lbs 11 ozs 14 dwt
53. 17 lbs 2 ozs 15 dwt 12 grs
54. 51 lbs 8 ozs 6 dwt 12 grs
55. 40 lbs 2 ozs 9 dwt 12 grs
56. 60 lbs 3 ozs 14 dwt 6 grs
57. 71 lbs 9 ozs 11 dwt 6 grs
58. 91 lbs 10 ozs 16 dwt
59. 103 lbs 4 ozs 13 dwt
60. 120 lbs 7 ozs 8 dwt 12 grs
61. 222 lbs 4 ozs 17 dwt 3 grs
62. 102 lbs 2 ozs 4 dwt 15 grs
63. 78 lbs 1 oz 14 dwt 3 grs
64. 174 lbs 3 ozs 16 dwt 3 grs
65. 258 lbs 5 ozs 12 dwt 21 grs
66. 342 lbs 7 ozs 9 dwt 15 grs
67. 402 lbs 8 ozs 15 dwt 21 grs
68. 474 lbs 10 ozs 7 dwt 9 grs
69. 498 lbs 10 ozs 17 dwt 21 grs
70. 546 lbs 11 ozs 18 dwt 21 grs

71. 12 lbs 3 ozs 8 dwt 12 grs
72. 3 lbs 6 ozs 2 dwt $10\frac{2}{7}$ grs
73. 4 lbs 10 ozs 19 dwt $9\frac{4}{5}$ grs
74. 2 lbs 8 ozs 15 dwt $5\frac{1}{3}$ grs
75. 4 lbs 1 oz 2 dwt 20 grs
76. 6 lbs 1 oz 14 dwt 6 grs
77. 8 lbs 2 ozs 5 dwt 16 grs
78. 2 lbs 11 dwt 10 grs
79. 2 lbs 5 ozs 9 dwt $16\frac{4}{5}$ grs
80. 3 lbs 17 dwt 3 grs
81. 17 dwt $5\frac{1}{2}\frac{1}{0}$ grs
82. 1 oz 1 dwt $12\frac{1}{1}\frac{5}{6}$ grs
83. 1 oz 8 dwt $17\frac{1}{4}$ grs
84. 9 dwt $13\frac{3}{4}$ grs
85. 12 dwt $7\frac{1}{2}\frac{1}{8}$ grs
86. 8 dwt $4\frac{1}{1}\frac{3}{4}$ grs
87. 6 dwt $21\frac{2}{5}\frac{1}{0}$ grs
88. 5 dwt $9\frac{1}{6}\frac{5}{4}$ grs
89. 4 dwt $18\frac{7}{8}$ grs
90. 4 dwt 2 $\frac{1}{2}\frac{3}{8}$ grs
91. 1 oz 18 dwt $23\frac{2}{3}\frac{8}{7}$ grs
92. 4 ozs 4 dwt $20\frac{1}{1}\frac{1}{7}$ grs
93. 5 ozs 10 dwt $23\frac{4}{1}\frac{}{3}$ grs
94. 2 ozs 9 dwt $17\frac{2}{2}\frac{6}{9}$ grs
95. 1 oz 13 dwt $13\frac{8}{4}\frac{}{3}$ grs
96. 1 oz 5 dwt $7\frac{8}{1}\frac{}{9}$ grs
97. 1 oz 1 dwt $12\frac{5}{6}\frac{1}{7}$ grs
98. 18 dwt $6\frac{2}{7}\frac{1}{9}$ grs
99. 17 dwt $9\frac{1}{6}\frac{2}{3}$ grs
100. 15 dwt $20\frac{4}{9}\frac{3}{1}$ grs

MEASURE OF TIME.

SECTION XXIX. (pages 83—84).

1. 49 dys
2. 864 hrs
3. 7560 min
4. 2700 sec
5. 16 wks 4 dys
6. 8 dys 22 hrs
7. 36 min 16 sec
8. 141 hrs 4 min
9. 145 min 54 sec
10. 29 dys 19 hrs
11. 840 hrs
12. 5496 dys
13. 152 dys 1 hr
14. 181 dys 4 hrs
15. 16 yrs 14 wks
16. 26 yrs 4 mo
17. 18 yrs
18. 30660 dys
19. 864 wks
20. 23 yrs 21 dys
21. 53 yrs 11 mo
22. 24 yrs 204 dys
23. 1672 yrs 20 wks
24. 2 m 4 d 9 h 3 m

25. 1152 mo
26. 1886 mo 2 wks
27. 3537 mo 11 dys
28. 1154 mo 19 d 16 h
29. 290540 dys
30. 41748 dys
31. 41 dys 7 hrs
32. 3504 dys
33. 239136 hrs
34. 914 hrs 6 min
35. 193 h 45 min 46 sec
36. 47712 hrs
37. 91 min 4 sec
38. 262080 min
39. 714240 min
40. 32580 min
41. 449 wks 1 dy 8 hrs
42. 159072 hrs
43. 30775 dys
44. 9486840 min
45. 15 dys 47 min
46. 6 yrs 10 mo 3 wks 2 ds 10 hs 56 m 31 sec
47. 501 yrs 2 wks 4 dys 20 hrs
48. 23956 min
49. 202496 sec
50. 31556937 sec
51. 5324 hrs
52. 199560 min
53. 4 ys 5 mo 3 wks 6 d 9 hrs 25 min
54. 10087020 min
55. 2938 hrs
56. 5647 dys 5 hrs
57. 204 yrs 6 mo 2 wks 3 dys
58. 3 mo 3 wks 4 dys 16 h 7 min 20 sec
59. 11718000 sec
60. 53594800 min
61. 278 dys
62. 176 dys
63. 235 days
64. 198 dys
65. 86 dys
66. 66 dys
67. 1619 dys
68. 1128 dys
69. 1199 dys
70. 1863 dys
71. 2 dys 3 hrs 20 min 30 sec.
72. 14 dys 18 hrs 55 min 34 sec
73. 9 mo 1 wk 8 hrs
74. 12 yrs 11 mo 6 dys 14 hrs 26 min 27 sec
75. 4 yrs 1 mo 3 wks 2 dys 22 hrs 48 min 24 sec
76. 11 dys 17 hrs 44 min
77. 10 hrs 16 min 48 sec
78. 8 dys 2 hrs 31 min 42 sec
79. 60 wks 16 hrs 12 min
80. 750 dys 6 hrs 26 min 56 sec
81. 6 mo 3 wks 4 ds 15 hrs 45 m
82. 1 yr 6 mo 1 wk 5 dys 10 hrs
83. 1 yr 4 mo 3 dys 20 hrs 45 m
84. 1 yr 8 mo 2 wks 6 dys 23 hrs 15 min
85. 2 yrs 3 mo 2 wks 4 dys 15 hrs

86. 2 yrs 1 mo 1 wk 3 dys 1 hr 45 min

87. 9 mo 6 dys 5 hrs

88. 11 mo 2 wks 18 hrs 15 min

89. 1 yr 11 mo 1 dy 12 hs 30 min

90. 1 yr 1 mo 3 wks 2 dys 7 hrs 30 min

91. 55 yrs 9 mo 2 wks 6 dys 4 hrs 32 min

92. 62 yrs 9 mo 1 wk 5 dys 5 hrs 6 min

93. 83 yrs 8 mo 2 wks 2 dys 6 hrs 48 min

94. 125 yrs 6 mo 3 wks 3 dys 10hrs 12 min

95. 167 yrs 5 mo 4 dys 13 hrs 36 min

96. 174 yrs 4 mo 3 wks 3 dys 14 hrs 10 min

97. 209 yrs 3 mo 1 wk 5 dys 17 hrs

98. 334 yrs 10 mo 1 wk 2 dys 3 hrs 12 min

99. 502 yrs 3 mo 1 wk 6 dys 16 hrs 48 min

100 244 yrs 2 mo 19 hrs 50 min

101. 3 mo 1 wk 2 dys 4 hrs 33 min 12 sec

102. 3 mo 2 wk 6 dys 15 hrs 13 min 4 sec

103. 2 mo 4 dys 11 hrs 47 min 52 sec

104. 5 mo 2 wks 4 dys 14 hrs 3 min 52 sec

105. 3 mo 2 dys 15 hrs 36 min 8 sec

106. 2 mo 1 wk 4 dys 44 min 56 sec

107. 4 mo 2 wks 3 dys 3 hrs 47 min 4 sec

108. 3 mo 2 wks 4 dys 23 hrs 58 min 48 sec

109. 6 mo 1 wk 6 dys 11 hrs 23 min 36 sec

110. 6 mo 3 wks 5 dys 13 hrs 17 min 44 sec

111. 7 hrs 26 min 15 sec

112. 1 dy 5 hrs 45 min

113. 14 hrs 52 min 30 sec

114. 9 hrs 55 min

115. 8 hrs 6 min $49\frac{1}{11}$ sec

116. 11 hrs 9 min $22\frac{1}{2}$ sec

117. 12 hrs 45 min

118. 8 hrs 55 min 30 sec

119. 22 hrs 18 min 45 sec

120. 17 hrs 51 min

121. 7 hrs 47 min $30\frac{14}{24}$ sec

122. 5 hrs 11 min $40\frac{14}{36}$ sec

123. 11 hrs 41 min $15\frac{14}{16}$ sec

124. 6 hrs 40 min $43\frac{10}{28}$ sec

125. 10 hrs 23 min $20\frac{14}{18}$ sec

126. 8 hrs 30 min $0\frac{1}{2}\frac{4}{2}$ sec
127. 3 hrs 20 min $21\frac{3}{5}\frac{8}{6}$ sec
128. 2 hrs 50 min $0\frac{1}{6}\frac{4}{6}$ sec.
129. 2 hrs 13 min $34\frac{3}{8}\frac{8}{4}$ sec
130. 1 hr 52 min $12\frac{1}{1}\frac{4}{0}\frac{}{0}$ sec
131. 12 min $11\frac{3}{7}\frac{1}{5}$ sec
132. 15 min $29\frac{4}{5}\frac{5}{9}$ sec
133. 14 min $44\frac{4}{6}\frac{8}{2}$ sec
134. 9 min $25\frac{5}{9}\frac{1}{7}$ sec
135. 17 min $15\frac{1}{5}\frac{}{3}$ sec
136. 22 min $17\frac{3}{4}\frac{9}{1}$ sec
137. 11 min $34\frac{3}{7}\frac{0}{9}$ sec
138. 14 min $30\frac{4}{6}\frac{6}{3}$ sec
139. 8 min $14\frac{2}{1}\frac{2}{1}\frac{}{1}$ sec
140. 7 min $40\frac{1}{1}\frac{1}{1}\frac{6}{9}$ sec

Section XXX (pages 85—86).

MEASURE OF CAPACITIES.

1. 108 qts
2. 90 gals
3. 42 pks
4. 94 pts
5. 1886 bus 2 pks
6. 27 qrs 1 bus
7. 248 gals
8. 400 pts
9. 1179 bush 1 gal
10. 1168 qrs 6 bush 3 pks
11. 940 fir
12. 7436 qts
13. 1705 kild 14 gals
14. 1120 h pts
15. 1707 gals 2 qts
16. 491 qts
17. 3428 tuns 156 gals
18. 9208 qts
19. 270 pipes 30 gals
20. 3592 qts
21. 96 bush 2 qts
22. 48 bush
23. 39 bus
24. 1885 bush
25. 755 bus
26. 231 gals 1 qt 1 pt
27. 761 gal 1 qt
28. 472 gals
29. 338 gals
30. 23 gals

31. 392 qts
32. 28 qts
33. 248 qts
34. 1005 qts
35. 511 qts 1 h pt
36. 880 qrs
37. 200 qrs 1 pk
38. 328 qts 2 bush 3 pks 1 gal 1 qt
39. 4 qrs 6 bush
40. 20 qrs 7 bush 1 gal 3 qts
41. 2116 gals
42. 972 gals
43. 5526 gals
44. 1944 gals
45. 900 gals
46. 28 bar 10 gals 2 qts
47. 10 bar 24 gals
48. 31 bar 3 fir
49. 432 bar 13 gals
50. 10 bar 30 gals
51. 55 pipes 115 gals
52. 6 pipes 93 gals
53. 168 pipes 6 gals
54. 42 pipes 54 gals
55. 69 pipes 113 gals 2 qts
56. 3740 gals
57. 29799 gals
58. 472½ gals
59. 48384 gals
60. 0
61. 58 bush 1 pk 1 qt
62. 1 qr 1 bush 2 pk 2 qts
63. 64 qts
64. 1098 pks 1 gal 1 qt
65. 771 qrs 5 bus 2 pks 1 gal
66. 35 ank 3 gals 3 qts
67. 47 bar 1 fir 5 gals
68. 661 butts 1 bar 6 gals
69. 246 hhd 47½ gals
70. 1104 pipes 1 hhd 17 gals
71. 26 bush 1 gal
72. 10 qrs 4 bush 3 pks
73. 18 tuns 184 gals 1 qt
74. 793 bar 1 kil 1 fir 8 gals
75. 47 gals 1 qt 3 gills
76. 545 ank 10 bar 12 gal
77. 61037 gals
78. 65152 gals
79. 31736 gals
80. 6878 gals
81. 7 qrs 7 bush
82. 6 qrs 7 bush 1 gal

83. 5 qrs 7 bush 1 pk
84. 8 qrs 6 bush 3 pks 1 gal
85. 10 qrs 6 bus 2 pks 1 gal
86. 2 qrs 7 bus 2 pks 1 gal
87. 11 qrs 6 bus 2 pks
88. 3 qrs 7 bus 2 pks
89. 4 qrs 7 bus 1 pk 1 gal
90. 9 qrs 6 bus 3 pks
91. 134 gals 2 qts
92. 117 gal 2 qts 1 pt 2 gls
93. 100 gals 3 qts 1 pt
94. 151 gals 1 qt 2 gills
95. 184 gals 3 qts 1 pt 2 gls
96. 50 gals 1 qt 1 pt 2 gills
97. 201 gals 3 qts
98. 67 gals 2 qt
99. 84 gals 2 gills
100. 168 gals 1 pt
101. 452 hhds 3 fir 5 gals
102. 396 hhds 1 gal
103. 509 hhds 1 fir
104. 226 hhds 1 fir 7 gals
105. 339 hhds 2 fir 6 gals
106. 622 hhds 1 fir 8 gals
107. 565 hhds 4 fir 4 gals
108. 678 hhds 5 fir 3 gals
109. 169 hhds 4 fir 3 gals
110. 282 hhds 5 fir 2 gals
111. 174 hhds 1 bar 17½ gals
112. 228 hhds 1 bar 3½ gals
113. 504 hhds 10½ gals
114. 726 hhds
115. 5740 hhds 1 bar 17½ gals
116. 463 hhds 1 bar 21 gals
117. 504 hhds 10½ gals
118. 537 hhds 1 bar 17½ gals
119. 107 hhds 1 bar 3½ gals
120. 275 hhds 1 bar 7 gals
121. 4 bus 3 pk 2 qts 1½ pts
122. 6 bus 1 gal 2 qts $1\frac{5}{7}$ pts
123. 1 qr 2 bus 3 pks 1 gal
124. 7 bus 2 gals
125. 2 qrs 5 bus 3 pks
126. 5 bus 1 pk 1 gal 2 qts
127. 3 bus 2 pks 1 gal
128. 3 bus 3 pks 1 gal 2 qts $1\frac{1}{11}$ pts
129. 4 bus 1 pk 3 qts $0\frac{2}{5}$ pt
130. 1 qr 2 pks 1 gal 2 qts $0\frac{4}{5}$ pt
131. 1 fir $1\frac{4}{7}$ gal
132. 3 gal 1 qt $1\frac{1}{11}$ pt
133. $4\frac{8}{9}$ gals
134. $4\frac{4}{7}$ gal

135. 5 gal $2\frac{1}{5}\frac{4}{1}$ qts
136. 1 gal $1\frac{4}{2}\frac{6}{1}\frac{}{8}$ qt
137. 9 gals $3\frac{5}{2}\frac{}{9}$ qts
138. $3\frac{4}{3}\frac{}{6}\frac{4}{4}$ qts
139. 3 gals $3\frac{1}{7}\frac{1}{5}$ qts
140. 15 gals $3\frac{1}{9}$ qts
141. 22 gals $1\frac{3}{7}\frac{7}{7}$ qts
142. 20 gals $2\frac{1}{4}\frac{}{2}$ qts
143. 1 gal $3\frac{5}{9}\frac{0}{1}\frac{6}{2}$ qts
144. 22 gals $1\frac{2}{7}\frac{7}{7}$ qts
145. 4 gals $2\frac{3}{3}\frac{3}{6}\frac{8}{4}$ qts
146. $20\frac{2}{8}\frac{}{6}$ gals
147. 24 gals $1\frac{3}{7}\frac{}{1}$ qt
148. 114 gals $3\frac{1}{3}$ qts
149. 90 gals $2\frac{1}{1}\frac{2}{9}$ qts
150. 61 gals $2\frac{2}{2}\frac{}{8}$ qts

Section XXXI (pages 87—89).

LONG MEASURE.

1. 386 ft 9 in
2. 2821 yds 1 ft
3. 172 poles
4. 112 fur 10 poles
5. 468 miles 2 fur
6. 151 leagues
7. 182 fur
8. 1400 poles
9. $3756\frac{1}{2}$ yds
10. 273 feet
11. 276 in
12. 295 in
13. 48 m 0 fur 30 po 2 yds
14. 2428 nls 1 in
15. 1160 qrs
16. 191 yds
17. 152 ells 4 qrs
18. 432 in
19. $221\frac{1}{2}$ in
20. $1248\frac{1}{2}$
21. 151 yds 2 ft 4 in
22. 213 yds 1 ft
23. $3338\frac{1}{2}$ yds
24. $6902\frac{1}{2}$ yds
25. $63\frac{1}{1}\frac{}{1}$ poles
26. 131 poles $2\frac{1}{2}$ ft
27. 2400 poles
28. 136 poles
29. 16 m 55 yds 2 ft
30. 1 m 1709 yds

31. 1 m 5 fur 27 poles
32. 10 m 4 fur
33. 18 poles 5 yds 2 in
34. 5 fur 28p 2 yd 1 ft
35. 9 fur 35 po 1 yd 1 ft 6 in
36. 211 fur 24 poles
37. 6552 in
38. 135864 in
39. 30492 in
40. 190080 in
41. $114\frac{3}{4}$ ch
42. 5874 ft
43. 5400 links
44. 70 ch 40 links
45. 3276 ft
46. 8 m 506 fath
47. 2478 ft $11\frac{156}{300}$ in
48. 44 ch 75 links
49. 164208 miles
50. 2808 miles
51. 14 yds 1 ft 8 in
52. 19 fur 13 po $2\frac{1}{2}$ yds
53. 23 lea 1 fur
54. 840 m 2 fur 34 pls 4yd
55. 850 fur 122 yds 1 ft.
56. 64 ells 2 nls $0\frac{1}{4}$ in.
57. 59 ells 4 qrs 1 nl $1\frac{1}{2}$ in
58. 31 yds 1 nl
59. 7542 ells 3 qrs 3 nls $\frac{3}{4}$ in
60 6873 yds 2 qrs 2 nls $0\frac{1}{4}$ in
61. 152 yds 1 ft 9 in
62. 381 nls 7 fur 3 pls
63. 18 fur 28 pls $4\frac{1}{2}$ yds
64. 733 fur 28 pls 1 yd
65. 157 m 4 fur
66. 3 yds 3 nls
67. 26 ells 3 qrs
68. 40 qrs 1 nl
69. 251 qrs 3 nls 1 in
70. 165 qrs 1 nl
71. 30 fur 32 pls
72. 44 fur
73. 39 fur 24 pls
74. 22 furlongs
75. 13 fur 8 po
76. 17 fur 24 pls
77. 48 fur 16 pls
78. 52 fur 32 pls
79. 3 m 2 fur 16 po
80. 35 fur 8 pls
81. 268 yds 1 ft 4 in
82. 604 yds

83. 805 yds 1 ft
84. 906 yds
85. 1107 yds 1 ft
86. 1073 yds 2 ft 4 in
87. 1208 yds
88. 1409 yds 1 ft
89. 1476 yds 1 ft 4 in
90. 1610 yds 2 ft
91. 463 lea 2 mls 5 fur 4 pls
92. 591 lea 2 mls 4 fur 12 pls
93. 623 lea 2 mls 4 fur 4 pls
94. 687 lea 2 mls 3 fur 28 pls
95. 751 lea 2 mls 3 fur 12 pls
96. 735 lea 2 m 3 fur 16 pls
97. 543 lea 2 m 4 fur 24 pls
98. 303 lea 2 mls 6 fur 28 pls
99. 271 lea 2 mls 6 fur 12 pls
100. 207 lea 2 mls 6 fur 28 pls
101. 215 qrs 3 nls $\frac{1}{4}$ in
102. 161 qrs 3 nls $\frac{3}{4}$ in
103. 323 qrs 2 nls $1\frac{1}{2}$ in
104. 296 qrs 2 nls $1\frac{3}{4}$ in
105. 107 qrs 3 nls $1\frac{1}{2}$ in
106. 80 qrs 3 nls $1\frac{1}{2}$ in
107. 134 qrs 3 nls 1 in
108. 242 qrs 3 nls
109. 269 qrs 2 nls 2 in
110. 188 qrs 3 nls $\frac{1}{2}$ in
111. 392 ells 4 qrs
112. 883 ells 4 qrs
113. 1080 ells 1 qr
114. 1767 ells 3 qrs
115. 12651 ells 2 qr
116. 3240 ells 3 qrs
117. 3928 ells
118. 3044 ells 1 qr
119. 2749 ells 3 qrs
120. 589 ells 1 qr
121. 6554 yds
122. 551 yds
123. 645 yds 1 qr
124. 2291 yds
125. 195 yds 3 qrs
126. 391 yds 2 qrs
127. 464 yds
128. 1283 yds 1 qr
129. 420 yds 2 qrs
130. 6467 yds
131. 4 fur $12\frac{2}{5}$ po
132. 1 m 1 fur $27\frac{1}{2}$ po
133. 6 fur $18\frac{1}{2}$ po
134. 1 m 4 fur $36\frac{3}{4}$ po

135. 5 fur $21\frac{2}{7}$ po
136. 3 fur $9\frac{1}{6}$ po
137. 3 fur $20\frac{10}{11}$ po
138. 3 fur 35 po
139. 7 fur 30 po
140. 4 fur $33\frac{3}{4}$ po
141. 1 qr $\frac{59}{96}$ nls
142. 1 qr $1\frac{7}{8}$ nl
143. 1 qr $1\frac{23}{84}$ nl
144. 1 qr $2\frac{11}{72}$ nls
145. 1 qr $2\frac{89}{64}$ nls
146. 1 qr $2\frac{47}{86}$ nls
147. 2 qrs $\frac{11}{54}$ nls
148. 2 qrs $1\frac{11}{48}$ nl
149. 3 qrs $\frac{11}{36}$ nls
150. 1 yd 2 qr $3\frac{11}{16}$ nls
151. 4 pls 1 yd $1\frac{5}{36}$ ft
152. 4 yds $1\frac{6061}{6065}$ ft
153. 8 pls 3 yds $\frac{1}{1}\frac{3}{5}\frac{3}{2}$ ft
154. 3 yds $2\frac{15}{19}\frac{8}{16}$ ft
155. 3 pls 4 yds $\frac{16}{34}\frac{3}{8}$ ft
156. 3 po $\frac{1}{4}\frac{8}{3}\frac{1}{2}$ ft
157. 5 pls 4 yds $1\frac{1}{2}\frac{7}{2}\frac{8}{4}$ ft
158. 4 yds 1 ft
159. 6 pls 3 yds $\frac{1}{1}\frac{8}{9}\frac{1}{6}$ ft
160. 6 pls $1\frac{1}{2}\frac{6}{1}\frac{5}{4}$ ft

Section XXXII (page 89—90).

SQUARE MEASURE.

1. 24 ft 8 in
2. 83 yds 1 ft
3. 309 per $22\frac{3}{4}$ yds
4. 591967
5. 10729 in.
6. 249 roods 24 per
7. 2 mls 571 ac 2 ro
8. 71 ac
9. 12 mls 74 ac
10. $17756\frac{3}{4}$ yds
11. 6534 yds
12. $4763\frac{1}{4}$ ft
13. 21748 in
14. 5 yds 7ft 58 in
15. 295 per $23\frac{1}{4}$ yds
16. 28 ac 3 r 4 p
17. 271541 yds
18. $863333\frac{1}{2}$ yds
19. 7984 roods
20. 477 ac 3 ro 13 per

21. 19 per $7\frac{1}{4}$ yds 2 ft 71 in
22. 7 ro 940 yds 4 ft.
23. 7 ro 38 p $22\frac{1}{2}$ yds
24. 71 ro
25. 26 yds 7 ft 47 in
26. 312 po 26 yds
27. 5935 per
28. 973 per
29. 52 ac 3 ro 24 per
30. 186 ac 2 rds
31. 17 ac 2 rds 1 per $25\frac{3}{4}$ yds
32. 572160 ac
33. 69 yds 2 ft 42 in
34. $228266\frac{1}{2}$ yds
35. 38115 yds
36. $20194\frac{3}{4}$ yds
37. 279 per $24\frac{1}{2}$ yds
38. 30160 per
39. 2548 yds
40. 216 per
41. 12 ac 1 rd 26 per
42. 10 ro 6 per $28\frac{3}{4}$ yds
43. 25 yds 7 ft 101 in
44. 993 per 2 yds 6 ft 112 in
45. 9 m 214 ac 28 per 2 yds
46. 5 ac 0 ro 33 po
47. 39 per 28 yds 2 ft 36 in
48. 12 po 14 yds 7 ft 36 in
49. 341 a 26 per 29 yds 1 ft 36 in
50. 19 a 3 r 34 p 10 yds 6 ft 108 in
51. 33 ac 3 per
52. 25 ac 2 rds 29 per
53. 22 ac 2 per
54. 14 ac 2 rds 28 per
55. 11 ac 1 per
56. 29 ac 1 rd 16 per
57. 40 ac 1 rd 17 per
58. 44 ac 4 per
59. 36 ac 2 rd 30 per
60. 18 ac 1 rd 15 per
61. 61 yds 7 ft 96 in
62. 208 yds 6 ft 108 in
63. 139 yds 1 ft 72 in
64. 185 yds 5 ft
65. 371 yds 1 ft
66. 340 yds 1 ft 96 in
67. 324 yds 6 ft 72 in
68. 278 yds 3 ft
69. 510 yds 2 ft 72 in
70. 556 yds 6 ft
71. 1580 yds
72. 1316 yds 6 ft

73. 7162 yds 6 ft
74. 1176 yds 2 ft
75. 2054 yds
76. 3230 yds 2 ft
77. 3634 yds
78. 16063 yds 3 ft
79. 12604 yds 8 ft
80. 3774 yds 4 ft
81. 2 ro $3\frac{6}{7}$ per
82. 2 ro $37\frac{2}{5}$ per
83. 2 ro $17\frac{5}{6}$ per
84. 3 ro $26\frac{3}{4}$ per
85. 1 ac 3 ro $13\frac{1}{2}$ per
86. 1 ro $33\frac{3}{8}$ per
87. 1 ro $13\frac{4}{11}$ per
88. 1 ro $25\frac{2}{9}$ per
89. 1 ro $8\frac{11}{12}$ per
90. 1 ro $18\frac{7}{10}$ per
91. $21\frac{17}{59}$ poles
92. $2\frac{488}{604}$ poles
93. $17\frac{32}{72}$ poles
94. $14\frac{52}{56}$ poles
95. 1 ro $38\frac{1}{2}$ pls
96. $16\frac{8}{78}$ pls
97. $1\frac{345}{911}$ poles
98. $23\frac{14}{54}$ poles
99. $19\frac{40}{64}$ poles
100. $4\frac{8}{312}$ poles

MISCELLANEOUS QUESTIONS.

1. £46 9 6
2. £14 0 0
3. £2142 17 $1\frac{5}{7}$
4. £4166 13 4
5. 125000000
6. £35 17 4
7. £6 19 $6\frac{3}{4}$
8. £19 4 $7\frac{5}{13}$
9. 52 packets
10. £8 3 $1\frac{3}{4}$
11. £2 6 8
12. £0 11 $6\frac{1}{4}$
13. 212 days
14. £7 10 0
15. 504 pt. bottles
16. 68109 h. p.
17. £0 3 $8\frac{24}{64}$
18. 9780

19. £3 4 $7\frac{1}{2}$

20. $821\frac{1}{3}$

21. £13 10 $3\frac{9}{37}$

22. 240 herrings

23. 9605 florins

24. 10675 far

25. 5408 pks

26. £19 4 $7\frac{1}{4}$

27. 1064 lbs

28. £374 5 6

29. £72 6 6

30. £2 8 0

31. £3 6 $1\frac{11}{13}$

32. $\frac{3}{4}$d per lb

33. 1300 loaves

34. 62556

35. £9 4 $1\frac{7}{4}$

36. 73 dys

37. 90000

38. 11 hrs 17 mts $38\frac{14}{17}$ sec

39. $71015\frac{19}{20}$ h. sov.

40. $47145\frac{1}{16}$ four-p.

41. £1 9 $4\frac{1}{2}$

42. 53952640 lbs

43. 248160 ft

44. 11760 nuts

45. £283 9 $7\frac{1}{2}$

46. 33 spoons

47. 3354 years

48. 1505 times

49. 2240 h. pounds

50. $2666\frac{2}{3}$ lbs

51. $3901\frac{2}{4}\frac{1}{8}\frac{2}{7}$

52. 65 yrs 24 dys

53. 416 rows 198 trees

54. 6084 animals

55. 3024 qts

56. 2561 eggs

57. $6944\frac{4}{9}$ gross

58. 8 hrs 12 mts 48 sec

59. 1960322

60. 1867 nuts

61. 941040 persons

62. 300

63. £88 4 0

64. £60 9 $6\frac{1}{2}$

65. $77\frac{1}{50}$ times

66. 4500 gui

67. £7 17 3

68. £228 17 0

69. £13 13 $10\frac{1}{2}$

70. £554 11 8

71. £135 0 0
72. £3 15 10
73. £7 9 $c\frac{1}{4}$
74. £22 4 11
75. £4 14 $3\frac{1}{2}$
76. £0 13 9
77. $1\frac{1}{4}$d.
78. 666 sq in
79. £10 4 9
80. £45 12 6
81. 1201500
82. £1410 10 8
83. 8 yrs 10 ms $2\frac{3}{4}$ wks
84. £1636 13 4
85. £0 8 9
86. 399237
87. £2115
88. £3 12 4
89. 1304160 ft
90. 1376 pts
91. 202329 h. pence
92. 5737 gui 14 s
93. £91 0 0
94. £50 17 6
95. £354 3 4
96. 29280
97. $3\frac{3}{4}$d
98. 5612 days
99. £712 19 $3\frac{1}{2}$
100. 1 mile

Supplementary Exercises on Weights and Measures.

(pages 96—99).

1. 1 qr 4 lbs 4 ozs 18 dwts 22 grs
2. 63 tn 10 cwt 3 qrs 13 lbs
3. 1 cwt 2 qrs 4 lbs 13 ozs
4. 100 ac 1 rd 12 pls
5. 48 yrs 3 mths 3 wks 6 ds 13 hrs
6. 151 mls 6 fur 6 pls
7. 66 lbs 10 ozs 12 dwts 7 grs
8. 496 lbs 4 ozs 3 dwts 12grs
9. 267 tns 16 cwt 1 qr 7 lbs 2 ozs
10. 1106 yds 2 ft 9 ins
11. 1457 mls 6 fur 10 pls
12. 441 ac 2 rds 19 pls
13. 426 yrs 9 mo 0 wks 1 dy 1 hr
14. 24 wks 5 dys 2 hrs 37 min
15. 300 qrs 1 pk
16. 84 lbs 7 ozs 19 dwt 10 grs

17. 16 tons 14 cwt 2 qrs 26 lbs
18. 81 mls 4 fur 29 pls
19. 703 ac 1 ro 38 pls
20. 21 qrs 2 bus 1 pk
21. 62 yds 2 qrs 1 nl
22. 103 lbs 1 oz 19 dwts 22 grs
23. 149 lbs 5 ozs 2 dwts 19 grs
24. 127 lbs 9 ozs 7 dwts 22 grs
25. 74 tns 3 cwt 0 qr 1 lb
26. 700 tns 19 cwt 2 qrs 17 lbs 1 oz
27 801 mls 3 fur 23 pls
28. 618 yds 1 ft 11 in
29. 346 m 6 fur 32 pls $4\frac{1}{2}$ yds
30. 230 yds 8 ft 139 in
31. 21 ac 1 rd 22 pls
32. 79 ac 3 rds 35 pls $25\frac{1}{4}$ yds
33. 96 yds 3 qrs 3 nls
34. 66 yds 2 qrs 2 nls $1\frac{1}{4}$ in
35. 31 yrs 8 mo 1 wk 5 dys
36. 0
37. 12 lbs 6 ozs 13 dwts 5 grs
38. 11 tns 12 cwt 3 qrs 8 lbs
39. 34 lea 0 mls 2 fur 12 pls
40. 140 yds 1 qr 3 nls
41. 231 ac 1 ro 8 pls
42. 7 yrs 6 mo 3 wks 3 dys 19 hrs
43. 17 lbs 1 oz 18 dwts
44. 5 lbs 7 ozs 8 dwts 9 grs
45. 435 lbs 2 ozs 14 dwts
46. 22 tns 15 cwt 1 qr 6 lbs
47. 3 tns 5 cwt 3 qrs 15 lbs 8 ozs
48. 976 tons
49. 463 yds 2 ft
50. 1593 yds 2 ft 3 in
51. 553 mls 7 fur 29 pls 1 ft 6 in
52. 977 qrs 2 bus
53. 3743 qrs 1 bus 2 pks
54. 177709 yds
55. 5203 yds 2 qrs 0 nls 2 in
56. 1 wk 2 hrs 27 min 14 sec
57. 76 yrs 5 mo
58. 44 cent 14 yrs 0 mo 26 wks
59. 52 sq yds 5 sq ft 124 in
60. 204 ac 2 ro 4 pls $27\frac{3}{4}$ yds
61. 1 oz 19 dwts 4 grs
62. 13 tns 16 cwt 2 qrs 3 lbs 8 ozs
63. 8 qrs 1 bus 3 pks 1 gal $1\frac{7}{9}$ pt
64. 9 ac 1 ro $18\frac{6}{7}$ pls
65. 16 yds 1 qr $\frac{1}{4}$ nl
66. 2 lbs 3 ozs 0 dwts $12\frac{3}{7}$ grs
67. 12 lbs 0 oz 16 dwt $1\frac{4}{15}$ grs
68. 4 lbs 7 ozs 19 dwts $1\frac{17}{21}$ grs

69. 3 tns 8 cwt 2 qrs 25 lbs 3 ozs $3\frac{1}{8}$ drs

70. 0 tns 1 cwt 2 qrs 16 lbs 10 ozs $2\frac{10}{11}$ drs

71. 6 lbs 0 ozs $14\frac{11}{16}$ drs

72. 31 mls 5 fur 31 pls $3\frac{2}{8}$ yds

73. 12 yds 2 ft $9\frac{1}{6}$ in

74. 3 yds 1 ft $7\frac{7}{9}$ in

75. 7 ac 2 pls 3 yds 2 ft

76. 21 sq yds 6 sq ft $135\frac{1}{8}$ sq in

77. 15 ac 1 ro 20 pls

78. 12 qrs 0 bus 2 pks 0 gal $2\frac{4}{10}$ qts

79. 1 qr 0 bus $3\frac{1}{15}$ pks

80. 3 yrs 0 mo 1 wk 3 dys 4 hrs 21 min $49\frac{1}{11}$ sec

Section XXXIII (pages 99—100).

APOTHECARIES' WEIGHT.

1. 108 sc 10 grs

2. 1096 grs

3. 282 drs

4. 164 sc

5. 19 ozs 2 drs

6. 3635 grs

7. 706 lbs 3 ozs

8. 155 drs

9. 29060 grs

10. 37 lbs 6 ozs 2 sc

11. 29440 „

12. 220 grs

13. 355 „

14. 120960 „

15. 306 ozs

16. 15 ozs 5 drs 2 sc 6 grs

17. 57 ozs 2 drs 1 sc

18. 15 ozs 4 drs

19. 375 sc

20. 423 sc 15 grs

21. 6288 sc

22. 356 sc

23. 2008 drs

24. 488 drs

25. 27 drs 1 sc 2 grs

26. 173 drs

27. 15 lbs 2 ozs 3 drs 6 grs

28. 22 lbs 6 ozs 4 drs

29. 128 „ 10 „

30. 14 „ 0 „ 3 „

31. 203 „ 8 „ 2 drs

32. 45 „ 6 „ 3 „

33. 4 lbs 7 ozs 2 drs
34. 34 lbs 7 ozs 1 sc 1 gr
35. 30 „ 0 „ 2 sc
36. 4 „ 5 „ 3 drs
37. 0 „ 5 „ 0 drs 1 sc
38. 6 „ 7 „ 7 „
39. 0 „ 0 „ 1 dr 2 sc 17 grs
40. 9 „ 4 „ 1 „ 0 sc 15 grs
41. 121 „ 9 „ 7 „
42. 170 „ 6 „ 5 „

45. 97 „ 5 „ 4 drs
46. 219 „ 3 „ 3 „
47. 73 „ 1 „ 1 „
48. 292 „ 4 „ 4 „
49. 268 „ 0 „ 1 „
50. 48 „ 8 „ 6 „
51. 11 „ 5 „ 2 „ 2 sc
52. 12 „ 10 „ 4 „
53. 20 „ 0 „ 2 „ 2 „
54. 25 „ 0 „ 3 „ 1 sc
55. 31 „ 5 „ 5 „ 1 „
56. 35 „ 0 „ 4 „ 2 „
57. 40 „ 0 „ 5 „ 1 „
58. 47 „ 2 „ 4 „
59. 55 „ 0 „ 7 „ 1 „
60. 0
61. 1 „ 8 „ 0 „ 0 „ 12 grs
62. 2 „ 4 „ 1 „ 1 sc 8 grs
63. 3 „ 7 „ 6 „ 0 „ 4 „
64. 4 „ 1 „ 5 „ 1 „ 12 „
65. 5 „ 1 „ 4 „ 1 „ 8 „
66. 4 „ 3 „ 1 „ 1 „ 4 „
67. 1 „ 12 „ 6 „ 0 „ 8 „
68. 3 „ 7 „ 0 „ 0 „ 8 „
69. 5 „ 11 „ 7 „ 1 „ 12 „
70. 5 „ 4 „ 4 „ 0 „ 12 „
71. 6 „ 3 „ 7 „ 1 „ 16 „
72. 1 „ 1 „ 6 „ 1 „ $8\frac{4}{11}$ „
73. 1 „ 0 „ 5 „ 0 „ 16 „
74. 4 „ 2 „ 5 „ 0 „ 4 „
75. 1 „ 4 „ 7 „ 0 „ $1\frac{1}{5}$ „
76. 3 „ 1 „ 7 „ 2 „ 8 „
77. 2 „ 1 „ 2 „ 1 „ 12 „
78. 1 „ 6 „ 7 „ 2 „ 14 „
79. 1 „ 9 „ 5 „ 1 „ 16 „
80. 2 „ 6 „ 3 „ 0 „ $2\frac{2}{5}$ „
81. 0 „ 0 „ 5 „ 1 „ $1\frac{1}{8}$ „
82. 0 „ 0 „ 6 „ 2 „ $1\frac{2}{7}\frac{3}{7}$ „
83. 0 „ 0 „ 7 „ 2 „ $8\frac{2}{11}$ „
84. 0 „ „ 1 „ 1 0 „ $11\frac{1}{14}\frac{1}{4}$ „

85. o lbs 1 oz 2 drs 1 sc $10\frac{30}{40}$ grs 86. o lbs 1 oz 3 drs 2 sc $2\frac{3}{11}$ grs

87. o „ 1 „ 6 „ 2 „ $2\frac{6}{7}$ „ 88. o „ 2 „ 2 „ 1 „ $3\frac{4}{7}$ „

89. o „ 3 „ 4 „ 1 „ $16\frac{3}{7}$ „ 90. o „ 4 „ 0 „ 0 „ $11\frac{1}{4}$ „

91. o „ 9 „ 0 „ 1 „ $6\frac{16}{17}$ „ 92. o „ 6 „ 4 „ 1 „ $1\frac{5}{17}$ „

93. 2 „ 1 „ 6 „ 0 „ $10\frac{8}{15}$ „ 94. 1 „ 5 „ 5 „ 0 „ $1\frac{2}{15}$ „

95. 1 „ 7 „ 5 „ 1 „ $19\frac{15}{17}$ „ 96 1 „ 2 „ 4 „ 1 „ $1\frac{1}{4}$ „

97. o „ 3 „ 6 „ 2 „ $8\frac{14}{19}$ „ 98. o „ 4 „ 2 „ 1 „ $1\frac{10}{13}$ „

99. o „ 3 „ 4 „ 0 „ $12\frac{78}{95}$ „ 100. o „ 2 „ 6 „ 2 „ $2\frac{51}{59}$ „

SECTION XXXIV (pages 100–101).

CUBIC OR SOLID MEASURE.

1. 52 c ft 784 c in
2. 14597 c ft
3. 192 c ft
4. 10240 c in
5. 313 c yds 24 c ft
6. 15 c yds 765 c in
7. 3239 c yds 16 c ft
8. 742 c ft
9. 420764 c in
10. 450680 c in
11. 18 lds 9 c ft
12. 12 c lds 9 c ft 1415 c in
13. 3 „ 7 „
14. 124 „ 27 „
15. 2 „ 14 „ 554 c in
16. 407 „ 23 „
17. 37 „ 24 „
18. 53 „ 40 „
19. 13 tons 28 c ft 31 c in
20. 572 tons 4 c ft
21. 18 „ 9 „
22. 1 „ 32 „ 1442 c in
23. 6 c yds 3 c ft 955 c in
24. 72 c yds 15 c ft 1423 c in
25. 389 „ 1 „ 1516 „
26. 247 „ 5 „ 1529 „
27. 3 c ft 256 c in
28. 14 „ 18 „ 1029 „
29. 84598 c ft 25 c in
30. cannot
31. 31 c yds 18 c ft 1656 c in
32. 59 c yds 23 c ft 1400 c in

33. 190 c yds 5 c ft 1296 c in
34. 288 c yds 22 c ft 1264 c in
35. 338 „ 4 „ 384 „
36. 12 „ 1 „ 12 „
37. 24 c ft $350\frac{15}{64}$ c in
38. 1 c yd 4 c ft $1033\frac{1}{6}$ c in
39. 5 c yds 16 c ft $1159\frac{9}{15}$ c in
40. 4 c yds 18 c ft $676\frac{3}{4}$ c in

Section XXXV (page 101).

APOTHECARIES' FLUID MEASURE.

1. 24 drams 24 minims
2. 18 ozs 5 drs 24 min
3. 12 pts 5 ozs 3 drs 14 min
4. 7 „ 4 „ 47 „
5. 157 drs 40 min
6. 1256 drs
7. 7440 min
8. 7080 min
9. 43168 min
10. 61479 min
11. 18 pts 5 ozs 2 drs 19 min
12. 8 pts 7 ozs 6 drs 16 min
13. 2 „ 0 „ 3 „ 54 „
14. 14 „ 9 „ 1 „ 23 „
15. 2 „ 1 „ 1 „ 44 „
16. 0 „ 1 „ 1 „ 44 „
17. 55 „ 5 „ 7 „ 42 „
18. 73 „ 13 „ 2 „ 16 „
19. 83 „ 0 „ 7 „ 33 „
20. 64 „ 9 „ 4 „ 59 „
21. 141 „ 8 „ 5 drs
22. 283 „ 1 „ 2 drs
23. 466 „ 8 „ 7 „
24. 377 „ 7 „
25. 414 „ 2 „ 1 „
26. 1 „ 14 „ $7\frac{2}{9}$ drs
27. 14 ozs $5\frac{2}{19}$ drs
28. 10 ozs 2 drs $24\frac{1}{2}\frac{2}{7}$ min
29. 4 ozs 7 drs $43\frac{1}{1}\frac{3}{4}$ min
30. 2 ozs 4 drs $36\frac{1}{9}$ min

Section XXXVI (pages 102—103).

AVERAGE OF NUMBERS.

1. 31
2. $8\frac{1}{2}$
3. $51\frac{1}{2}$
4. $72\frac{1}{2}$
5. 61
6. $90\frac{1}{2}$

7. $153\frac{1}{2}$ 8. 76 9. $33\frac{1}{6}$

10. $25\frac{4}{7}$ 11. $8\frac{1}{5}$ 12. $82\frac{3}{10}$

13. $106\frac{1}{3}$ 14. $186\frac{9}{13}$ 15. $189\frac{1}{2}$

16. $7\frac{167}{168}$ 17. £1 2 $11\frac{1}{2}$ 18. 9s $1\frac{13}{20}$d

19. 2 lbs 9 ozs 3 dwts $20\frac{1}{2}$ grs 20. 18 cwt 2 qrs $18\frac{2}{3}$ lbs

21. 10 ells 4 qrs $3\frac{1}{2}$ nls 22. 4 mls $652\frac{1}{2}$ yds

23. 166 gal 1 qt $1\frac{1}{4}$ pt 24. £259 2 $3\frac{5}{4}$

25. 720 26. 24 min 45 sec

27. £113 2 28. $941\frac{43}{567}$

29. $3\frac{96}{128}$ grains 30. 1152 pills

31. 3 ozs 2 drs 0 sc $9\frac{364}{1024}$ grs

PART VI.

SECTION XXXVII (pages 107—113).

BILLS OR ACCOUNTS.

1. £1 18 7	2. £2 1 2	3. £2 10 9
4. 0 5 0½	5. 0 16 2	6. £1 0 6½
7. £1 18 5½	8. £3 16 6	9. £2 4 11
10. 0 4 2	11. 0 18 1½	12. 0 8 3¾
13. £1 13 0	14. £2 11 4	15. £1 17 9
16. £1 5 5½	17. £1 17 3	18. £2 1 11
19. £2 18 10½	20. 0 6 9	21. £1 10 11
22. £3 12 4	23. £2 6 10½	24. £1 14 0
25. 0 7 4¾	26. 0 18 2	27. 0 8 4¼
28. 0 13 10¾	29. £2 5 9	30. £3 12 9
31. £4 4 4	32. £1 1 11	33. £1 16 9
34. £17 3 0	35. £6 11 6	36. £2 8 10
37. £14 4 4	38. £13 14 6¾	39. £47 4 0
40. £10 9 0½	41. £10 9 9	42. £3 4 5
43. £12 9 6	44. £2 6 10½	45. £18 9 0
46. £14 16 0	47. £22 8 4½	48. £24 6 4
49. £2 15 9	50. £515 18 5	51. £116 11 2¼
52. £148 10 0	53. £9 0 10⅜	54. £3717 18 0
55. £181 6 6	56. £70 7 11	57. £870 0 10
58. £8672 15 8	59. £148 8 3	60. £145 14 8½
61. £180 16 7½	62. £6 11 3¾	63. £52 18 3
64. £180 1 0¾	65. £7 11 8¾	66. £4661 8 2
67. £310 11 9	68. £462 1 10½	

Section XXXVIII (pages 114—120).

PRACTICE.

Case I.

1—3. £3 5 4; 168 4d; £1 12 8

4—6. £1 16 0; £2 14 0; 188

7—9. 158 8½; £1 11 5; £2 7 1½

10—12. £2 19 1½; £1 19 5; £2 19 1½

13—15. £8 16 2; £7 .1 2; £7 16 11

16. £2 7 0¾ 17. £3 4 6 18. £2 6 8

19. 98 20. 158 9d 21. £1 7 1½

22. £4 0 8½ 23. 148 5d

Case II.

21—27. £3 10 9; £4 8 5½; £5 6 1½; £6 3 9½

28—31. £6 6 8; £7 2 6; £7 18 4; £8 14 2

32—35. £93 13 0; £101 9 1; £109 5 2; £117 1 3

36—39. £164 2 0; £174 7 1½; £184 12 3; £194 17 4½

40—43. £127 5 0; £133 12 3; £139 19 6; £146 6 9

44—47. £48 8 6; £50 8 10½; £52 9 2½; £54 9 6¾

48—51. £238 17 6; £247 8 1½; £255 18 9; £264 9 4½

52—55. £82 5 4; £84 16 9; £87 8 2; £89 19 7

56—59. £137 2 9; £140 18 11½; £144 15 1½; £148 11 3¾

60—63. £298 7 6; £305 16 8¼; £313 5 10½; £320 15 0¾

64—67. £450 7 2; £460 11 10½; £470 16 7; £481 1 3¾

68—71. £679 10 3; £1245 15 5½; £396 7 7¾; £962 12 10½

72—75. £3194 2 5½; £3851 14 8¾; £2536 10 2¼; £3194 2 5½

76—79. £1369 11 10½; £913 1 3; £3378 6 7½; £2556 11 6

80—83. £488 9 2; £359 18 4; £925 10 0; £1054 0 10

84. 118 1$\frac{1}{4}$d 85. £12 3 6 86. £3 15 1

87. £6 6 88. £8 3 4 89. £24 13 6

90. £2 13 4 91. £3 1 7$\frac{1}{2}$ 92. £16 1 5

93. £3 1 9

CASE III.

94—97. £248 3; £268 16 7; £273 19 1$\frac{1}{4}$; £279 3 4$\frac{1}{2}$;

98—101. £502 0 11$\frac{1}{4}$; £511 3 6; £520 6 0$\frac{1}{2}$; £529 8 7$\frac{1}{2}$

102—105. £558 16 9$\frac{1}{2}$; £568 6 3; £577 15 8$\frac{1}{2}$; £587 5 1$\frac{1}{2}$

106—109. £572 3 8$\frac{1}{2}$; £581 5 4; £590 6 11$\frac{3}{4}$; £599 8 7$\frac{1}{2}$

110—113. £172 4 11; £174 16 4; £177 7 9; £179 19 2

114—117. £730 8 3; £740 14 0; £761 5 6; £771 11 3

118—121. £729 0 11; £777 0 2$\frac{1}{2}$; £834 11 3$\frac{1}{2}$; £853 15 0$\frac{1}{2}$

122—125. £230 13 5; £235 13 8$\frac{1}{2}$; £270 15 9; £285 16 7$\frac{1}{2}$

126—129. £1074 3 0; £1099 14 6; £1133 16 6; £1184 19 6

130—133. £507 12 0; £514 16 0; £532 16 0; £554 8 0

134—137. £1331 8 9; £1356 1 10$\frac{1}{2}$; £1372 10 7$\frac{1}{4}$; £1380 15 0

138—141. £221 1 10; £223 13 3; £224 18 11$\frac{1}{2}$; £226 4 8

142—145. £810 3 9; £819 3 9$\frac{1}{2}$; £841 13 10$\frac{1}{2}$; £850 13 11$\frac{1}{4}$

146—149. £1826 0 10; £1844 6 0$\frac{1}{2}$; £1871 13 10$\frac{1}{4}$; £1899 1 8

150—153. £443 19 5$\frac{1}{4}$; £456 9 6$\frac{1}{2}$; £458 11 3; £471 1 4$\frac{1}{2}$

154—157. £2142 5 0; £2208 0 5; £2217 8 4; £2236 4 2

158—161. £1995 0 0; £2090 0 0; £2161 5 0; £2232 10 0

162—165. £1162 4 5; £1202 0 5$\frac{1}{2}$; £1277 12 11$\frac{1}{4}$; £1333 7 4$\frac{1}{2}$

166—169. £3401 12 6; £3486 13 3$\frac{1}{2}$; £3543 7 2$\frac{1}{4}$; £3552 16 2

170. £213 15 0 171. £88 1 8 172. £121

173. £45 12 6 174. £28 13 6 175. £229 8 0
176. £623 14 0 177. £7276 14 10½ 178. £76 4 3
179. £355 9 10¾

CASE IV.

(180—182) £55365 0 0; £27682 10 0; £48905 15 0
(183—185) £14747 18 6; £50836 10 4; £29572 1 4
(186—188) £14926 5 6; £19938 3 0; £10807 8 6
(189—191) £4000 2 8; £11171 8 6; £14270 4 3
(192—195) £89236 17 6; £30660 17 6; £15657 6 3
(196—198) £65582 10 2; £27044 6 8; £34923 11 11
(199—201) £33147 13 6; £77042 17 1; £108234 10 11
(202—204) £163992 0 8; £133785 10 7; £96856 11 7½
(205—207) £35065 16 0; £27338 17 0; £5855 17 0
(209—211) £64195 4 0¼; £47221 4 0½; £33776 17 7¾
(212—214) £14075 7 8½; £40001 14 7½; £31889 13 9¾
(215—217) £82690 13 11¼; £254129 7 10½; £47431 0 3¾
(218—220) £84999 8 4; £133090 15 0; £162018 11 10½
(221—223) £39157 5 6¾; £34412 7 10½; £25153 2 8¾
(224—226) £217384 11 6¼; £173239 14 8; £509638 14 10¼
(227—229) £56140 19 0; £121923 8 10; £186068 16 3
(230—232) £526889 12 8; £376311 17 3; £225741 17 9½
(233—235) £927213 1 3¾; £807253 5 9; £728490 14 10½
(236—238) £8644 5 4; £17288 10 8; £25932 16 0
(239—241) £472983 11 8; £236491 15 10; £118245 17 11
(242—245) £11539 18 6½; £23079 17 1; £46165 10 1¾
(246—248) £29570 5 0; £62978 12 6; £95719 10 0

(249—252) £53930 6 3; £237580 5 5; £24648 12 6

(253—255) £568527 9 10½; £368845 4 11; £99968 5 9

(256—258) £1316581 18 10½; £869317 7 3¾; £542571 8 4½

(259—261) £593189 16 0½; £106029 9 7; £316732 1 8

(262—264) £697548 1 6; £296061 9 5; £98158 0 2½

(265—267) £76747 1 9; £98802 5 4; £20242 14 10

(268—270) £839773 0 8; £737667 13 1; £237239 10 3

(271—273) £540954 5 3½; £139108 12 4½; £180048 10 7¾

(274—276) £151835 13 4; £95189 18 0; £33790 5 0

(277—279) £262520 0 0; £330170 0 0; £9425 0 0

(280—283) £30182 8 9; £32646 7 6; £10201 1 3

(284—286) £140043 3 9; £182966 6 10½; £103562 3 1½

(287) £565 19 0 (288) £1218 0 0 (289) £2418 3 0

(290) £163 3 8½ (291) £812 0 1½ (292) £3412 4 10

(293) £495 9 2 (294) £65 4 4⅞

Section XXXIX. (pages 120—121).

Case V.

1. £60790 14 11⅛ 2. £12678 14 6¾ 3. £28050 13 7⅛

4. £20600 10 1⅞ 5. £26213 12 1⅞ 6. £11377 3 3¾

7. £216575 10 0⅕ 8. £260448 14 0½¼ 9. £582636 1 11½

10. £74968 6 0½ 11. £40967 4 4⅘ 12. £54781 11 5¾

13. £74273 7 2½½ 14. £407714 9 7 15. £28647 16 10½

16. £47609 15 0½ 17. £4 11 8⅝ 18. £19 16 8⅞

19. £20 5 4⅛ 20. £49 14 6⅜ 21. £7 3 1⅘

22. £21 7 7½ 23. £244 8 4

Section XL (pages 123—126).

COMPOUND PRACTICE.

Case VI.

1.	£21	13	$10\frac{1}{4}$	2.	£106	10	$0\frac{1}{4}\frac{14}{8}\frac{1}{0}$
3.	£119	1	$8\frac{15}{32}$	4.	£19	14	$10\frac{59}{64}$
5.	£145	9	$11\frac{49}{80}\frac{1}{0}$	6.	£20	9	$1\frac{16}{17}\frac{43}{04}$
7.	£1	1	$11\frac{85}{10}\frac{5}{24}$	8.	£40	6	$3\frac{14}{71}\frac{01}{68}$
9.	£2	5	$6\frac{9}{16}$	10.	£10	7	$9\frac{85}{10}\frac{5}{14}$
11.		13	$11\frac{47}{64}$	12.	£22	19	$4\frac{1}{2}$
13.	£22	13	$7\frac{37}{80}$	14.	£180	6	$5\frac{3}{53}$
15.	£17	0	$6\frac{47}{64}$	16.	£2	7	$8\frac{7}{16}$
17.	£16	4	$7\frac{49}{80}$	18.	£21	6	$2\frac{1}{16}$
19.	£24	0	$6\frac{11}{16}$	20.	£50	15	$1\frac{85}{24}\frac{5}{6}$
21.	£7	19	$10\frac{36}{12}\frac{1}{80}$	22.	£1225	8	$6\frac{9}{16}$
23.	£3	3	$2\frac{17}{34}$	24.	£8	8	$8\frac{1}{2}$
25.		14	$11\frac{3}{11}$	26.		6	$0\frac{1}{24}$
27.	£339	4	$3\frac{11}{24}$	28.	£88	11	$2\frac{8}{9}$
29.	£6	7	$0\frac{1}{2}$	30.	£182	8	$6\frac{33}{40}$
31.	£7	12	$8\frac{14}{32}\frac{9}{0}$	32.	£74	12	$6\frac{1}{16}$
33.	£29	2	1	34.	£8	18	$10\frac{79}{10}\frac{9}{8}$
35.	£17	8	$2\frac{71}{16}\frac{1}{2}$	36.	£381	9	$0\frac{57}{32}\frac{1}{4}$
37.	£4	8	$9\frac{19}{10}\frac{9}{8}$	38.	£191	9	$5\frac{24}{12}\frac{1}{0}\frac{1}{6}$
39.	£204	5	$10\frac{39}{64}$	40.	£30	4	$7\frac{15}{32}$
41.	£1	12	$5\frac{17}{32}$	42.	£127	9	$3\frac{13}{64}$
43.	£5	10	$9\frac{17}{32}$	44.	£0	4	$7\frac{11}{24}$

45. £0 13 $0\frac{15}{16}$

46. £0 6 $11\frac{7}{15}$

47. £4 11 $5\frac{57}{64}$

48. £614 2 $46\frac{16}{63}$

49. £119 17 $5\frac{11}{42}$

50. £39 7 $4\frac{1}{15}$

51. £72 8 $4\frac{32}{63}$

52. £903 4 $9\frac{65}{126}$

53. £20 12 $7\frac{1}{4}$

54. £12 10 $1\frac{1}{8}$

55. £81 19 $6\frac{9}{16}$

56. £28 4 $6\frac{25}{32}$

57. £32 13 7

58. £142 1 $2\frac{1}{16}$

59. £148 19 $1\frac{11}{16}$

60. £260 9 $5\frac{73}{32}$

61. £1707 16 $2\frac{1}{4}$

62. £1 11 $6\frac{1}{2}$

63. £5 0 $3\frac{3}{4}$

64. £1 5 10

65. £1 19 $5\frac{5}{8}$

66. £24 19 $2\frac{53}{64}$

67. £15 15 $4\frac{159}{182}$

68. £37 8 $7\frac{19}{24}$

69 £ 51 11 $11\frac{13}{14}$

70. £4 9 $1\frac{1}{3}$

71. £4 7 $10\frac{16}{21}$

72. £0 16 $10\frac{191}{320}$

73. £1 16 $4\frac{6}{9}\frac{17}{60}$

74. £11 4 $0\frac{203}{320}$

75. £95 17 $10\frac{2}{7}$

76. £933 16 $9\frac{57}{70}$

77. £2 17 $11\frac{211}{320}$

78. £7 7 $8\frac{7}{15}$

79. £737 12 $3\frac{3}{4}$

80. £393 0 9

81. £4 13 $6\frac{9}{16}$

82. £83 4 $4\frac{1}{2}$

83. £37 5 $3\frac{1}{4}$

84. 522 bus. 3 pks. 2 qts.

85. £8 13 $8\frac{76}{91}$

86. £164 15 $6\frac{6}{7}$

GENERAL MISCELLANEOUS EXERCISES.

(pages 127—131.)

1. 352	2. 3000	3. 356883
4. 217	5. 1848	6. 46
7. 132	8. 8815	9. 8000
10. 896	11. 12045	12. 2448
13. 4368	14. $14086\frac{9}{3}\frac{2}{1}\frac{}{8}$	15. £1 1
16. £1 17 6	17. £1 15 6	18. 5s 4½d
19. £8 19 0	20. 527	21. $640\frac{4}{9}$
22. 2s 6d	23. £298 10	24. £7 17 6
25. £2 13 4	26. £1005	27. 58 dys 19 hrs 37 m
28. $9451\frac{6}{1}\frac{2}{2}$	29. 109	30. 4557600
31. £336 15 7½	32. $10\frac{1}{11}$	33. $557\frac{2}{9}$
34. 511896	35. £4639 11	36. £77 12 3½
37. 2640	38. $9741\frac{1}{3}$	39. $2821\frac{1}{2}$
40. 284	41. £6 19 9	42. 39600
43. £24 7 $2\frac{5}{1}$	44. 4 fur 28 p	45. 10yr 10m 23h 12m
46. 16 dys 28 min	47. $496\frac{1}{2}\frac{6}{9}$	48. 15480
49. 9 cwt 3 qrs	50. $4\frac{3}{4}$ yds	51. 7120
52. $6\frac{1}{3}\frac{0}{2}\frac{2}{3}$d.	53. £35	54. 1 cwt 3 qrs 25 lbs 11 ozs
55. 74 lbs 1 oz	56. 4 tons 11 cwt 6 lbs 8 ozs	57. £61 10
58. 19200	59. 338688	60. 3622
61. 894960	62. 24lbs 10ozs 9 grs	63. 6 yds 2 qrs 1 nl
64. 62 a 2 r 8 p	65. £137 10 $3\frac{1}{2}\frac{3}{5}$	66. 2 tons 16 cwt 2 qrs 23 lbs
67. $226\frac{6}{7}$	68. 252	69. 3364 gals 3 qts

70. £1 17 $6\frac{1}{4}$ 71. £1654 13 5 72. $6176\frac{1}{4}$
73. £526 10 74. 48 4d 75. £17 4 3
76. $53\frac{17}{22}$ 77. $9\frac{2}{3}\frac{0}{7}\frac{5}{2}$ 78. £1501 14 10
79. 4876 a. 2 r. 12 p. 80. 5067 $\frac{3}{6}$ gals 81. £177 5 $6\frac{3}{4}$
82. £2689 9 $4\frac{1}{2}$ 83. £1 9 $6\frac{1}{2}$ 84. £50 4 6
85. £28 7 86. £197 8 9

SECTION XLI. (pages 132—135).

MENSURATION OF AREAS.

1. 432 in 2. 3906 ft 3. 7644 ft
4. 20056 ft 5. 2511 ft 6. 15750 yds
7. 4176 yds 8. 4725 yds 9. 6624 yds
10. 757550 ft

TO FIND THE AREAS OF RECTANGLES.

1. 19 ft 10^{i} 2. 52 ft 4^{i} 11^{ii} 4^{iii} 9^{iv}
3. 33 ft 10^{i} 3^{ii} 3^{iii} 6^{iv} 1^{v} 4. 254 ft 6^{i} 10^{ii} 5^{iii} 11^{iv}
5. 3203 ft 9^{i} 10^{ii} 6^{iii} 6. 1861 ft 4^{i} 5^{ii} 9^{iii} 9^{iv}
7. 69 ft 11^{i} 3^{ii} 7^{iii} 1^{iv} 8^{v} 8^{vi} 8. 10 ft 1^{i} 4^{ii} 9^{iii} 1^{iv}
9. 1298 ft 6^{i} 7^{ii} 7^{iii} 10. 88507 ft 11^{i} 8^{ii}
11. 1248056 ft 7^{i} 8^{ii} 12. 15571 ft 4^{i} 11^{ii} 4^{iii}
13. 9978 ft 0^{i} 11^{ii} 4^{iii} 14. 1912 ft 7^{i} 4^{ii}
15. 751 ft 2^{i} 2^{ii} 7^{iii} 6^{iv} 16. 49 ft 4^{i} 8^{ii}
17. 13 yds 1 ft 8^{i} 10^{ii} 18. 487 yds 5 ft 8^{i}
19. 5892 yds 1 ft 4^{i} 8^{ii} 20. 2273 yds 6 ft 8^{i} 11^{ii}

TO FIND THE AREAS OF SQUARES.

1. 27 ft 6^{i} 9^{ii} 2. 54 ft 1^{i} 0^{ii} 0^{iii} 9^{iv}

3. 396 ft 8^{i} 1^{ii}
4. 744 ft 5^{i} 5^{ii} 8^{iii} 1^{iv}
5. 778 ft 11^{i} 5^{ii} 2^{iii} 1^{iv}
6. 287 ft 4^{i} 2^{ii} 4^{iii} 1^{iv}
7. 6075814 ft 2^{i} 1^{ii}
8. 4134 ft 8^{i} 2^{ii} 5^{iii} 1^{iv} 0^{v} 1^{vi}
9. 86 ft 9^{iii} 7^{iv} 10^{v} 4^{vi} 5^{vii} 4^{viii}
10. 1248433 ft 9^{i} 4^{ii}

TO FIND THE AREAS OF TRIANGLES.

1. 1570 ft 1^{i} 2^{ii}
2. 1528 ft 2^{i} 5^{ii}
3. 20475 yds
4. 38047½ yds
5. 17 per 4½ yds
6. 195 ft 9^{i} 4^{ii} 6^{iii}
7. 20 ft 3^{i} 4^{ii} 1^{iii}
8. 150 ft 1^{i} 8^{ii}
9. 27331 ft 6^{i}
10. 215448 yds
11. 13331514 yds
12. 43 ft 4^{i} 9^{ii} 8^{iii} 6^{iv} 6^{v}.

PART VII.

SECTION XLII (page 140).

GREATEST COMMON MEASURE.

1. 6	2. 834	3. 75	4. 192
5. 908	6. 66	7. 750	8. 561
9. 74	10. 270	11. 19	12. 17
13. 16	14. 15	15. 2	16. 9
17. 14	18. [illegible]	19. 3	20. 11
21. 12	22. 9		

SECTION XLIII (page 141).

LEAST COMMON MULTIPLE.

1. 24	2. 120	3. 144	4. 180
5. 300	6. 144	7. 252	8. 288
9. 420	10. 144	11. 360	12. 2520
13. 6930	14. 3600	15. 840	16. 6300
17. 576	18. 6720	19. 12474	20. 36120

SECTION XLIV (pages 142—3).

REDUCTION OF FRACTIONS.

CASE I.

1—4 $\frac{17}{4} : \frac{47}{6} : \frac{78}{8} : \frac{75}{8}$ 5—8. $\frac{64}{5} : \frac{81}{11} : \frac{113}{6} : \frac{288}{12}$

9—12 $\frac{4182}{168} : \frac{1058}{0} : \frac{2837}{20}$ 13—16. $\frac{2128}{15} : \frac{3904}{19} : \frac{6001}{\frac{28761}{15}}$

17. $\frac{363}{4}$ 18. $\frac{3002}{8}$ 19. [illegible]

Case II.

1—4. $8\frac{4}{5} : 13\frac{1}{2} : 21\frac{5}{4} : 50$ 5—8. $28\frac{3}{7} : 166 : 427\frac{1}{2} : 910$

9—12. $67\frac{1}{5} : 256\frac{5}{12} : 20\frac{2}{3} : 47\frac{7}{8}\frac{3}{5}$

13—16. $90 : 3260 : 77\frac{2}{6}\frac{5}{0}\frac{9}{5} : 309\frac{1}{6}\frac{7}{1}$

Case III.

1—4. $\frac{1}{2} : \frac{3}{5} : \frac{2}{3} : \frac{3}{7}$ 5—8. $\frac{1}{2} : \frac{7}{27} : \frac{3}{10} : \frac{9}{100}$

9—12. $\frac{18}{91} : \frac{1}{2} : \frac{3}{40} : \frac{9}{100}$ 13—16. $\frac{11}{27} : \frac{77}{191} : \frac{119}{404} : \frac{1000}{1369}$

Case IV.

1. $\frac{6 \cdot 9 \cdot 10}{12}$ 2. $\frac{24 \cdot 3 \cdot 8}{30}$ 3. $\frac{20 \cdot 8 \cdot 18 \cdot 21}{24}$ 4. $\frac{35 \cdot 32 \cdot 28 \cdot 18}{40}$

5. $\frac{140 \cdot 175 \cdot 252 \cdot 360}{420}$ 6. $\frac{54 \cdot 56 \cdot 57 \cdot 48}{60}$ 7. $\frac{80 \cdot 90 \cdot 100 \cdot 105 \cdot 108}{120}$

8. $\frac{238 \cdot 245 \cdot 1080 \cdot 1225}{1200}$ 9. $\frac{360 \cdot 90 \cdot 105 \cdot 136}{720}$

10. $\frac{60000 \cdot 7000 \cdot 900 \cdot 170 \cdot 27}{100000}$

Section XLV (page 144).

ADDITION OF VULGAR FRACTIONS.

Case V.

1. $1\frac{11}{20}$	2. $\frac{23}{30}$	3. $1\frac{5}{18}$
4. $2\frac{7}{60}$	5. $1\frac{3}{5}$	6. $4\frac{1}{15}$
7. $23\frac{2}{15}$	8. $16\frac{13}{24}$	9. $14\frac{9}{14}$
10. $35\frac{3}{4}$	11. $1\frac{5}{36}$	12. $11\frac{61}{420}$
13. $6\frac{4}{15}$	14. $4\frac{1}{8}$	15. $27\frac{47}{60}$
16. $2\frac{113}{640}$	17. 14s $1\frac{23}{60}$	18. £41 8 $10\frac{17}{20}$
19. 4s $11\frac{1}{16}$	20. £75 8 $3\frac{3}{4}$	

SECTION XLVI (page 145).

SUBTRACTION OF VULGAR FRACTIONS.

CASE VI.

1—5 $\frac{2}{3}$; $\frac{1}{12}$; $\frac{1}{2}$; $\frac{1}{6}$; $\frac{2}{5}$.

6—10. $\frac{8}{15}$; $\frac{1}{12}$; $1\frac{1}{10}$; $2\frac{12}{35}$; $7\frac{1}{36}$.

11. $\frac{3}{8}$ 12. $5\frac{13}{35}$ 13. $3\frac{4}{15}$

14. £101 12 $0\frac{1}{20}$ 15. 70 yds 0 ft $11\frac{1}{6}$ in

SECTION XLVII (page 146).

MULTIPLICATION OF VULGAR FRACTIONS.

CASE VII.

1. $1\frac{1}{5}$ 2. $\frac{2}{21}$ 3 $1\frac{1}{2}$

4. $\frac{1}{27}$ 5. $\frac{7}{10}$ 6. $\frac{6}{35}$

7. $8\frac{53}{80}$ 8. $\frac{2}{45}$ 9. $36\frac{146}{225}$

10. £52 13 $4\frac{8}{9}$ 11. £215 17 10 12 £1894 1 8

13. £ 7 16 0 14. £593 3 $10\frac{1}{2}$

SECTION XLVIII (page 146).

DIVISION OF VULGAR FRACTIONS.

CASE VIII.

1. $\frac{1}{3}$ 2 $1\frac{1}{6}$ 3. 16 4. 3

5. $2\frac{1}{7}$ 6. $\frac{4}{7}$ 7. 910 8. $2\frac{46}{61}$

9. 21 10. $13\frac{107}{121}$ 11. 18 12. $\frac{1}{24}$

13. $\frac{5}{66}$ 14. $2\frac{1}{2}$ 15. £11 $2\frac{27}{160}$

SECTION XLIX (page 147).

COMPLEX FRACTIONS.

CASE IX.

1. $\frac{5}{8}$ 2. $\frac{240}{241}$ 3. $\frac{5}{27}$ 4. $8\frac{3}{4}$

5. 7 6. $\frac{8}{15}$ 7. $\frac{6}{7}$ 8. $\frac{1}{8}$

9. $\frac{11}{121}$ 10. $\frac{1}{36}$ 11. $\frac{9}{14}$ 12. $\frac{1}{4}$

13. 1

SECTION L (pages 147—148).

REDUCTION OF FRACTIONS.

CASE X.

1. 2s 6d: 10s $9\frac{3}{5}$d: £1 12 0: 18s: 16s 8d: 9s 4d
2. 18s 9d: 10s 0d: £9 6 8: £15: £6 16 $7\frac{3}{5}$
3. £15 15; £6 17 $10\frac{1}{2}$: 16s 8d
4. £4 4: £4 4 $4\frac{1}{2}$: £77 9 $10\frac{5}{8}$: £10 19 $11\frac{4}{5}$
5. 6s 8d: 7s: £10 6 3 [2 qrs $18\frac{3}{4}$ lbs
6. 16 cwt: 4 cwt 1 qr $21\frac{7}{9}$ lb: 1 lb 8 oz: 1 oz 8 dwt: 3 tn 6 cwt
7. 6 fur: 5 yds 1 qr $3\frac{3}{11}$ nls: 2 fur 25 po: 2 acres
8. $6\frac{3}{4}$d: £3 0 0: 14s
9. £1 12 4: £2 9 $6\frac{4}{5}$
10. £3 6 8: £7 7 9
11. 17 cwt 2 qrs 9 lbs $11\frac{11}{15}$ ozs: 1 m 0 fur 10 po 5 yds
12. 6 oz 4 dwt 4 grs: 6 yds 3 qrs 2 nls

SECTION LI (page 148).

CASE XI.

1. $\frac{1}{5}$ 2. $\frac{7}{160}$ 3. $2\frac{19}{48}$
4. $1\frac{259}{480}$ 5. $\frac{47}{1280}$ 6. $\frac{97}{5760}$
7. $\frac{9}{560}$ 8. $\frac{1}{168}$ 9. $\frac{1}{25}$
10. $1\frac{31}{336}$ 11. 620 12. $\frac{4679}{19200}$

SECTION LII (pages 149—150).

CASE XII.

1. $\frac{1}{24}$ 2. $\frac{1}{160}$ 3. $\frac{5}{9}$
4. $\frac{5}{1056}$ 5. $\frac{7}{7920}$ 6. $\frac{13}{5280}$

7. $\frac{3}{360}$ 8. $\frac{1}{3840}$ 9. $2\frac{2}{9}$

10. $1\frac{3}{17}$ 11. $24\frac{1}{16}$ 12. $9\frac{1}{7}$

13. $2\frac{46}{55}$ 14. $15\frac{1}{9}$ 15. $12\frac{17}{24}$

16. 1672 17. £$1135\frac{59}{1360}$ 18. £$\frac{6}{8}$

19. £1 4 $6\frac{27}{32}$ 20. £238 15 $4\frac{7}{17}$

21. £312 14 $7\frac{5}{16}$ each man: £187 12 $9\frac{1}{3}$ the boy

22. £195 15 $9\frac{1}{25}$ 23. 41856 24. $6\frac{2}{7}$ mls

25. £1 10 $0\frac{36}{37}$ 26. £2000 27. 3 fur 1 ft $1\frac{2}{5}$ in

28. $39\frac{73}{56}$ 29. $\frac{1}{20}$ 30. £15

31. $2\frac{27}{99}$ 32. £380 33. 9s $8\frac{1}{2}$d

34. $\frac{29}{480}$ 35. 6s $4\frac{172}{375}$ 36 £42 13 $1\frac{9}{35}$

37. $\frac{1}{8}$ 38. $\frac{9}{320}$

Section LIII. (page 152).

ADDITION.

1. 1506·2325 2. 981·2673 3. 444·2673

4. 61·26054 5. 25·104204 6. 44·94263

7. 170·63133 8. 236·2541 9. 1760·45175

10. 564·4325 11. 13·54342 12. 35·1531

13. ·842014 14. 1·180061 15. 18·655

16. 8·7254

Section LIV. (page 153).

SUBTRACTION.

1. 113·895 2. 571·5713 3. ·57975

4. 29·9139 5. 37·04 6. ·011882

7. 199·9219	**8.** 14·8044	**9.** 64·001369
10. ·0735814	**11.** 1·080001	**12.** ·998889
13. ·90901	**14.** 7·11112	**15.** ·99
16. 99·99	**17.** ·009	**18.** ·000999
19. ·0242	**20.** 2·97	

Section LV. (page 154).

MULTIPLICATION.

1. 1·265625	**2.** ·520773512	**3.** ·00201616
4. 1604·0025	**5.** 945·3897	**6.** 1606·8864
7. ·0961875	**8.** ·23088048	**9.** 5·066496
10. 19·97005	**11.** ·32912286	**12.** 80·2842251
13. 6·7068	**14.** 147004·072	**15.** 1·875
16. 217·62	**17.** 186·15	**18.** 1258·93
19. 658·[illegible]5		

Section LVI. (page 155).

DIVISION.

1. 3·653	**2.** ·217568	**3.** ·007854
4. 4·6036	**5.** 43·451	**6.** 41·7261
7. 1·87[illegible]6	**8.** 6·0104	**9.** 379·117
10. 3·8787	**11.** 10000	**12.** ·000138
13. 957·361	**14.** 17·3734	**15.** 119.6737.
16. ·35	**17.** 174·4548	**18.** 15, 10·1469[illegible].
19. [illegible]d	**20** £1 17 11·58	

Section LVII. (page 156).

1. ·5	**2.** ·25	**3.** ·2	**4.** ·125
5. ·4375	**6.** ·1071428	**7.** ·18	**8.** ·3
9. ·4	**10.** 1·4583	**11.** ·43	**12.** ·1472
13. 1·840225	**14.** 83·416		

Section LVIII. (page 157).

1. 12s 6d **2.** 9 inches **3.** 1·5 inches **4.** 9d.

5. 3·6 in **6.** 10s; 18s; 2s 2·3d; £213 12s

7. 6·96d; 4½d **8.** 3 cwt 1 qr 25 lbs 12·16 ozs; 9 cwt; 3 qrs 6 lbs 15·104 ozs

9. 8 gals 3 qts 0 p 3·449g; 17 gals 1·3504 qts; 162 gals 1 qt 0 p 1.216 g

10. 1 p 1·568 g; 23 po 20 yds 5·13 ft; 7 fur 28 po 0 yd 2·64 ft

11. 37 po 4·18 yds; 5·08 po; 118 ac 1 ro 24 po

12. 8 min 24 sec; 14 min 32·64 sec; 1 day 39 min 44·64 sec

13. 3 pks; 3 bus 2·0032 pks; 2 cwt 3 qrs 20·832 lbs

14. 1 oz 14 dwt 1·92 gr; 2 ozs 3·9936 drs

15. 3·168 poles; 38·4144 poles; 192 ac 0 ro 1·024 p.

Section LIX. (page 158).

1. ·45	**2.** ·83	**3.** ·5	**4.** ·75
5. ·1	**6.** ·2375	**7.** ·002556	**8.** 1·3
9. ·06481	**10.** ·1	**11.** ·083	**12.** 18·7083
13. ·53125	**14.** ·148	**15.** ·361	**16.** ·00431
17. ·4375	**18.** ·7916	**19.** ·029	**20.** ·059027

MISCELLANEOUS EXERCISES.

(pages 158—159).

1.	64·26875	2.	1 fur 93·28 yds	3.	£1 12s 8·72d
4.	41·2184	5.	·71872	6.	2·8
7.	·001	8.	·15694	9.	£6250
10.	19 cwt 3 qrs 21·728 lbs	11.	4·5d	12.	£13 4 $5\frac{1}{4}$
13.	£1 9 4·6	14.	£5 18 4·3125	15.	·0227
16.	5	17.	29·59	18.	£496 2 5·76
19.	£10	20.	311·0549 days	21.	£9 15 $5\frac{1}{4}$
22.	·5614	23.	93 cwt 2 qrs 13·5 lb	24.	5934·317

SECTION LX. (page 160).

PROPORTION.

1.	3	2.	9	3.	100	4.	2
5.	6	6.	1	7.	4	8.	350
9.	$826\frac{1}{2}$	10.	150	11.	500	12.	3490

SECTION LXI. (pages 161 - 163).

SIMPLE PROPORTION.

1.	£14 5s	2.	50 sheep	3.	£25 5s
4.	150 men	5.	£28 17s 6d	6.	$38\frac{1}{2}$ tons
7.	400 men	8.	£28 16s $5\frac{2}{3}$d	9.	15 lbs $11\frac{1}{7}$ oz
10.	£1 15s $0\frac{3}{13}$d	11.	£62 18s $2\frac{3}{7}\frac{0}{0}\frac{2}{1}$	12.	£11 19s $10\frac{3}{180}$
13.	£247 13 $5\frac{1}{6}\frac{5}{6}$—£28 17 6			14.	£79 6 8
15.	18 $0\frac{1}{5}\frac{2}{5}\frac{1}{2}\frac{3}{0}$d	16.	£87 10 8	17.	£87 3 0

18. $409090\frac{10}{11}$ men 19. £1549 3 4 20. $9\frac{11}{13}$ days

21. $151\frac{1}{6}$ nights 22. £1 5 $10\frac{4}{21}$d 23. £477 13 0

24. $52\frac{22}{25}$d 25. £1270 4 $10\frac{1}{2}$ 26. £14 1 7

27. £277 15 $6\frac{3}{3}$ 28. £149 19 6 29. 5 hr 29 min 36 sc

30. 16 days 31. £159 32. £239 8 6

33. £2 11 $3\frac{33}{73}$ 34. £19 1 $8\frac{5}{14}$ 35. 6 cwt 3 qr $15\frac{32}{39}\frac{7}{1}$ lb

36. £18 2 6 37. £78 3 $5\frac{7}{23}$ 38. £718 0 6

39. 68 $2\frac{15}{71}$d 40. $337\frac{11}{17}\frac{08}{21}$ days 41. 129 sheep

42. £5 13 9 43. £3 19 $9\frac{39}{77}$ 44. £300

45. £425 15 $2\frac{74}{113}$ 46. 138 $6\frac{27}{154}$d 47. $12\frac{4}{5}$ years

48. £10 0 $6\frac{2}{53}$ 49. £1 4 $11\frac{4}{9}$ 50. £1966 13 4

Section LXII. (page 165).

COMPOUND PROPORTION.

1. 24 qrs 2. 81 days 3. £19 10s

4. 24 days 5. 20 days 6. 19 horses

7. 33 wks 8. $3\frac{450}{1007}$ ms 9. 30 miles

10. $156\frac{1}{4}$ acres 11. $23\frac{1}{3}$ men 12. £12 2 $5\frac{1}{4}$

13. 11 cwt 2qrs $4\frac{1}{3}\frac{16}{77}$lb 14. £89 12 0 15. £48

16 £148 1 $7\frac{1}{5}$ 17. $6\frac{20}{56}$ casks 18. $16\frac{24}{13}\frac{8}{17}$ days

19 208 acres 20. £300 21. 18s $1\frac{200}{333}$d

Section LXII*a*. (page 167—169).

INTEREST. Case I.

1. £60 2. £229 9 $6\frac{3}{5}$ 3. £29 18 0

4. £14 17 9 5. £13 7 $3\frac{8}{5}$ 6. £103 0 $1\frac{1}{2}$

7. £32 13 $11\frac{2}{5}$ 8. £29 3 $6\frac{144}{365}$ 9. £93 15 $6\frac{279}{730}$

10 £193 11 $3\frac{51}{200}$ 11. £61 0 $4\frac{1}{2}$ 12. £416 17 6

13. £12 15 $9\frac{59}{120}$ 14. £79 1 $4\frac{17}{60}$ 15. £750 15 0

CASE II.

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5. $2\frac{822}{14989}$ 6. $4\frac{9164}{30159}$ 7. $31\frac{111}{119}$ 8. $86\frac{86}{699}$

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4. £404 18 $9\frac{5}{27}$ 5. £3723 12 $8\frac{8}{11}$ 6. £547 12 $6\frac{90}{208}$

7 £461 15 $1\frac{1}{19}$ 8. £667 4 $1\frac{67}{77}$

CASE IV.

1. $4\frac{1}{6}$ p. cent 2. $5\frac{415}{597}$ p cent 3. $3\frac{323}{586}$ p cent

4. $7\frac{23761}{23377}$,, 5 $4\frac{2}{187}$,, 6. $2\frac{362}{571}$,,

7. $11\frac{427}{1268}$,, 8. $8\frac{1}{3}$

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4. £56 17 $2\frac{3181}{3200}$ 5. £14 4 $9\frac{3}{16}$ 6. £52 18 $8\frac{475613}{500000}$

7. £172 8 $1\frac{1}{5}$ 8. £30 1 $4\frac{1235609}{4000000}$

MISCELLANEOUS EXERCISES IN INTEREST.

(page 170).

1. 4 mo 2 wks $5\frac{9}{61}$ dys 2. 16s $1\frac{1}{5}$d 3. £$11\frac{3}{7}$ p. cent

4. £1 2 $9\frac{7203}{200000}$ 5. £8 2 $3\frac{67}{73}$ 6. £1 17 $7\frac{931}{3650}$

7. £14285 14 $3\frac{3}{7}$ 8. $21\frac{1}{19}$ years 9. £276 5 $7\frac{23}{40}$

10. £3 9 $8\frac{439}{1000}$ 11. £9 10 $9\frac{63}{73}$ 12. £1219 0 $11\frac{3}{7}$

13. £211 17 $2\frac{119}{160}$ 14. £231 12 $3\frac{168}{1725}$ 15. $6\frac{1}{4}$ per cent

16. £40 14 9·6

SECTION LXIII. (page 172).

DISCOUNT.

1. £3 17 $11\frac{7}{77}$ 2. £1 3 4 3. £1 12 $1\frac{47}{49}$

4. £8 13 $5\frac{211}{269}$ 5. 16s $6\frac{2}{61}$d 6. £4 18 $7\frac{65}{211}$

7. 13s $11\frac{10}{43}$d 8. 18s $4\frac{848}{649}$d 9. 8s $6\frac{318}{2291}$ 8s $6\frac{42}{73}$

10. £8 10 $5\frac{513}{3097}$ £8 12 $8\frac{64}{75}$ 11. £1 10 $10\frac{270}{631}$ £1 11 $1\frac{527}{1825}$

12. 6s $8\frac{516}{2297}$d 6s $8\frac{284}{3065}$d 13. £877 3 $10\frac{6}{19}$

14. 12s $11\frac{195}{311}$d 15. 18 $6\frac{397}{3563}\frac{30}{11}$d 16. £590 1 $2\frac{2180}{3068}\frac{66}{81}$

SECTION LXIV. (pages 173—174).

STOCKS & SHARES.

1. £910 2. £737 4 3. £1326 10

4. £1927 10 5. £1515 6. £3555 11

7. $3\frac{11}{18}$ 8. $3\frac{11}{43}$ 9. $4\frac{116}{371}$

10. $4\frac{8}{13}$ 11. $4\frac{88}{103}$ 12. $4\frac{326}{393}$

13. £352 18 $9\frac{15}{17}$ 14. £79 2 $2\frac{2}{3}$ 15. £198 17 $3\frac{3}{11}$

16. £71 3 $1\frac{587}{705}$ 17. £188 15 $7\frac{587}{731}$ 18. £596 1 $6\frac{14}{17}$

19. 60 20. £3 21. £152 17 $8\frac{116}{127}$

22. £102 9 $6\frac{258}{343}$ 23. £46 8 $11\frac{49}{333}$ 24. £43 17 $10\frac{6385}{8401}\frac{4}{9}$

25. $95\frac{3}{4}$

MISCELLANEOUS PERCENTAGES.

(pages 175—176.)

1. $21\frac{7}{33}$ 2. 82554 3. 18 4. $116\frac{2}{3}$

5. £8 18 $7\frac{2}{5}$ 6. 10s $4\frac{4}{5}$d 7. £9 9 $11\frac{1}{2}$ 8. $17\frac{1}{17}$

9. 5·5 gain p.cent 10. 13s $0\frac{1}{4}$d 11. £3560 12. $6\frac{1}{11}\frac{0}{12}\frac{7}{6}$d.

13. 2s $6\frac{2}{9}\frac{0}{1}$d 14. 29·065 15. $12\frac{2}{5}$ 16. £70

17. 925000 gals 18. £1621 12 $5\frac{7}{37}$ 19. £750 £1500 £2250

20. 559983

SECTION LXV. (page 177).

SQUARE ROOT.

1. 19 2. 37 3. 84 4. 99 5. 125

6. 768 7. 492 8. 349 9. 1012 10. 1947

11. 29·3025 12. 96·3057 13. 19·6469 14. 26·9647 15. 83·4268

16. $\frac{4}{5}$ 17. $\frac{6}{11}$ 18. $\frac{10}{35}$ 19. $\frac{45}{57}$ 20. ·63394

SECTION LXVII. (page 177).

CUBE ROOT.

1. 37 2. 49 3. 85 4. 123 5. 392 6. 470

7. 984 8. 1008 9. 1·8 10. 3·16 11. 4·01 13. 21·3

13. 167·276 14. 88·894 15. 45·221 16. 16·158 17. $\frac{4}{9}$ 18. $\frac{7}{16}$

19. $\frac{2}{5}\frac{1}{3}$ 20. ·5146

MISCELLANEOUS EXERCISES.

(pages 178—180).

1. $41666\frac{2}{3}$

2. $8\frac{364}{477}$, $4\frac{166}{477}$, $14\frac{25}{53}$, $2\frac{1021}{1053}$

3. £5 4 0

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5. $308\frac{1}{4}$ yds

6. £21 13 4

7. 45 yds

8. £13 0 $10\frac{5}{16}$

9. £312 10

10. 3·65918641

11. £375 7 $5\frac{853421}{2000000}$

12. $4\frac{1528}{9474}$

13. $1\frac{239}{2980}$

14. $4\frac{14}{159}$

15. 128 ft 4' 2'' 2''' 3''''

16. 7 per cent

17. £2 4 $3\frac{27}{59}$

18. 11s $8\frac{5}{8}$d

19. 3·7875

20. £640, £384, £256

21. $3\frac{1231}{3123}$ yrs

22. £26 5 $3\frac{3}{5}$

23. 398·88

24. $60\frac{40}{201}$

25. $81\frac{3}{5}$ weeks

26. £863 16 $9\frac{119}{9261}$

27. 3s $11\frac{53}{101}$d

28. £7 13 $7\frac{1}{6}$

29. $8\frac{8}{53}$

30. £21 1 $10\frac{1}{2}$

31. £11 5 $9\frac{63}{125}$

32. $73\frac{18}{19}$

33. $3\frac{7}{24}$d

34. A £500, B £666 13 4, C £833 6 8

35. 40 days

36. $15\frac{1689}{1900}$ days

37. £27347 16 $10\frac{1}{2}$

38. 3s $8\frac{1}{10}$d

39. £381 5

40. 24 hours

41. 19s $9\frac{1}{27}$d

42. 330 ft 10' 8'' 11'''

43. $9\frac{1049373}{1361815}$d

44. £8 2 $0\frac{4}{9}$

45. 13939

46. £10 13 $7\frac{422}{495}$

47. £3415 1 $4\frac{2144}{14641}$

48. 273·89 yds

49. $7\frac{1}{2}$ minutes

50. 3·15

51. 27·2023

52. 3 hrs 45 min

53. £$180\frac{27}{52}$

54. child £3 6 8; woman £6 13 4; man £13 6 8

55. $5\frac{5}{11}$ min after one

56. £25030 16 9

57. 94·35 inches

58. 90 feet

59. lost 1s $11\frac{17}{21}$

60. $87\frac{13}{24}$ yds

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