A

CONCISE INTRODUCTION

TO

PRACTICAL

ARITHMETIC

FOR THE USE OF

SCHOOLS.

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PREFACE.

ON my arrival at Kingston about ten years ago to superintend the Education of a select number of Pupils, I experienced much inconvenience from the want of School-Books.—To supply this defect I was under the necessity of compiling several treatises on different subjects, and among the rest, the following on Arithmetic, which I am now induced to publish for the greater convenience of my School.—The great advantages of well digested Text Books both to Master and Scholar are too evident to require proofs. In revising this little work for the Press, I have endeavoured to make the rules and definitions as simple as possible consistent with perspicuity, a quality which must never be lost sight of in any work, particularly those of an elementary kind.—I am sufficiently aware that little reputation can be acquired by the publication of a School-Book on a subject already more perfect than any of the other sciences, & which has been so well treated by abler hands.—But my desire to be useful to my Pupils induced me to undertake the work, which I thought might without any great exertion of entellect, though not without much labour, be made more useful for this country than any other publication on the subject.

There is a difference of opinion among Teacher's as to the order of Teaching the Primany rules, some giving the simple and then returning to the compound, others Teaching both at once.—I have been in the habit of giving all the simple rules to young Pupils before they proceeded to the compound, but to young Men of discernment, I have seldom found it necessary, as they commonly understood the compound with as much facility as the simple. But if the Pupils are carried through all the Primary rules before they begin to write them down in their Books, it becomes a matter of indifference which arrangement be chosen.—It should however be laid down as a principle that no Boy can do any thing right the first time, but that he must learn by the help of his Teacher, so as to be able to do it himself ever after.—The strict observance of this rule will render any arrangement easy, and facilitate the

study not only of Arithmetic, but of any other subject.—
Multiplication is applied to the measuring of Timber in
all its varieties, because many who require this knowledge
are not able to remain long enough at School to reach
Duodecimals which are generally taught at the end of Ar-
ithmetic—of this I have had frequent experience—for the
same reason an account of household expences is introduc-
ed in Subtraction ; & in Division, Book-debts and forms of
Bills and receipts.—In Proprotion, the common distinc-
tion of Direct and Inverse has been rejected, and a rule
given that comprehends both.—The same rule, extended
in its operation, serves for Double Proportion, and is
very easily understood by Boys who are too young to
comprehend any explanation of Antecedents and conse-
quents.—In Practice, a case of Feet and Inches is intro-
duced, which will frequently be found more convenient
than cross Multiplication.—Care has been taken, in Vul-
gar Fractions, to make the rules easy of comprehension
and to take away that seeming abstruseness so frequently
complained of.—In the arrangement of Decimal Fractions,
as well as in the simplicity of the rules, something, it is
hoped, will be found worthy of approbation.—Simple In-
terest comprehends several rules which differ in name rath-
er than in principle, some tables are introduced of great
use in Practice and several things entirely new.—In Com-
pound Interest and Annuitis, the several cases are render-
ed easy, and although it was necessary to contract this
part of the treatise as much as possible, every thing of real
use is retained.—

To this practical, treatise, I intended to subjoin the
theory and had actually prepared part of it, but finding
the work growing larger than I expected, I desisted from
that part of my design.——It would have been easy to
have given this work a more novel appearance, by insert-
ing the common methods of preforming the different rules
used by other nations, but these being rather curious
than useful, I declined noticing them.——Some things
introduced in other Books have been rejected in this.
For example, though Multiplying by the component parts
of a composite number be recommended, yet dividing by
component parts is rejected, because it is difficult to as-

certain the value of the remainder (if there be any) until the Pupil has learned Fractions.—It did not seem necessary to give Reduction as a separate rule, as it is only the application of Multiplication and Division.—Several rules are not separately treated, because they are comprehended in Proportion.—

Never forgetting that it was my duty to make a useful Book rather than an ingenious one, I have not scrupled to borrow what seemed useful from other treatises.—In this respect I am chiefly indebted to Dr. Hutton's and Dr. Hamilton's excellent treatises from which I have transcribed several questions that convey useful knowledge at the same time that they improve the Pupil in Arithmetic.—The reader however will discover that the questions are chiefly new, and such as will frequently occur in business.—Not that I attach any merit to the composition of such questions for I frequently write them out as they are wanted, and this every person ought to be able to do who teaches Arithmetic, or at least he should have a great collection, that he may give his Pupils a sufficient variety to prevent copying.——The few notes added on Surveying are not intended to supersede a more accurate study of that subject.—The Problems concerning the Gregorian Calender belong to a very short system of Chronology used in the School, and they are added here for convenience—they may perhaps be found useful to others—for although the calculations in the Nautical Almanac are much more correct, these Problems will be found sufficiently so for common use.—I have added by way of Appendix a few forms very useful in business.—Upon the whole it is hoped that this treatise will answer the purpose of a Text Book in this country better than an other publication on the subject.

Before conclding this Address, I beg leave to notice my method of teaching Arithmetic, as it may be of use to those Teachers who have not yet acquired much experiance.—In a new country like this, a variety of branches must be taught in every respectable School.—Young Men coming from a distance at a very considerable expence are anxious to get forward as fast as possible, and even those destined for the learned professions are seldom al.

lowed the time requisite for acquiring the knowledge pre-
viously necessary.—These considerations induced me to
turn my thoughts to the Discovery of some sure and at
the same time, expeditious method of teaching Arithmetic.
—This object I have accomplished with a much greater
degree of success than I dared to promise myself. I divide
my Pupils into separate Classes according to their pro-
gress.—Each Class have one or more sums to produce
every day neatly wrought upon their Slates—the work is
carefully examined, after which I command every figure
to be blotted out and the sums to be wrought under my
eye.—The one whom I happen to pitch upon first, gives,
with an audible voice, the rules and reasons for every
step, and as he proceeds the rest silently work along with
him, figure for figure, but ready to correct him if he
blunder that they may get his place—as soon as this one
is finished, the work is again blotted out and another call-
ed upon to work the question aloud as before while the
rest again proceed along with him in silence and so on
round the whole Class.—By this method the principles
are fixed in the mind, and he must be a very dull Boy in-
deed who does not understand every question thoroughly
before he leave it.—This method of teaching Arithmetic
possesses this important advantage that it may be pursu-
ed without interrupting the Pupil's progress in any other
useful study.—The same method of teaching Algebra has
been used with equal success.—Such a plan is certainly
very laborious but it will be found successful, and he that
is anxious to spare labour, ought not to be a public
Teacher.—When Boys remain long enough, it has been
my custom to Teach them the Theory and to give them a
number of curious questions in Geography, Natural Phi-
losophy and Astronomy, a specimen of which may be seen
in the questions placed before the Appendix.

I need not detain the reader praising the subject which
I have been treating, for who is ignorant of the great ad-
vantages resulting from its cultivation.—Who does not
know that it is the Key to all the treasures of Mathema-
tics, Natural Philosophy and Astronomy that a thorough
knowledge of it is essential to the man of business, highly
requisite to the Scholar and ornamental to the Gentleman.

ARITHMETIC.

ARITHMETIC is the Art or Science of Numbers.

NOTATION AND NUMERATION,

TEACHES us to read and write any sum or number. All numbers may be expressed by the following figures :

    1   2   3   4   5   6   7   8   9   0

One, two, three, four, five, six, seven, eight, nine, cypher.

TABLE I.

9	Units	1
90	Tens	12
900	Hundreds	123
9000	Thousands	1234
90000	Tens of Thousands	12345
900000	Hundreds of Thousands	123456
9000000	Millions	1234567
90000000	Tens of Millions	12345678
900000000	Hundreds of Millions	123456789

TABLE II.

Periods.	Quadrill. Trillions. Billions. Millions. Units.
Half Periods.	Th. Un. Th. Un. Th. Un. Th. Un. Th. Un.
Figures.	483, 671, 549, 681, 932, 393, 756, 479, 872, 367

From these Tables we may observe,

1. That the names of the places proceed in raising in a tenfold proportion, from the right hand to the left—Units, Tens, Hundreds, &c.

2. That every figure has two values, its simple and its local value.

3. That though the cypher be nothing in itself, yet by writing it on the right hand of any figures, it increases their value in a tenfold proportion. Thus 9 in the first line of the table on the left hand, signifies simply 9, but in the second line with the cypher joined it signifies nine tens, or ninety.

4. That the reading of any large number is made easier by dividing it into periods of six figures, or half-periods of three figures.

EXAMPLES.

Write down four hundred and three.   Read 4985.
Write thirty-six millions six hundred. Read 9,876895476
Write two thousand nine hundred and
   eight.   Read 576976854768

. . . .

A SYNOPSIS OF THE ROMAN NOTATION BY THE LETTERS OF THE ALPHABET.

1	I	30	XXX
2	II	40	XL
3	III	50	L
4	IIII or IV	60	LX
5	V	70	LXX
6	VI	80	LXXX
7	VII	90	XC
8	VIII	100	C
9	IX	500	IƆ or D
10	X	1000	CIƆ or M
11	XI	2000	MM or ĪĪ
12	XII	5000	IƆƆ or V̄
13	XIII	6000	IƆƆM or V̄Ī
14	XIV	10000	CCIƆƆ or X̄
15	XV	50000	IƆƆƆ or L̄
16	XVI	60000	LX̄
17	XVII	100000	C̄ or CCCIƆƆƆ
18	XVIII	500000	IƆƆƆƆ
19	XIX	1000000	M̄ or CCCCIƆƆƆƆ
20	XX	2000000	M̄M̄

OBSERVATIONS.

1. As often as any character is repeated, so many times its value is repeated.

2. When a character of inferior value is placed after one of a superior value, their values are added; but when placed before, the value of the superior is lessened by the value of the inferior.

3. Every inverted Ɔ, affixed to this character IƆ (500) increases its value tenfold.

4. Every time a C and Ꙩ are placed at each end of this character CIꙨ (1000), increases its value tenfold.

5. A line drawn over any character increases its value a thousand-fold.

SOME OF THE MOST USEFUL PROPERTIES OF NUMBERS.

1. Unity is that by which every thing in nature is called one ; as one house, one horse.

2. Number is that which is composed of one or more units.

3. An Intejer or whole number is a unit, or a collection of units., as 1, 78, 56. They are so called to distinguish them from Fractions, which are broken numbers, or parts of numbers, as one third, one fourth, $\frac{1}{3}, \frac{1}{4}$.

4. One number is said to measure another when it divides it without any remainder.

5. And if a number exactly divides two or more numbers, it is then called their common measure.

6. An even number is that which can be halved or divided into two equal parts.

7. An odd number is that which cannot be halved or which differs from an even number by unity.

8. A prime number is that which can only be measured by 1 or unity.

9. A Composite number is that which can be measured by one number greater than unity.

10. A perfect number is that which is equal to the sum of all its aliquot parts, as 6, 28, 496, 8128.

CHARACTERS EXPLAINED.

$+$ Plus, more ; the sign of Addition.

$-$ Minus, less ; the sign of Subtraction.

$\times$ Multiplied by ; the sign of Multiplication.

$\div$ Divided by ; the sign of Division.

$: :$ So is ; the sign of Proportion, as $2 : 4 : : 8 : 16$.

⊐ Greater than.   ⊏ Less than.

∞ Difference.

$\sqrt{}$ Square Root. $3\sqrt{}$ Cube Root.

$=$ Equality ; equal to.

ADDITION.

ADDITION teacheth to find the sum of two or more numbers, and is either Simple or Compound.

. . . .

SIMPLE ADDITION.

R U L E.

WRITE the numbers under each other, so that units may stand under units, tens under tens, &c. Then beginning with the column of units, find its sum, and for each ten in that sum carry one to the next superior place, writing the excess, if any, under the column added. Proceed thus with each remaining column except the last, under which write the whole sum.

EXAMPLES.

478	547685	3798547
367	973904	9367398
654	657439	421762
219	276839	54983
543	845784	5629
721	928967	567
208	392138	39
3310		
2832		
3310 *Proof.*		

1st PROOF. Cut off the top line. Add all the rest together—then add this last found sum and the line cut off—Their sum will be the same as the first.

2d PROOF. Repeat the work, beginning at the top.

As it is of great consequence in business to perform Addition readily and exactly, the judicious teacher will subjoin examples till this be effected.

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QUESTIONS IN SIMPLE ADDITION.

1. A. borrows at one time of B. £92, at a second time £317, and at a third time £203—What sum did he borrow in all?   *Ans.* £612.

2. From Quebec to Montreal is 180 miles, from thence to Kingston 200—from thence to York 149---from thence to Niagara 78 miles---from thence to Detroit 210. Required the distance from Quebec to Detroit.

Ans : 817 miles.

3. A Farmer has 13 acres of land sown with wheat, 17 with Indian corn, 9 with pease, 2 planted with pota- toes, 23 acres of meadow, and an orchard containing 1 acre. How much cleared land has he.

Ans : 65 Acres.

4. A Merchant has in Cash £356, in good Bills £476, in Merchandize £347, and in accounts £693—what is he worth ? *Ans.* £1872.

5. A Farmer purchases a Farm for £175—His Horses cost him £57—His Oxen £42—His Sheep £7—His Farming Utensils £25.—What did he lay out ?

Ans. £306.

6. How many days are there from the 16th of March to the 8th of August ? *Ans.* 145 Days.

7. England contains 8,331,434 Inhabitants—Wales 541,546—Scotland 1,599,068, the Army including the Militia 198,351. Seamen in the Navy 126,279, Seamen in Registered Ships 144,558—Convicts 1,410—Ireland contains 4,387,354.—Required the population of the British Empire. *Ans.* 15,300,000.

8. A General mustering his Army, finds that he has, 32947 Infantry, or Foot Soldiers, 4137 Horse, 3978 Dragoons, 2135 Light Horse, 579 Artillery or Gunners, 937 Pioneers, 178 Sappers and 235 Miners—How many Men does he command. *Ans.* 44,916.

COMPOUND ADDITION.

RULE.

PLACE Denominations of the same kind under each other.—Add the figures of the lower Denomination.— Carry by as many as make one of the next superior De- nomination—write the overplus, if any, under the De- nomination added.—Proceed in the like manner through all the Denominations.

OF THE GOLD AND SILVER COINS CURRENT IN BRITISH
AMERICA.

GOLD COIN.

Coins.	Weight.		Value. Actual Currency.			Antient French Currency.		Pieces.
	dwts.	grs.	£.	s.	d.	livr.	s.	
A Guinea	5	6	1	3	4	28	0	Of England.
A Half Guinea	2	15	0	11	8	14	0	
Quarter Guinea	1	18	0	7	9¾	9	6	
A Johannes	18	0	4	0	0	96	0	Of Portugal.
A Half do.	9	0	2	0	0	48	0	
A Moidore	6	18	1	10	0	36	0	
A Doubloon	17	0	3	14	6	89	8	Of Spain.
A Half do.	8	12	1	17	3	44	14	
A Louis D'Or, coined before 1793	5	4	1	2	8	27	4	Of France.
A Pistole of France, coined before 1793	4	4	0	18	3	21	18	
An American Eagle	11	6	2	10	0	60	0	Of America.
A Half Eagle	5	15	1	5	0	30	0	

SILVER COIN.

Coins.	Value. £.	s.	d.	liv.	s.
The Dollar or English Crown	0	5	6	6	12
The English Shilling	0	1	1	1	6
The Spanish Dollar	0	5	0	6	0
The French Dollar coined before 1793	0	5	6	6	12
The French piece of 4 livres 10 sols	0	4	2	5	0
The French piece of 36 sols	0	1	8	2	0
The French piece of 24 sols	0	1	1	1	6
The American Dollar	0	5	0	6	0
The Spanish Pistarene	0	1	0	1	4

COMPOUND ADDITION.

TROY WEIGHT.

			Grs.
24 Grains	make 1 Pennyweight,	dwt.	24=1 dwt.
20 Pennyweights	·· 1 Ounce,	oz.	480=20=1 oz.
12 Ounces	········· 1 Pound,	lb.	5760=240=12=1 lb.

By this Weight are wieghed Gold, Silver and Jewels.
—There is a subdivision of the Troy grain peculiar to
Jewellers—they divide the grain into 20 mites, each mite
into 24 droits, each droits into 20 periots and each periot
into 24 blanks.

EXAMPLES.

lbs.	oz.	dwt.	grs.	lbs.	oz.	dwt.	grs.
765	8	19	23	1724	6	18	21
888	9	16	19	650	11	13	19
549	11	12	22	3836	9	17	22
904	10	18	20	5347	10	11	9
293	6	14	9	4578	4	19	23
672	3	7	18	963	3	14	12
4075	3	10	15	17101	11	16	10
3309	6	10	16	15377	4	17	13
4075	3	10	15	17101	11	16	10

What is the sum of 53 lbs. 17 dwt. 13 grs.—38 lbs. 10
oz. 10 dwt.—36 lbs. 8 oz. 15 dwt. 22 grs.—40 lbs. 9 oz.
16 dwt. 20 grs.—42 lbs. 10 oz. 14 dwt.—48 lbs. 11 oz. 18
dwt. 21 grs. ?

Ans. 261 lbs. 4 oz. 13 dwt. 4 grs.

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AVOIRDUPOISE WEIGHT.

Marked.

Dr.	16 Drams	make	1 Ounce
oz.	16 Ounces	········	1 Pound
lbs.	28 Pounds	········	1 Quarter of an Cwt.
qr.	4 Quarters or 112 lbs.		1 Hundred weight
cwt.	20 Hundred weight	··	1 Ton, T.

COMPOUND ADDITION.

Drams.
    16=1 *Ounce.*
   256=16=1 *Pound.*
  7168=448=28=1 *Quarter.*
 28672=1792=112=4=1 *Cwt.*
573440=35840=2240=80=20=1 *Ton.*

By this weight are weighted all things of a coarse or ossy nature as Corn, Bread, Butter, Cheese, Flesh, recery Wares, and some Liquids, and also all Metals cept Silver and Gold.

			oz.	*dwt.*	*grs.*	
ote.—lb.	1 Avoirdupoise	=	14 ··	11 ··	15½	*Troy.*
oz.	1 Ounce	=		18 ··	5½	
Dr.	1 Dram	=		1 ··	3½	

Therefore a pound Avoirdupoise is heavier than a und Troy—but an ounce Troy heavier than an ounce voirdupoise.

EXAMPLES.

us.	cwt.	qrs.	lbs.	oz.	Drs.
83 ··	18 ··	2 ··	27 ··	14 ··	13
66 ··	17 ··	3 ··	22 ··	13 ··	11
93 ··	15 ··	1 ··	19 ··	15 ··	14
70 ·	19 ··	0 ··	12 ··	10 ··	15
66 ··	14 ··	3 ··	26 ··	5 ··	8
43 ··	15 ··	1 ··	23 ··	4 ··	10
36 ··	19 ··	3 ··	21 ··	1 ··	7
53 ··	1 ··	0 ··	21 ··	2 ··	10
36 ··	19 ··	3 ··	21 ··	1 ··	7

Tons	cwt.	qrs.	lbs.	oz.	Drs.
5601 ··	19 ··	3 ··	27 ··	15 ··	15
9764 ··	18 ··	1 ··	22 ··	13 ··	9
8047 ··	13 ··	0 ··	16 ··	14 ··	12
7963 ·	16 ··	3 ··	10 ··	11 ··	14
3628 ··	10 ··	2 ··	23 ··	9 ··	8
2639 ··	15 ··	0 ··	24 ··	8 ··	5
37646 ··	14 ··	2 ··	14 ··	9 ··	15
32044 ··	14 ··	2 ··	14 ··	10 ··	0
37646 ··	14 ··	2 ··	14 ·	9 ··	15

A Merchant purchases 6 Chests of Tea, the first contains 3qrs. 17lbs. 15oz. 14drs.—the second 2qrs. 13lbs. oz. 3drs.—the third 3qrs. 27lbs.—The fourth 1qr. 19 s. 1oz. 13drs.—the fiilth 3qrs. 2lbs. 12oz. 3drs.—the xth 1qr. 13drs.—Required the weight of the whole.

There is a boat loaded with Sugar weighing 13cwt. 3 rs. 17lbs.—Salt 14cwt. 1qrs. 27lbs. 13drs.—Potash 17 wt. 1qr. 13lbs. 2oz. 1dr.—Iron 19cwt. 1qr 18lbs 13 z. 11drs.—Required the weight.

EXAMPLES.

Ton.	pipes.	hhd.	gall.
4245	1	1	62
894	0	0	61
763	1	1	43
3932	1	1	42
1480	1	1	36
527	1	1	24
11845	1	1	15
7598	1	1	16
11845	1	1	15

Punch.	gall.	qts.	pts.
946	83	3	1
864	76	2	1
783	54	1	0
658	46	2	1
592	33	1	0
301	22	1	1
4147	65	0	0
3200	65	0	1
4147	65	0	0

A merchant purchases 1p. 1hhd. 27gal. 3qts. 1pt. of Sherry—64hhd. 22gal. 2qts. 1pt. of Madeira—21hhd. 17gal. 3qts. 1pt. of Port—73hhd. 61gall. 2qt. 1pt. of Malaga—63hhd. 45gal. 1qt. 1pt. of Burgundy—Required the sum of the whole.

A vintner on examining his cellar, found of Brandy 1 ton, 1 pipe, 1hhd. 61gal. 3qts.—Of rum 9T. 2p. 1hhd. 10gall. 1qt.—Of gin 8T. 1p. 1hd.—Of wines of various kinds 25T. 2p. 0hd. 41gal. 3qts.—How many tons had he in all?

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ALE AND BEER MEASURE.

Marked.

pt.	2 Pints	make	1 Quart.
qt.	4 Quarts	..	1 Gallon.
gal.	8 Gallons	..	1 Firkin of Ale.
	9 Gallons	..	1 Firkin of Beer.
frk.	2 Firkins	..	1 Kilderkin.
kil.	2 Kilderkins	..	1 Barrel.
	3 Kilderkins	..	1 Hogshead, hhd.
bar.	3 Barrels	..	1 Butt.
btt.	2 Butts	..	1 Tun, T.

Pints.

$$2 = 1\,Quart.$$
$$8 = 4 = 1\,Gallon.$$
$$72 = 36 = 9 = 1\,Firkin.$$
$$144 = 72 = 18 = 2 = 1\,Kilderkin.$$
$$288 = 144 = 36 = 4 = 2 = 1\,Barrel.$$
$$432 = 216 = 54 = 6 = 3 = 1\tfrac{1}{2} = 1\,Hogshead.$$
$$576 = 288 = 72 = 8 = 4 = 2 = 1\tfrac{1}{2} = 1\,Puncheon.$$
$$864 = 432 = 108 = 12 = 6 = 3 = 2 = 1\tfrac{1}{3} = 1\,Butt.$$

The Ale Gallon contains 282 Cubic or Solid Inches.

EXAMPLES.

Tuns.	bit.	bar.	kld.	fir.	gall.		Hhd.	hld.	firk.
486 ..	1 ..	2 ..	1 ..	1 ..	7		98 ..	1 ..	1
848 ..	1 ..	1 ..	0 ..	0 ..	6		76 ..	1 ..	1
934 ..	0 ..	1 ..	1 ..	1 ..	4		84 ..	0 ..	1
653 ..	1 ..	1 ..	1 ..	1 ..	5		69 ..	1 ..	0
329 ..	0 ..	0 ..	0 ..	1 ..	4		43 ..	1 ..	1
190 ..	1 ..	1 ..	1 ..	0 ..	3		50 ..	0 ..	1
3143 ..	0 ..	2 ..	1 ..	1 ..	5		423 ..	0 ..	1
2956 ..	0 ..	2 ..	1 ..	1 ..	6		324 ..	1 ..	0
3143 ..	0 ..	2 ..	1 ..	1 ..	5		423 ..	0 ..	1

A beer made in three months 32 Tuns, 1b. 1hhd. 27gall. 3qt. of strong ale—23 Tons, 0b. 1hd. 51gall. 2qts. porter—98T. 1b. 0hu. 2gall. 1qt. of small beer—How many tuns were brewed in the whole?

A vintner receives at one time 5hhd. 2fir. 7gal 3qts. 1pt.—at another, 5fir. 6gall. 2qts. 1pt. and at another 7 tuns, 5hhds. 50galls.—How many tuns, hogsheads, &c. did he receive in all?

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DRY MEASURE.

Marked.

pt.	2 Pints	make 1	Quart
qt.	2 Quarts	......	Pottle.
ptl.	2 Pottles	......	Gallon.
	2 Gallons	......	Peck.

APOTHECARIES WEIGHT.

Marked.					Grs.
gr.	20 Grains make	1 Scruple			20=1Scr.
scr.	3 Scruples	1 Dram			60=3=1Dr.
dr.	8 Drams.........	1 Ounce			480=24=8=1Ounce.
oz.	12 Ounce........	1 Pound, lb.			5760=288=96=12=1lb.

This is the same as Troy weight, only having different divisions—Apothecaries make use of this weight in compounding their Medicines ; but they buy and sell their Drugs by Avoirdupoise weight.

EXAMPLES.

lbs.	oz.	dr.	scr.	gr.	lbs.	oz.	dr.	scr.	grs.
162	11	7	2	19	864	9	6	2	19
640	10	4	1	16	746	10	7	1	16
373	8	2	0	14	903	11	6	0	14
894	9	6	1	13	324	9	5	2	18
588	11	5	0	17	257	6	4	0	13
796	6	3	2	18	543	3	2	1	10
3457	10	6	1	17	3641	4	1	1	10
3294	10	6	1	18	2776	6	2	1	11
3457	10	6	1	17	3641	4	1	1	10

An Apothecary makes a composition of seven ingredients—the first weighed 7lbs. 11oz. 3dr. 1scr. 18grs.—the second 19lbs. 2oz. 0dr. 0scr. 3grs.—the third 13lbs. 8oz. 7dr. 2scr. 0grs.—the fourth 10lb. 7oz. 6dr. 1scr. 13grs. —the fifth 17lbs. 9oz. 3dr. 2scr. 14grs.—The sixth 8lbs. 3oz. 1dr. 2scr. 17grs. and the seventh 1lb. 8oz. 6dr. 1 scr. 19grs.—What was the weight of the whole.

• • ▶ •

CLOTH MEASURE.

Marked.				
nl.	4 Nails	make	1 Quarter of a yard	
qrs.	3 Quarters		1 Flemish Ell	
	4 Quarters		1 Yard	yd.
	5 Quarters		1 English Ell	E. E.
	6 Quarters		1 Flemish Ell	F. E.

1000 Feet French measure=1068 Feet English. An English league contains 15810 English feet, and a French league 15120 French feet or 16184--16 English feet.—The difference therefore between an English and a French league is 308,16 feet English. Note. 1375 French perches make 1602 English.

. . . .

WINE MEASURE.

Marked.

Pt.	2 Pints	make	1 Quart.	
qt.	4 Quarts	. . . .	1 Gallon.	
gal.	42 Gallons	. . . .	1 Tierce.	
	63 Gallons	. . . .	1 Hogshead.	
	84 Gallons	. . . .	1 Puncheon.	
hhd.	2 Hogsheads	. . . .	1 Pipe or Butt.	
P.	2 Pipes	. . . .	1 Tun. T.	

Pints.

$$2 = 1 \, Quart.$$
$$8 = 4 = 1 \, Gall.$$
$$336 = 168 = 42 = 1 \, Tierce.$$
$$504 = 252 = 63 = 1\tfrac{1}{2} = 1 \, Hogshead.$$
$$672 = 336 = 84 = 2 = 1\tfrac{1}{3} = 1 \, Punch.$$
$$1008 = 504 = 126 = 3 = 2 = 1\tfrac{1}{2} = 1 \, Pipe.$$
$$2016 = 1008 = 252 = 6 = 4 = 3 = 2 = 1 \, Tun.$$

=

Note. By this are measured all Wines, Spirits, Strong waters, Cyder, Mead, Perry, Vinegar, Oil and Honey—The wine gallon contains 231 cubic or solid inches.—And it is remarkable that the Wine and Ale gallons have the same proportion to one another as the Troy and Avoirdupois pounds ; that is, as 1lb. Troy is to 1lb. Avoirdupois, so is one Wine gallon to one Ale gallon.

COMPOUND ADDITION.

pk.	4 Pecks	make one	Bushel.
bush.	8 Bushels	. . . . . .	Quarter.
qrs.	5 Quarters	. . . . . .	Wey or Load.
	4 Bushels	. . . . . .	Coomb.
	5 Pecks	. . . . . .	Bushel, water measure.
C.	10 Coombs	. . . . . .	Wey.
W.	2 Weys	. . . . . .	Last. *Lst.*

Pints.

$$8 = 1\,Gall.$$
$$16 = 2 = 1\,Peck.$$
$$64 = 8 = 4 = 1\,Bushel.$$
$$512 = 64 = 32 = 8 = 1\,Quarter.$$
$$2560 = 320 = 150 = 40 = 5 = 1\,Wey\ or\ Load.$$
$$256 = 32 = 16 = 4 = 1\,Coomb.$$
$$16 = 2 = 5 = 1\,Water\ Measure.$$
$$5120 = 640 = 300 = 80 = 10 = 2 = 1\,Last.$$

By this are measured all dry wares, as, corn, seeds, roots, fruit, salt, coals, sand, oisters, &c. The standard gallon contains $268\frac{2}{5}$ solid inches, and the Winchester bushel $2150\frac{2}{5}$ cubic or solid inches.

EXAMPLES.

Last.	wey.	coomb.	bush.		Pecks.	gall.	potts.	qts.	pts.
196	1	9	3		83	1	1	1	1
480	1	7	1		76	1	1	1	1
543	0	6	2		84	1	1	1	1
864	1	8	1		38	0	0	0	0
732	1	5	0		65	1	0	1	1
971	1	3	2		92	0	1	1	1
3789	1	0	1		401	1	1	1	1
3592	1	0	2		318	0	0	0	0
3789	1	0	1		401	1	1	1	1

A corn merchant exports 36 lasts, Lw. 4qrs. 1 coom. 3bush. 3 pecks of wheat—71 lasts, 1 way, 2qrs. 0c. 2 bush. 2 pecks of rye—86 lasts, 1 way, 3qrs. 1coom. 1 bush. 3 pecks of beans—and 46 lasts, 6bush. of oats— How many lasts were exported in the whole ?

MINOT OF CANADA.

96 French solid Inches make 1 Pot of Paris.
20 Pots   ..   ..   1 Minot.

The Winchester bushel being 8 inches deep and 18⅛ inches in diameter, contains 2150⅖ English cubic inches. A minot contains 1920 French cubic inches. 100 Minots are equal to 108,765 Winchester bushels.

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TIME.

Marked.

sec.	60 Seconds	make 1	Minute.
min.	60 Minutes	· · · · · ·	Hour.
ho.	24 Hours	· · · · · ·	Day.
da.	7 Days	· · · · · ·	Week.
w.	4 Weeks	· · · · · ·	Month. *mo.*

13 Months, 1 day, 5 hours and 49 minutes; or 365 days, 5 hours, 49 minutes make 1 Year.

Seconds.
60 = 1 *Minute.*
3600 = 60 = 1 *Hour.*
86400 = 1440 = 24 = 1 *Day.*
604800 = 10080 = 168 = 7 = 1 *Week.*
2419200 = 40320 = 672 = 28 = 1 = 1 *Month.*

EXAMPLES.

m.	w.	d.	h.	m.	s.	m.	w.	d.	h.	m.	s.
1316	3	6	23	54	46	546	2	5	22	56	43
2894	2	5	20	59	38	673	2	6	21	43	58
4733	1	2	19	46	32	754	1	4	19	23	26
9652	0	4	22	34	26	432	0	2	17	20	19
920	2	3	23	39	38	897	3	1	12	19	13
501	1	2	21	19	14	980	1	0	18	17	36
20049	0	6	12	4	14	4285	0	1	16	1	15
18702	0	6	12	9	28	3788	1	2	17	4	32
20049	0	6	12	4	14	4285	0	1	16	1	15

SQUARE MEASURE.

Marked.

in.	144 Square Inches	make one square	Foot.
f.	9 Square Feet	....	Yard.
yd.	30¼ Square Yards	....	Pole.
po.	40 Square Poles	....	Rood.
ro.	4 Roods	....	Acre. ac.

Inches.
144 = 1 Foot.
1296 = 9 = 1 Yard.
39201 = 272¼ = 30¼ = 1 Pole.
1568160 = 10890 = 1210 = 10 = 1 Rood.
6272640 = 43560 = 4840 = 160 = 4 = 1 Acre.

By this measure, land, husbandmen and gardners' work are measured—Also, artificers' work, such as boards, glass, pavements, plaistering, wainscoting, tiling, flooring, and every dimension of length and breadth only.

EXAMPLES.

A.	R.	P.	Yds.	feet.	in.
4560	3	39	96	8	136
3872	2	26	84	7	123
2965	1	22	73	6	29
8431	3	19	29	5	93
7596	0	12	61	4	84
9283	2	21	58	2	112
26510	2	22	405	0	1
31949	2	23	308	0	9
26510	2	22	405	0	1

A surveyor measuring 6 parcels of land, found the first to contain 17 acres, 2r. 36p.—the second 81a. 3r. 20p.—the third 94a. 2r. 10p.—the fourth 8a. 17p.—the fifth 84 1a. 3r. 19p.—the sixth 96a. 2r. 39p.

A gentleman has 5 farms—the first 382a. 1r. 34p. the second 618a. 3r. 14p.—the third 265a. 17p.—the fourth 409a. 1r. 36p. and the fifth 100 acres, 1r. 27p.—What was the contents of the estate?

FRENCH SQUARE MEASURE.

Marked.

in.	144 Square Inches	make one	Square Foot.
f.	36 Feet	. . . . .	Toise.
ts.	9 Toises	. . . . . .	Perche.
per.	100 Perches	. . . . . .	Arpent.
arp.	7056 Arpents	. . . . . .	League. *L.*

62500 French feet=71289 English feet, and 756250
Arpents=641601 Acres.

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SOLID MEASURE.

Marked.

in.	1728 Inches	=	1 Cubic or Solid Foot.
f.	27 Feet	=	1 Yard. *yd.*

This table is used when 3 dimensions are concerned,
viz. length, breadth and thickness, or depth.

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FRENCH SOLID MEASURE.

in.	1728 Inches	make	1 Cubic or Solid Foot.
t.	216 Feet	. . . .	1 Toise. *Ts.*

1000 French Cube Feet are equal to 1218--186432
English Cube Feet.

The weights and measures established by law, are the
Pound Avoirdupois, the English Gallon, the Minot, the
French Foot, and the Yard English.

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MEMORANDA.

BY an act of the Provincial Parliament of Lower Can-
ada, passed in April, 1808, it is enacted that payments in
Gold above £20 may be made in bulk. English, Por-
tuguese and American at 89sh. per ounce—French and
Spanish at 87sh. 8½d. per ounce, deducting half a grain
for each piece, to compensate any loss the receiver might
sustain from paying it away in single pieces. For every
grain over or under, when weighed by the single piece,
add or deduct 2¼d. in English, Portuguese or American
Gold; but in French and Spanish, add or deduct 2⅕d.
The value of these deductions may be easily found by the
following Tables, calculated for grains, pennyweights,
and ounces.

TABLE I.

Exhibiting the value of British, Portugal and American Gold, when weighed in bulk, at 89sh. per ounce Troy.

GRAINS.

0	1					2					3					4					5					6				
Pounds	Pounds	Shillings	Pence	Farthings	Decimals	Pounds	Shillings	Pence	Farthings	Decimals	Pounds	Shillings	Pence	Farthings	Decimals	Pounds	Shillings	Pence	Farthings	Decimals	Pounds	Shillings	Pence	Farthings	Decimals	Pounds	Shillings	Pence	Farthings	Decimals
1	0	0	2	0	9	0	0	4	1	8	0	0	6	2	7	0	0	8	3	6	0	0	11	0	5	0	1	1	1	4
2	0	0	4	1	8	0	0	8	3	6	0	1	1	1	4	0	1	5	3	2	0	1	10	1	0	0	2	2	2	8
3	0	0	6	2	7	0	1	1	1	4	0	1	8	0	1	0	2	2	2	8	0	2	9	1	5	0	3	4	0	2
4	0	0	8	3	6	0	1	5	3	2	0	2	2	2	8	0	2	11	2	4	0	3	8	2	0	0	4	5	1	6

PENNYWEIGHTS.

0	1					2					3					4					5				
Pounds	Pounds	Shillings	Pence	Farthings	Decimals	Pounds	Shillings	Pence	Farthings	Decimals	Pounds	Shillings	Pence	Farthings	Decimals	Pounds	Shillings	Pence	Farthings	Decimals	Pounds	Shillings	Pence	Farthings	Decimals
1	0	4	5	1	6	0	8	10	3	2	0	13	4	0	8	0	17	9	2	4	1	2	3	0	0
2	0	8	10	3	2	0	17	9	2	4	1	6	8	1	6	1	15	7	0	8	2	4	6	0	0
3	0	13	4	0	8	1	6	8	1	6	2	0	0	2	4	2	13	4	3	2	3	6	9	0	0
4	0	17	9	2	4	1	15	7	0	8	2	13	4	3	2	3	11	2	1	6	4	9	0	0	0

OUNCES.

0	1					2					3					4				
Pounds	Pounds	Shillings	Pence	Farthings	Decimals	Pounds	Shillings	Pence	Farthings	Decimals	Pounds	Shillings	Pence	Farthings	Decimals	Pounds	Shillings	Pence	Farthings	Decimals
1	4	9	0	0	0	8	18	0	0	0	13	7	0	0	0	17	16	0	0	0
2	8	18	0	0	0	17	16	0	0	0	26	14	0	0	0	35	12	0	0	0
3	13	7	0	0	0	26	14	0	0	0	40	1	0	0	0	58	8	0	0	0

TABLE II.

Exhibiting the value of French and Spanish Gold, at 87sh. 8½d. per Ounce Troy.

GRAINS.

	1. £. s. d. f. dc.	2. £. s. d. f. d.	3. £. s. d. f. d.	4. £. s. d. f. d.	5. £. s. d. f. d.	6. £ s. d. f. d.
1	0 0 2 0 3¼	0 0 4 1 ½	0 0 6 2 ¼	0 0 8 3	0 0 10 3 ¾	0 1 1 0 ½
2	0 0 4 1 ½	0 0 8 3	0 1 1 0 ½	0 1 5 2	0 1 9 3 ½	0 2 2 1
3	0 0 6 2 ¼	0 1 1 0 ½	0 1 7 2 ¾	0 2 2 1¼	0 2 8 3¼	0 3 3 1½
4	0 0 8 3	0 1 5 2	0 2 2 1	0 2 11 0	0 3 7 3	0 4 4 2½

PENNYWEIGHTS.

	1.	2.	3.	4.	5.	6.
1	0 4 4 2 ½	0 8 9 1	0 13 1 3 ½	0 17 6 2	1 1 11 0 ½	
2	0 8 9 1	0 17 6 2	1 6 3 3	1 15 1 0	2 3 10 1	
3	0 13 1 3 ½	1 6 2 3	1 19 5 2 ½	2 12 7 2	3 5 9 1 ½	
4	0 17 6 2	1 15 1 0	2 12 7 2	3 10 2 0	4 7 8 2	

OUNCES.

	1.	2.	3.	4.
1	4 7 8 2	8 15 5 0	13 3 1 2	17 10 10 0
2	8 15 5 0	17 10 10 0	26 6 3 0	35 1 8 0
3	13 3 4 2	26 6 3 0	39 9 4 2	52 12 6 0

Dealers in WOOL have a weight peculiar to themselves.

The Sack,	containing	2 Weighs
The Weigh	......	6½ Tods
The Tod	......	2 Stones
. The Stone	......	2 Cloves
The Clove	.....	7 *lbs.*

Also, 12 Sacks make 1 Last, or 4368 pounds.

56 lbs. of old Hay or 60 lbs. new Hay, make a Truss.
40 lbs. of Straw make a Truss.
36 Trusses make a Load of Hay or Straw.
14 lbs. make a Stone.
5 lbs. of Glass make a Stone.
24 Stones make a Seam.

PAPER. A Quire contains 24 Sheets—a Ream 20 Quires—a Bundle 2 Reams—a Bale 10 Reams. 12 Skins of Parchment make a Roll.

48 Cubic feet of timber equal 1 Ton.
10 Qrs. or 80 Bushels equal 1 Last of Corn.
17 Cwt. equal a Last of Flax and Feathers.
12 Barrels equal a Last of Cod Fish, Herrings, &c.
8 lbs. equal a Stone of Fish.
640 Acres equal 1 Square Mile.

ANTIENT TABLES.

HEBREW MONEY.

				s.	*d.*
10 Greaks	=	1 Bekas	=	1	2½
2 Bekas	=	1 Shekel	= £	2	4½
60 Shekels	=	1 Manch or Mina	=	7 1	5
50 Minas	=	1 Talent	= 353 11	10

HEBREW OR JEWISH WEIGHTS.

				lbs.	*oz.*	*dwt.*	*gr.*
1 Shakel			=	0	0	9	3
100 Shakels	=	1 Manch	=	3	9	12	12
50 Manches	=	1 Talent	=	141	15	0	0

C 2

MEASURES OF CAPACITY.

1 Log	$=$		$\frac{1}{2}$ Pent &	9,82 Cubic ins.
4 Logs	$=$ 1 Cab	$=$	3	10,458
3 Cabs	$=$ 1 Hen	$=$	10	2,5
2 Hens	$=$ 1 Leak	$=$	20	5,0
3 Leaks	$=$ 1 Ephah or bath	$=$ 60		15,0
1 Omer	$=\frac{1}{10}$ of an Ephah	$=.6$		1,5
15 Ephas	$=$ 1 Homer	$=$ 305		7,00

Note.—A Cotyla or $\frac{1}{10}$ of an Omer contains just 10 Ounces Avoirdupoise of rain water.—An Omer 100 ; Epha 1000 ; a Choner or Homer 10,000.

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JEWISH LONG MEASURE.

				Feet Decimal.
3 Palms	$=$ 1 Span		$=$	1,912
2 Spans	$=$ 1 Cubit		$=$	1,829
4 Cubits	$=$ 1 Fathom		$=$	7,296
6 Cubits	$=$ 1 Reed		$=$	10,944
80 Cubits	$=$ 1 Scheenies		$=$	145,92
400 Cubits	$=$ 1 Sladieum or Furlong		$=$	729,6
5 Furlongs	$=$ 1 Sabbath days journey			
10 Furlongs	$=$ 1 Eastern Mile		$=$	72,96
3 Miles	$=$ 1 Parasan $=$ 4 Eng. miles & 580 feet.			

......

GRECIAN MONEY.

				£.	s.	d.
6 Obole	$=$	1 Drachm	$=$	0	0	$7\frac{1}{4}$
2 Drachms	$=$	1 Dedrachue	$=$	0	1	$3\frac{1}{2}$
4 Drachms	$=$	1 Tetradrachm	$=$	0	2	7
100 Drachms	$=$	1 Mina	$=$	3	4	7
60 Minas	$=$	1 Talent	$=$	193	15	0

......

ROMAN MONEY.

				£	s	d
1 Sestertius			$=$	0	0	$1\frac{3}{4}$
4 Sestertii	$=$	1 Denarius	$=$	0	0	$7\frac{3}{4}$
1000 Sestertii	$=$	1 Sestertium	$=$	8	1	$5\frac{1}{2}$
10 Sestertia			$=$	80	14	7

Note.—An As$=\frac{3}{4}$ D.—a Quadrans$=\frac{3}{4}$ of 1 Farthing and a Mite$=\frac{1}{4}$ of 1 Farthing.

GREEK and ROMAN WEIGHTS *reduced to English Troy Weight.*

				lbs.	oz.	dwt.	grs.	
		1	Lentes	= 0	0	0	0	$\frac{8\ 5}{12}$
4	Lentes	= 1	Siliqua	= 0	0	0	3	$\frac{1}{28}$
2	Siliqua	= 1	Obolus	= 0	0	0	9	$\frac{3}{28}$
2	Oboli	= 1	Scriptulum	= 0	0	0	18	$\frac{3}{14}$
3	Scriptula	= 1	Drachma	= 0	0	2	6	$\frac{9}{14}$
1½	Drachma	= 1	Sextula	= 0	0	3	0	$\frac{6}{7}$
2	Drachma	= 1	Siciliacs	= 0	0	4	13	$\frac{2}{7}$
3	Sextula	= 1	Duella	= 0	0	6	1	$\frac{5}{7}$
3	Duella	= 1	Uncia	= 0	0	18	5	$\frac{1}{7}$
12	Uncia	= 1	Libra	= 0	10	18	13	$\frac{5}{7}$

The Roman Ounce is the English Avoirdupoise Ounce which they divided into 7 Denarii as well as 8 Drachms ; and as they reckoned the Denarius equal to the Attic Drachm—this will make the Attic weights and eight heavier than the correspondent Roman weights.

————

1. An Under-Writer Insures for A £219 13s.—for B £358 3s. 9d.—for C £176 12s. 3d.—for D. £545 17s. 8¾d.—What sum did he Insure in all ?

Ans. £1300 6s. 8¾d.

2. A Merchant Balancing his Books, finds that he has in Cash £57 14s. 9½d.—Goods worth £473 12s. 5d.—a House which he values at £637 9s. 4d. and ½ share of a Ship valued at £1176 19s. 3¾d.

Ans. £2345 15s. 10¾d.

3. A Merchant receives from his Customers—Wheat 376bush. 2pecks 0gal.—493bush. 1peck Indian Corn—197bush. 3pecks 1gal. of Pease.—Required the whole quantity of Grain. Ans. 1067bush. 2pecks 1gal.

4. A Merchant at Quebec receives 7 Hogsheads of Sugar—No. 1 contains 11cwt. 2qrs. 27lbs.—No. 2 contains 9cwt. 3qrs. 19lbs.—No. 3, 10cwt. 2qrs.—No. 4, 9cwt. 3qrs.—No. 5, 8cwt. 1qr. 17lbs.—No. 6, 11cwt. 1qr. 16lbs.—No. 7, 12cwt. 2qrs. 7lbs.—Required the total weight. Ans. 74cwt. 1qr. 1lb.

5. A Privateer takes a Prize, the private Men's shares came to £2189 17s. 3d.—The Officers as much besides £4751—unknown to the Men. What was the real value of the Prize.   Ans. £9133 14s. 6d.

6. A Commissary buys 117 barrels of Pork, for £518 12s. 3d.—189 barrels of Flour, for £299 15s. 4d.—and 87 barrels of Pease, for £67 19s. On counting his money he finds that he still has £575 17s. 6d. How much money had he at first?   Ans. £1462 4 1.

7. A Merchant imports 4 ton, 3hhd. 17gal. of Port wine—7 tons, 2hhd. 54gal. of Madeira—5 tons, 1hhd. 21gal. Teneriffe—and 3 tons, 6gal. Bourdeux. Required the quantity imported.

8. A Merchant has consigned to him £317 10s. 3d. worth of Cod-fish—Salmon worth £179 14s. 3d.—Shad £18 4s.—Haddock £87 18s. 11d.—Herrings £218 13s. 9d. What was the value of the whole consignment?

SIMPLE SUBTRACTION.

SIMPLE Subtraction teacheth to find the difference between any two numbers. The greater is called the minuend, the less the subtrahend.

RULE.

Place the subtrahend under the minuend, and subtract units from units, tens from tens, &c. When any figure of the subtrahend is greater than the corresponding one of the minuend, borrow ten, taking care to add one to the next figure of the subtrahend, for every ten so borrowed.

EXAMPLES.

```
  7846354          89276895
  3735123          78978109
  -------          
  4111231
  -------
  751.351
```

PROOF.—Add the difference and subtrahend together ; the sum will be equal to the minuend, when the work is right. . . . . . .

QUESTIONS.

1. How old is a man born in the year 1745, this present year ? Ans. 64 years.

2. William the Norman, conquered England in the year 1066—the revolution happened through the interposition of the Prince of Orange in 1688. How many years intervened ? Ans. 622.

3. Milton the poet died in the year 1674. How long has he been dead ? Ans. 135.

4. Borrowed of B. the sum of £1160—Paid at one time £270 ; at another time £198, and at a third payment £384. How much remains due ? Ans. £308.

5. I drew out from the bank at one time £168 ; at another £393 ; at a third £295 ; and at a fourth £376 ; and paid in at sundry times £1100. Required the balance. Ans. £132.

6. London contains 864,845 inhabitants and the 5 next largest Cities in Great Britain, as follows ; Manchester 84,020, Edinburgh 82,560, Liverpool 77,653, Glasgow 77,385, Bermingham 73,670. How much does the population of London exceed that of these five Cities ? Ans. 469,557.

7. The French Acre contains 36,774 English Square Feet, the English Acre contains 43,560 Square Feet Required the difference. Ans. 6786.

8. The population of Europe is estimated at 160,000,000, France proper contains 23,000,000, the Austrian States 27,300,000, Italy 16,250,000, Great Britain and Ireland 15,300,000, Spain 10,500,000, Holland 2,500,000, Russia 26,195,000. Required the population of the lesser States of Europe, when these are deducted.

COMPOUND SUBTRACTION.

RULE.

WRITE Denominations of the same kind under each other. Subtract the numbers in each Denomination, of

the Subtrahend from the corresponding figures in the
Minuend.—Borrow when necessary according to the val-
ue of the next higher place.—*Proof*, Add the Subtrahend
and remainder together : if their sums be equal to the
minuend, the work is right.

EXAMPLES.

	£.	s.	d.		£.	s.	d.
From	978	10	3½	*From*	7643	9	11¼
Take	849	11	9¾	*Take*	5984	7	6¾
	128	18	5¾		1659	2	4½
	£978	10	3½ *Proof.*		£7643	9	11¼ *Proof.*

QUESTIONS.

1. A Borrowed from his friend B £17 16s. 3d. and
paid him back sometime after £9 18s. 7s.—How much
is still due   Ans. £7 17s. 8d.

2. A Merchant upon examining his outstanding debts,
found that they amounted to £1000 8s. 9d. of this sum
he received at one time £108 14s. 4d. at another £112
10 6¾d. and at a third £258 8s. 5⅓d. What remains
due ?   Ans. £520 15s. 4¾d.

3. A Merchant has in Cash £165 12s. 3d. Goods val-
ue £1276 9s. 7½d. outstanding debts £850 18s. 9¼., He
owes A £100 6s. 8d. B £179 5s. 4d. C £169 16s. 10¾d.
—Required his neat stock.   Ans. £1443 13s. 9d.

4. Subtract 1 farthing from £100.

5. A Broker failing in business owes A £98 12s. 9d.
B £117 4s. 3d. C £23 5s. 11d. D £9 3s. 9½. E £43
17s. 10¾d. F £29 13s. 7d. He surrendered to his credi-
tors in Cash £33 19s. 1d. Flour to the value of £42 6s.
Household Furniture worth £57 12s. 8d. and recovera-
ble debts £19 2s. 5d. How much do his creditors lose
by him ?   Ans. £168 17s 4¼d.

6. A Curator of an estate receives from A £329 17s.
9½d. and from B. £217 5s. 4d. from C £381 15s. 4½d.
from D. £109 12s. 3d.—Out of which he paid to E £219
3s. 4¾d. and to F £119 4s. 3¾d. How much has he to
give to the heirs.   Ans. £700 3s. 0½d.

7. A Gentleman in Quebec goes to an Horse Race, where he gains a prize of 10 Guineas, lost by betting against A £29 11s. 4d. won of B £39 12s. 8d. lost to C £17 8s. 5d. recovered a debt from E £218 15s. 3d. and as he goes home he pays debts to the amount of £47 10s. 6d. and he carried home with him 200 Guineas. How much money had he when he set out ?

Ans. £25 11s. 4d.

8. B of Montreal accepts a Bill of a £1000 and upon examining his Cash he finds the amount £765 12s. 5d. two good Bills on London, one of £135 15s. the other of £79 4s. 3d. How much did he borrow to pay the acceptance?

Ans. £19 8s. 4.

9. A silver-smith purchases from A. 14lb. 10oz. 19dwt. 10gr.—from B. 17lbs. 11oz. 18dwt. 22gr.—and from C. 18lbs. 9oz. 14dwt. 21grs.—of which he makes up into spoons 7lb. 3oz. 19dwt. 23grs.—and into Indian orna-ments 19lbs. 4oz. 18dwt. 21grs. How much has he on hand ?   Ans. 24 11 14 9.

10. An apprentice is to serve till he is 21 years of age, who is now 16 years, 7mo. 25d. 17h. 45m. How long has he to serve ?   Ans. 4y. 4m. 4d. 6h. 15m.

11. A merchant receives 1 ton, 17cwt. 1qr. of sugar, and sold to A. 2½cwt.—to B. 3cwt. 1qr. 27lb.—to C. 11cwt. 3qr. 17lb. 8oz. What has he left ?

Ans. 19 7 11 8.

12. A merchant receives from one customer 36 bush. of wheat—from another 57 bush. 2pk.—from a third 129 bush. 3pk.—and from a fourth 213 bush—he sells to E. 27bush. 1pk. 1g.—to F. 118bush. 2pk. How much wheat is still on hand ?   Ans. 290b. 1pk. 1g.

13. A gentleman has one field of 27a. 1r. 17p. 19yd. —another of 19a. 3r. 5p.—a third of 35a. 2r. 5p. 30yd. —a fourth of 21a. 17p. 19yd. He makes a circular field where the corners of the four fields join, containing 43a. 1r. 15p. 27yd. How much ground is left ?

14. The earth revolves round the sun in 365 days, 5h. 49m. and, Venus in 224 days, 16h, 49m. 24seq. What is the difference of their periodical times ?

15. A merchant in Montreal receives 5 barrels of pot-ash—No. 1 weighs 4cwt. 2qr. 19lb. the weight of the barrel 28lbs.—No. 2, 3cwt. 3qr. 17lb. tare 19½.—No. 3, 4cwt. 1q. 24lbs. tare 1q. 3lb.—No. 5, 6cwt. 15lbs. tare 1q. 15lb. 4oz.—No. 6, 4cwt. 1q. 13lbs. tare 16½. Required the neat weight.

16. A farmer goes to town with a load of wheat, which he sells at £5, and he purchases 1½lb. of indigo for £1 7s. 4d. tea for 9s. 11½d. twenty bushels of salt at £1 11s. 4d. and 2 al. of rum for 17s. 8d.—he spends 3s. 9d. What money did he bring home?

17. Account of household expences :—

1808.		Received. £. s. d.	Paid. £. s. d.
Jan. 1st.	On hand　　··	4　6　8	
3d.	Paid for 3lbs. of tea, at 7/6		1　1　6
	For sugar, 1 loaf at 6½lb.		8　3
‚	For 3 cords of wood		1　17　6
10th.	Received　　··	12　4　7	
13th.	Paid the butcher　··		2　17　6
	Paid the baker　　··		1　5　4
16th.	Paid for an ax　··		12　6
	For a milk cow　··		4　0　3
21st.	Received　　··	7　19　4	
25th.	Paid the shoemaker		1　14　6
27th.	The brewer		1　1　3
28th.	1 barrel of pork		4　3　9
		24　10　7	19　2　4
		19　2　4	
31st.	On hand　·· ··	5　8　3	

18. A gentleman leaving town, gives his servant £456 12s. and desires him to pay his different accounts, and also to receive some debts owing him. The servant pays to A. £36 13s. 8d. to B. £108 12s. 9d.—he receives from X. £119 3s. 5d.—pays C. £203 9d. and to E. £5 13s.

2d. he receives from Y £319 4s. 7½d. from N £235 14s. 10d. and he pays to F £304 6s. 8d. to G £297 18s. 3d. How much money has the Servant left.

SIMPLE MULTIPLICATION.

MULTIPLICATION is a compendious method of addition. The number to be Multiplied is called the Multiplicand. The number by which you Multiply, the Multiplier ; and the number found, the Product. The Multiplier and Multiplicand are also called Factors.

R U L E.

PLACE the Multiplier under the Multiplicand, Units under Units, Tens under Tens, &c. Then Multiply the whole Multiplicand by each figure in the Multiplier successively always observing to place the first figure of each Product exactly under its respective Multiplier. The sum of these Products will be the answer.

Note.—Multiplication is best proved by Division.

D 2

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

EXAMPLES.

97865483765	7925437521
2	4

195730967530

372510498	42154669873
8	9

8104987652	698753461
11	12

27654398573	8654793271	9768452301
298	483	987

QUESTIONS.

1. How many Square Feet are contained in a floor that measures 36 feet by 22 ? Ans. 792 Feet.

2. How many letters in a book that consists of 12 volumes, each volume 472 pages, each page 45 lines & each line 40 letters. Ans. 10195200.

3. How many Grains of Wheat are there in 217 bushels, each bushels containing 675,000 grains ? Ans. 146475000.

4. The distance from Quebec to Montreal is 180 miles, supposing the road 17 yards broad — How many Square yards does it contain ? Ans. 5385600 yards.

5. How many times does the minute hand of a watch go round in 9 months ? Ans. 388800.

6. A general marching his army into the field, had 356 in rank and 89 in file. What was the number of men ? Ans. 31684.

7. A farmer has a field 156 yards long, and the breadth he divides into 297 drills, each a yard apart. How many bushels of corn will he have, supposing each hill to have four ears and each ear 256 grains ? Ans. 205 $\frac{11664}{18000}$.

8. How many balls does a fleet require consisting of 12 ships of 90 guns, 9 of 74, 8 of 64, to supply them with 156 round of shot ? • Ans. 352848.

9. An army consisting of 12574 are to be furnished for 7 months with 2lbs. of bread per day. How many pounds are necessary ? Ans. 47152 cwt. 2qr.

10. There is an army composed of 79 battalions, each consisting of 450 men. What is the number contained in all. ......

IF it be required to bring numbers from a higher to a lower denomination,

R U L E,

Multiply the given number by the next denomination, adding in the parts of that denomination, if any. Pro-

SIMPLE MULTIPLICATION.

l in the same manner with the next inferior denomina-
, till you bring the number as low as is required.

QUESTIONS.

. Reduce 9s. 11d. into farthings.
. In £1 how many shillings, pence, and farthings ?
. In £7343 how many farthings ?
. In £40 10s. how many pence and half-pence ?
. In 12s. 2½d. how many half-pence ?
. In 700 guineas how many sixpence and pence ?
. Reduce £475 12s. 11¾d. to farthings.

. . . .

TROY WEIGHT.

. In 6lbs. 10 oz. 5dwt. how many grains ?
. In 9 ingots of silver how many grains, each weigh-
2lb. 10 oz. 10dwt. ?

. . . .

APOTHECARIES WEIGHT.

0. In 7lbs. how many ounces, drams, scruples, and
ns ?
1. In 546lbs. 18gr. how many grains ?
2. In 14lb. 11oz. how many scruples ?

. . . .

AVOIRDUPOIS WEIGHT.

3. In 6cwt. 1qr. 18lbs. how many drams ?
4. In 30 tons, 18cwt. 2qr. 20lb. 12oz. 15dr. how
ny drams ?
5. How many pounds does a ship of 259 tons bur-
n carry ?

. . . . . .

6. In 17 acres of land, how many square feet ?
7. How many minutes and seconds in 27 years ?
8. The earth is 360 degrees in circumference, each
ree 69½ miles. How many barley-corns will it re-
re to measure round it ?

COMPOUND MULTIPLICATION.

• • • • • •

R U L E.

PLACE the Multiplier under the lowest denomination of the Multiplicand ; and if it do not exceed 12, multiply the several denominations, observing to carry according to the local value.

RULE 2.—When the multiplier exceeds 12, multiply by its component parts successively.

RULE 3.—When component parts cannot be obtained for the whole multiplier, multiply by the numbers whose product comes nearest the given multiplier, then by the difference, and the sum of the product is the answer.

EXAMPLES.

£. s. d.	£. s. d.	£. s. d.	£. s. d.
35 12 7¼	89 17 8¾	96 14 3½	79 3 11⅓
71 5 2½			

QUESTIONS.

1. What cost 2yds. of linen at 3s. 9¼d. per yard ?
   Ans. 7s. 6½d.
2. What cost 3 bush. of wheat at 4s. 9d. per bushel ?
   Ans. 14s. 3d.
3. What cost 9lb. of sugar at 7½d. per. pound ?
   Ans. 5s. 7½d.
4. What cost 14lbs. of tea at 5s. 4½ per pound ?
   Ans. £3 15s. 3d.
5. What cost 17lbs. of butter at 10¾d. per pound ?
   Ans. 15s. 2¾d.
6. What cost 27lbs of beef at 4¼d. per pound ?
   Ans. 9s. 6¾d.
7. If a moidore be worth £1 7s. what is the value of forty-six ?   Ans. £62 2s.
8. If a moidore be worth £1 10s. what is the value of 79 ?   Ans. £118 10s.
9. What will 29cwt. of cheese come to at £1 17s. 8d. per hundred ?   Ans. £54 12s. 4d.

D 2

0. What is the price of 56,000 nails at 1s. 10½d. per usand ?   Ans. £4 11s.

1. What will 21000 feet of plank come to at £2 2s. ?   Ans. £44 12s. 6d.

2. What will 345½ acres of land come to at 6s. 3d. acre ?   Aus. £107 19s. 4½.

3. If the toll of a mill be one day with another 7½ hels, how many bushels in a year, and what their ue at 5s. 9d. supposing 300 working days ?
    Ans. £646 17s. 8d.

4. How many tons in 296 barrels of flour, each 1cwt. ?   Ans. 25 ton, 18cwt.

5. What is the price of 3hhds. of wine, at 15s. 7d. gallon ?   Ans. £ 147 5 3.

6. A farmer has two servants hired at 2s. 9d. each day. What will their wages amount to in a year ?
    Ans. £ 100 7 6.

7. A gentleman has £750 a year, and spends £1 6s. per day. What does he save yearly ?
    Ans. £270 18 6.

8. How much will a mill grind in a year at 79bush. a day ?   Ans. 23925.

9. What is the price of 786bush of salt at 1s. 9¾d. ?
    Ans. £71 4s. 7¼d.

20. A quarter-master finds that the cloathing of one dier cost £4 17s. 6d. To what sum will the clothing a whole battalion of 756 men amount to ?
    Ans. £3685 10s.

21. A farmer has on his farm 259 bushels of wheat, rth 4s. 9½d. per bush.—197 bush. of pease, worth 3s. d.—341 bushels of Indian corn worth 3s. 1d.—and 17 of hay, worth £1 17s. 8d. per ton what is the value the produce of the farm ?   Ans. £182 9s. 5d.

22 A farmer sends to market 79cwt. of flour, which ls for £1 3s. 9d. per cwt. How much does the whole ount to ?   Ans. £93 16 3.

23. A merchant leased a house and shop for 19 years £89 17s. 6d. per annum ; 14 yeaas are now elapsed. quired the money paid, and likewise what is to pay.

24. 340 Soldiers are to have new coats, each coat to contain 3 ells, 3qr. 1 nail. How much cloth will serve ?
Ans. 1592yds. 1qr. 1na.

25. Government discharged 7145 sailors, each claiming 18 months pay. Required what sum will pay them off, allowing £1 7s. 8d. per month ?
Ans. £177910 10.

26. I bought 9hhd. of sugar, each weighing gross 7cwt. 1qr. 11lb. and am allowed deduction on each hogshead of 2qr. 13lb. What is the neat weight ?
Ans. 60cwt. 2qr. 10lb.

27. A merchant failing for £765, compounds with his creditors for 14s. 7d. per pound. What sum at that rate will clear his debt ? Ans. £557 16s. 3d.

28. How much sterling money shall I give for 27 French crowns at 4s. 6d. each ? Ans. £6 1s. 6d.

29. How much sterling money shall I give for 768 pisos at 3s. 2d. ? Ans. £121 10.

30. How much sterling money may I give for 278 millreas at 6s. 8d. each ? Ans. £92 13s. 4d.

31. A young gentleman coming of age, demanded the rental of his estate, which was delivered by his guardian, as follows :—I demand his yearly income, reduced to money—Wheat 5s. 3d. barley 3s. 11½d. pease 3s. 7¾d. oats 2s. 9d. per bushel.

FORM OF A RENTAL.

	MONEY.			WHEAT.			BARLEY.			PEASE.			OATS.		
	£.	s.	d.	qrs.	b.	p.	qrs.	b.	p.	qrs.	b.	p.	qrs.	b.	p.
A. pays	217	6	8	56	5	1	17	2	0	14	5	3	11	2	7
B. ..	318	12	9	47	2	0	19	3	2	16	4	0	0	0	0
C. ..	456	17	3	73	3	2	18	0	3	7	7	1	9	6	0
D. ..	231	18	11	30	4	8	13	0	3	6	1	3	7	5	2
E. ..	192	15	4	45	7	1	23	5	0	7	0	1	8	7	1
F. ..	276	1	3	27	3	2	17	4	3	18	7	0	9	1	3
G. ..	395	19	1	13	1	2	15	2	1	17	0	3	6	4	3
H. ..	567	0	3	0	0	0	17	3	2	18	0	3	8	5	1
	2656	11	6	294	3	3	151	6	2	106	1	2	62	0	3

34. What is the pay of 10 companies of 60 men each, at £1 6s. 8d. per month ?   Ans. £800.

35. What is the value of a piece of ground 23 yards broad and 19 long, at 4s. 9¾d. per square yard ?

36. A miller purchases 125 pine trees for £31 5s.—; each tree makes 6 logs, each log 16 boards, and each board is worth 5½d.   What is made by the purchase ?

37. What is the value of 19 boxes of soap, each containing 2½cwt. at 7¼d. per pound ?

. . . . . .

MULTIPLICATION is also applied to Mensuration, lineal, superficial, and solid.

To find the superficial content. Multiply the length by the breadth—in multiplying by the feet, place each product under the denomination of the multiplicand from which it arises, carrying when necessary by 12 to the next higher place. In multiplying by inches, set each product one place nearer to the right hand ; and in multiplying by the parts set each product another place towards the right hand.

EXAMPLES.

	I. P.			F. I. P.
Multiply	6 3		Multiply	4 2 5
By	3 2		By	3 2 9
	1 0 6			12 7 3
	18 9			8 4 10
				3 1 9 9
	19 9 6			13 6 9 7 9

QUESTIONS.

	ft. in.		ft. in.		
1. Multiply	4 5	by	3 6	Ans.	15 5 6
2. Multiply	5 6	by	4 3	Ans.	23 4 6
3. Multiply	6 6	by	3 8	Ans.	23 10
4. Multiply	24 3	by 16	7	Ans.	402 1 9
5. Multiply	48 7	by 36	6	Ans.	1773 3 6

<pre>
            ft. in.   ft. in.
</pre>

6. Multiply 6 4 3 by 4 3 7 Ans.   27 3 2 10 6

7. Multiply 56 1 4 by 48 3 6 Ans. 2709 8 4 8

8. Multiply 68 8 0 by 9 10 11 Ans. 680 5 7 4

9. In a board 12 feet long and 8 inches broad, how many square feet ?   Ans. 8 feet.

10. In a board 14 inches broad and 16 feet 6 inches long, how many square feet ?   Ans. 19 feet 3 in.

11. In a board or plank 15 feet 6 inches long and 10in. 6p. broad, how many square feet ?

Ans. 13f. 6in. 9p.

12. Required the content of a plank 20¾ feet long, 12½ inches broad ?   Ans. 21 7 4 6.

Note.—When the ends of the board or plank differ in breadth, add the two breadths and multiply the length by half the sum.

13. Required the content of a board 12 feet 9 inches long, the breath at one end being 15 inches and at the other 10 ?   ·   Ans. 13 3 4 6

14. There is a board 18½ feet long 17 inches breadth 5 at one end and 11 at another, required its content.

To find the Solid content Multiply the length, breadth and thickness together.

15. Required the solid content of a tree 16 feet long and 14 inches the side of the square ?   Ans. 21 9 4.

16. Required the solid content of a tree 14 feet long and 10½ inches the side of the Square ? Ans. 10 8 7 6.

17. What is the solid content of a tree 24 feet 6 inches long and 20 inches the side of the square ?

Ans. 68 feet 8 inches.

18. If a piece of timber be 18½ feet long 14 inches broad and 9 inches deep, what is the solid content ?

Ans. 16f. 2in. 3p.

19. What is the solid content of a piece of timber or stone whose sides are 10 inches by 18 and length 18 feet ?

Ans. 22 feet 6 inches.

20. What is the solid content of a piece of timber 15 feet 2 inches long, breadth 15 inches and depth 4½ inches ?
Ans. 7f. 1in. 9p. 4 6.

Note.—The usual way of measuring timber is, to gird the tree in the middle with a small cord, then $\frac{1}{4}$ of the girt is taken for the side of the square. Tapering timber is measured by girding it in two or more places and dividing the sum of the girts by their number for the mean girt.

21. What is the solid content of a round tree 25 feet long and girt in the middle 45 inches?

Ans. 21 11 8 9.

22. How much timber in a round tree 30 feet long and girt 12 inches. Ans. 22 11 7 6.

23. How many solid feet in a round tree 28 feet 6 inches long and the girt 48 inches, 42 and 36 inches.

Ans. 21 9 10 1 6.

24. How many solid feet in a mast 87 feet long and the girts 56 inches, 52, 45 and 44 inches.

This method of measuring round timber, though generally used, is not very accurate; as will be afterwards shewn.

SIMPLE DIVISION.

BY Division we discover how often one number is contained in another. The number to be divided is called the Dividend, the number by which you divide, the Divisor; and the number expressing how many times the Divisor is contained in the Dividend, the Quotient.

Rule 1.—Place the Divisor on the left hand of the Dividend, find how often it is contained in the fewest first figures possible. Place the figure expressing the number of times in the Quotient, multiply the Divisor by it; place this product under the figures assumed and subtract it from them, to the remainder annex the next figure in the Dividend and proceed as before.

Note.—If it be necessary to bring down more than one figure, a cypher must be placed in the Quotient, for every figure more than one.

Rule 2.—When there are cyphers annexed to the Divisor, cut them off, and cut off an equal number of figures from the Dividend, then divide the remaining figures as usual and to the remainder if any, annex the figures cut off.

EXAMPLES.

Divide 98765432976 by 9   Divide 87654297314 by 12

9)98765432976

10973936997 3
       9

98765432976 *Proof.*

Note.—Multiplication and Division prove each other.

QUESTIONS.

1. In 44 pieces of Russia Sheeting there are 2046 yds how many yards in each piece ?   Ans. 46½ yards.

2. A Legacy of £4842 is to be divided among 9 persons. Required the share of each ?   Ans. £538.

3. A Gentleman purchased a tract of land consisting of 4572 acres, which he wishes to divide into 18 Farms, required the number of acres in each ?   Ans. 254 acres.

4. Fifty-six Merchants join in an adventure to China, by which they gain £11200, required the share of each ?   Ans. £200.

5. A Township of land consisting of 64000 acres is to be divided among 1280 men, what will be the share of each ?   Ans. 50 acres.

6. A Club of 17 persons find their expences at the end of the year to be £289, how much must each pay ?

7. A General has 43554 Soldiers, now if he place 427 in the rank, how many in file ?   Ans. 102.

8. In 6132 gallons of Spirits, how many Puncheons ? |

9. England and Wales contain 9343578 Inhabitants and 49450 Square Miles, how many Inhabitants to a Square Mile ?   Ans. 188.

10. A party of soldiers 272 miles from head-quarters, are ordered to join in 16 days. How many miles must they march per day ?   Ans. 17.

11. A ship sails round the earth in one year, the circumference being 24932 miles. How many miles does she sail per hour ?

12. A farmer plants 175536 hills of Indian corn in 424 rows. Required the number of hills in each row.

COMPOUND DIVISION.

. . . . . .

R U L E.

WORK with the highest denomination as in Simple Division—Reduce the remainder to the next lower denomination, adding in the given number of that name—continue the division to the lowest denomination. But if the divisor be of different denominations, reduce both the divisor and dividend to the lowest denomination, and proceed as in simple division.

EXAMPLES.

£.	s.	d. £.	s.	d.		£.	s.	d. £.	s.	d.

4) 45 13 4 (11 8 4   13) 68 9 7½ (5 5 4½
   4   65
   ——   ——
   .5   3
   4   20
   ——   ——
   1   13) 69 (5
   20   65
   ——   ——
   4) 33 (8   4
   32   12
   ——   ——
   1   13) 55 (4
   12   52
   ——   ——
   4) 16 (4   3
   16   4
   ——   ——
                              13) 14 (1
                              13
                              ——
                              1

QUESTIONS.

			s. d.			Ans.		s.	d.
1.	Divide	£3	9 0	by	3	Ans.	£1	3	0
2.	Divide	£8	6 6	by	3		£2	15	6
3.	Divide	£17	3 0	by	6		£2	18	10
4.	Divide	£21	8 0	by	8		£2	13	6
5.	Divide	£271	1 2¼	by	9		£30	2	4¼
6.	Divide	£43	16 0½	by	10		£1	7	7¼
7.	Divide	£340	10 0	by	16		£21	5	7½
8.	Divide	£3590	12 6	by	53		£67	14	11½
9.	Divide	£1260	15 5	by	365		£3	9	1

10. Divide 690cwt. 2qrs. 16lbs. by 22 ?

Ans. 31cwt. 1qr. 16lbs.

11. If 4 yards of Linen cost £1 12s what will 1 yard cost ?   Ans. 8s.

12. If 18lbs. of Green Tea cost £4 9s. what will 1lb. cost ?   Ans. 5s. 6d.

13. If 17lbs. of Tobacco cost £1 5s. 6d. what is that per lb.   Ans. 1s. 6d.

14. If 13cwt. of Sugar cost £25 18s. 9d. what is that per cwt.   Ans. £1 19s. 10½d. ₁²/₁₃.

15. Divide 94lbs. 3oz. 6dwt. by 14 ?   Ans. 6lbs.

16. Divide 9lbs. 9oz. 3dr. by 4 ?

Ans. 2lbs. 5oz. 2dr. 2scr.

17. Divide 1080yds. 2qrs. 1nl. by 56 ?

Ans. 19yds. 1qr. 1nl. ₂/₅₆.

18 Divide 176ac. 3ro. 12po. by 5 ?

Ans. 35ac. 1 26 2 ³/₈.

19. I bought 48 gallons of Gin for £15, what was that per gallon ?   Ans. 6s. 8d.

20. If 58 yards of Cloth cost £3 12s. 6d. what is that per yard ?   Ans. 1s. 3d.

21. A Farm containing 256 acres of Land is let for £310, what is that per acre ?   Ans. £1 6s. 4d.

22. If a man spend £259 2s. 4d. in twelve months what is that per month ?   Ans. £21 8s. 6d. ₁⁴/₁₂.

23. A Prize of £8064 is to be divided among 896 sol-diers, what is the share of each ?   Ans. £9.

24. If 112qrs. of Wheat cost £126, what is that per qr.   Ans. £1 2s. 6d.

E

25. If 120 bushels of Wheat cost £40 10s. what is that per bushel ?　　　　　　　Ans. 6s. 9d.

26. A gentleman has £1121 4s. per year—how much is that per month, week and day ?　　Ans. £93 4s. 8d. per month, £21 11s. 3d. per week, £3 1s. 5d. per day.

27. A Gentleman divides £13 4s. among some poor people giving each 5s. 6d.—Required the number ?
　　　　　　　　　　　　　　　　Ans. 48.

28. The revenues of a Seminary amount to £2305 1s. How many Students will be maintained at £19 1s. each ?
　　　　　　　　　　　　　Ans. 121 Students.

29. How long must a Tradesman work, to pay a debt of £41 12s. 11d. who spends 1s. 3d. and gains 2s. 6d. per day.　　　　　　　　Ans. $666\frac{1}{3}$ day.

30. A B C freight a Ship, A loads $\frac{1}{3}$, B $\frac{1}{6}$ and C $\frac{4}{8}$ they pay for the freight £672 18s. what is the share of each ?
　　　　Ans. A £224 6s. B £112 3s. C £336 9s.

31. If the cloathing of an army of £19704 men cost Government £81338 4s. 2d. how much is that per man ?
　　　　　　　　　　　　　Ans. £4 2s. 6d.

Sometimes it is required to bring a less Denomination to a greater.

R U L E.

DIVIDE by as many of the less Denomination as make one of the greater, and thus proceed till you have brought it into the denomination required—the Quotient with the remainder if any will be the answer.

QUESTIONS.

1. In 912 farthings, how many shillings ? Ans. 19s.
2. In 8018 half pence, how many Pounds ?
　　　　　　　　　　Ans £16 14s. 1d.
3. In 84572 farthings, how many Guineas? Ans. 84.
4. In 3600 farthings, how many Crowns ? Ans. 15.
5. In 21728 farthings, how many Crowns, half Crowns, Sixpences and Pence, of each an equal number ?

6. In 39365 Grains, how many lb.
　　　　　　　Ans. 6lb. 5oz. 10dwt.

7. In 169040 Grains, how many Ingots weighing each 2lb.

8. In 51789 Scruples, how many lb.

Ans. 19lbs. 2oz. 1dr. 2scr.

9. In 183808drs. how many cwt. Avoirdupoise ?

Ans. 6cwt. 1qr. 18lbs.

10. In 13440lbs. how many Tons. Ans. 6 Tons.

11. In 12800nls. how many yds. Ans. 800yds.

12. In 1800nls. how many eßs ? Ans. 50 ells.

13. In 3936nls. how many pieces of Cloth 20½ yards long ? Ans. 12 pieces.

14. In 190080 barly corns how many yds.

Ans. 1760 yards.

15. In 1362240 inches, how many miles ?

Ans. 21½ miles.

16. How many barley corns will reach round the world which is 360 degrees, each degree 69½ miles ?

Ans. 4755801600 barley corns.

17. In 7560 poles, how many acres ? Ans. 41ac.

18. In 172425 yards, how many acres ?

Aus. 35ac. 2ro. 20po.

19. In 53766 gallons, how many bushels and quarters ?

Ans. 840qrs. 3p.—6720 bushels.

20. In 21507 pints, how many qrs.

Ans. 47qrs. 6p. 3g. 1. 3.

21. In 120 pints, how many gallons ?

Ans. 15 gallons.

22. In 4032qts. how many Tons ? Ans. 4 Tons.

23. In 6848qts. how many hogsheads ?

Ans. 13hhds. 37 gallons.

24. In 720 gallons, how many barrels. of Beer ?

Ans. 20 barrels.

25. In 9216 pints of Ale, how many hogsheads ?

Ans. 24 hogsheads.

26. In 1 year of 365 day 5 hours 49 minutes, how many seconds ?

Ans. 31556940 seconds.

AN EXERCISE ON THE FOREGOING RULES.

Pay of the British Army Established by Law, 1806.

COMMISSIONED OFFICERS.
Marching Regiments of Foot.

	£	s.	d.	
Lieutenant Colonel, - - - - -	0	17	0	per diem.
Major, - - - - - - - - -	0	16	0	
Captain, - - - - - - - -	0	10	6	
A Captain having superior rank,	0	2	0	addit. per
Lieutenant, - - - - - - -	0	6	6	[diem.
Quarter Master, - - - - - -	0	6	6	
Adjutant, - - - - - - - -	0	8	6	
Ensign, - - - - - - - - -	0	5	3	

NON COMMISSIONED OFFICERS AND PRIVATES.

	Dragoons.	Infantry of the line.
	s. d.	s. d.
Serjeant Major, - - - -	3 2 per diem.	2 6 per diem.
Serjeant, - - - - - -	2 2	1 10
Corporal, - - - - -	1 7½	1 4
Corporals after 10 years service, Dragoons, }	1 8½	
Do. after 17 years service, 1 9½		
Do. after 7 years service, Foot,		1 5
Do. after 14 years service, do.		1 6
Trumpeter, Drummer, Fifer, 1 7		1 1
Private, - - - - - - 1 3		1 0
Do. after 10 years service, 1 4		
Do. after 17 years service, 1 5		
Do. Infantry after 7 years service,		1 1
Do. Do. after 14 years service,		1 2

QUESTIONS.

1. Required how much money a pay-master of a battalion must have to discharge one month's pay of his regiment, consisisting of 750 rank and file, 18 sergeants,

24 corporals, 12 captains, 14 lieutenants, 8 ensigns, 2 majors, oue lieutenant colonel, one quarter-master, one adjutant, one surgeon having captain's pay, one serjeant-major and 12 drummers. Ans. £1743.

2. Required the pay of 16 battalions of equal strength with the one in the last question, for 12 months, allowing 30 days to the month. Ans. £334656.

3. Required the pay of the British army for 12 months, consisting of 198550 men, allowing one colonel, 2 lieut. colonels, 4 majors, 20 captains, 20 lieutenants, 20 ensigns, 2 sugeons, 2 adjutants, 2 quarter masters, 2 serjeant majors, 26 serjeants, 40 corporals, 24 drummers and fifers, for 1000 men. Note—A colonel's pay £1 2s. 6d. per diem. Ans. £6185959 13.

4. Received from on board the Quebec, 6hhds. of sugar, No. 1, containing 7cwt. 3qrs. 27lbs. tare 3qrs. 14lb. No. 2, 9cwt. 2qrs. 18lb. tare 1cwt. 6lb.—No. 3, 11cwt. 1qr. 21lb. tare 1cwt. 3qrs. 17lb.—No. 4, 8cwt. 1qr. 13lb. tare 2qrs. 1lb.—No. 5, 10cwt. 1qr. 5lb. tare 2qr. 11lb.—No. 6, 13cwt. 1qr. 11lb. tare 1cwt. 3qr. 26lb. Required the neat weight of the whole, and the price at 9½d. per lb. Ans. 54cwt. 20lb. price £240 3 10.

5. A merchant taking an account of his affairs, finds that he has in ready money £497 12s. 8d.—17 Puncheons of spirits, worth 5s. 9d. per gallon—16 Pieces of linen, worth £5 11s. each—3 Pipes red port wine, worth £15 18s. per pipe—2 Hhds. of tobacco, worth £37 10s.—He owes to A. £117 8s.—to B. £22 6s. 8d. Required his neat stock. Ans. £1569 19s.

6. A farmer left 756 acres, to be divided equally among his three sons. How much had each, and what was the value supposing an acre £29 11s. ?
Ans. 252 acres.—£25 10s. 0½d.

7. A gentleman purchased 27000 acres of wild land, at 1s. 3d. per acre ; and 20 years afterwards he left it to be equally divided among 5 sons and 1 daughter. Required the value of the legacy, the land being worth 9s. 4d. per acre. Ans. £2100 value to each.

8. A gentleman purchases an estate of 392ac. 2r. for £8212 10s.—What did he pay per acre ? He divides it

E 2

into 4 farms of equal extent ; the first is let at £1 2s. 6d. per acre ; the second at £1 1s. 6d. per acre ; the third at £1 3d. and the fourth at 19s. 6d. per acre. What is his annual income ?   Ans. He paid £21 per acre. }
£411 7s. 11½d. yearly income. }

9. A merchant purchases 384 bbls. of flour, for £695 4s. what did he pay per barrel ?   Ans. £1 16s. 2⅜d.

10. I purchased 566bbls. of pot-ash for £6254 6s.— 6 barrels make a ton.   What did I pay per ton ?
Ans. £66 6s.

11. A merchant purchases 750bush. of wheat at 6s. 9d. per bushel, which he sends to mill and receives in return 1 barrel of flour for every 5 bush. which he sold for £2 2s. 6d.   What did he gain ?   Ans. £65 17 6.

12. A baker receives 4 cwt. of flour to make into loaves of 6lb. each ; the flour increases ⅟₇ in weight in baking.   How many loaves ?   Ans. 85⅓.

13. A. has a garden 50 yards 2 feet long and 42½ yds. broad.   How much land does it contain ?
Ans 2153⅓ yards.

14. How many yards of carpeting 4ft. 6in. wide, will be sufficient for a room 27½ feet long and 19ft. 9in. broad ?
£40⅛ yds.

15. There is a canal 2½ miles long, 12½ feet broad, and 5 deep, cut out of the solid rock.   Required the number of yards excavated, and the solid feet of stone taken out ?   Solid yards 30555⁵⁄₉—Feet 825000.

16. A farmer has 84 acres of arable land, from which he reaps 264 bushels, of wheat, 146 bushels of oats, 360 bushels of pease, 579 bushels of Indian corn, 14 tons of hay.   He had 22 bushels of wheat per acre, 16 of oats, 18 of pease, 24 of Indian corn, and 2 tons of hay—and the remainder of his land was fallow.   How many acres ?
Ans. 11⅗.

17. A gentleman has a wedge of gold weighing 26lbs. 10 oz. 18dwts. 14grs. which he wishes to be coined into guineas and half guineas, of each an equal number.
Ans. 805.

18. There is £50 to be distributed among a certain number of old men and women, the men to have 7s. 6d.

each, and the women 5s.   Required the number of each.

19. Received from London 3 boxes of hats, each containing 4 dozen, at 9s. 3d.—5 pieces of broad cloth, 105 yards at 19s. 6d. per yard—freight and other charges £3 19s. 6d.   In what sum do the goods stand me, and what will be the price of 1 yard of cloth, if I put the whole at £139 10s. ?

BILLS OF PARCELS.

Mr. JAMES GORDON,

<div align="center">Bought of ANDERW YOUNG,</div>

June 5th,	3 Pair of worsted stocking at 4s. 6d.	£0	13 6
	13 Yds. of linen at 5s. 9d.	3	14 9
	3 do. superfine cloth at £1 11 6	4	14 6
	2 Dozen of buttons at 4s. 8d.	0	9 4
	2 Sticks of hair at 7½d.		1 3
	4 Skeins of silk at 6d.		2 0
	8 do. thread at 1d.		8

<div align="right">£9 16 0</div>

A STATIONER's BILL.

Mr. GEORGE DUGUID,

<div align="center">Bought of PETER WILSON,</div>

1799			
March 1,	10 Reams post-paper at £1 12	£16	0 0
	8 do. fool's-cap at £1 2 6	9	0 0
	12 do. printing demi at £1 4	14	8 0
	6 do. coarse wrapping at 6s. 3d.	1	17 6

<div align="right">£11 5 6</div>

A GROCER's BILL.

Mr. DANIEL REID,

<div align="center">Bought of JOHN FERGUSON,</div>

1808			
April 17,	18lbs. of white sugar at 1s. 9d.	£1	11 6
	28 do. brown do. at 9d.	1	1 0
	9 do. tea at 6s. 9d.	3	0 9
	4 do. tobacco at 11d.		3 8
	3 do. snuff at 1s. 7d.		4 9
	5 gallons of spirits at 9s. 6d.	2	7 6

<div align="right">£8 9 2</div>

BOOK DEDTS.

Mr. James Brown,

<div align="right">To Patrick Barron, Dr.</div>

808, Aug. 7.	To 24 bushels salt at 3s. 6d.	£4	4
	To 18 gallons of brandy at 7s. 8d.	6	18
	To 12 reams of paper at £1 3s.	13	16
	• : • • • •	£24	18

Cornwall, January 7, 1808.

Mr. William Grant,

1808.   To Samuel Carr, Dr.

Jan. 18.	To 7 waistcoat patterns at 9s. 11d.	£3 9	5
	To superfine broad cloth 7yds. at £1 2s.	7 14	0
	To hats, coarse, 1 doz. at 9s.	5 8	0
	To white cotton, 3 pieces, 96 yards, at 1s. 3d. - - -	6 0	0
July 23.	To Irish linen,4 pieces,77¼yds. at 4s.8.	18 0	6
	To common cloth, 2 do. 35 yards, at 16s. 6d. - -	28 17	6
	To spirits, 27 gallons, at 7s. 6d.	10 2	6
		79 11	11

Credit.

By Potash, 1 ton, -	53	0	0
To Balance due, -	26	11	11

Errors excepted,

<div align="right">SAMUEL CARR.</div>

. . . .

Mr. Prim,   To Peter Jameison, Dr.

1808.

Nov. 30.	To ribbons, 17 yards, at 7½d.	£0 10	7½
	To fine lace, 5¾ yards, at 8s. 7½d.	2 9	6½
	To fine calicoes, 9 yards, at 6s. 1½d.	2 15	1½
Dec. 7.	To coarse printed do. 11yards at 3s.4d.	1 16	8
	To lace, superfine, 3 yards at 17s. 8d.	2 13	0
		10 4	11½
1809, Jan. 11.	By Cash in full - -	10 4	11½

<div align="right">PETER JAMIESON.</div>

A FARMER's ACCOUNT.

Mr. James Roswele,

   To Benjamin Waggoner, Dr.

1808.

Dec. 18. To 28 lb. of butter at 10d.   £1 3 4

   To flour, 3 cwt. at 17s. 6d. 2 12 6

   To pork, 1 hog, wt. 250lb. at 4s. 4 3 4

   To hay, 2 tons at £2 1 6 4 3 0

             ———12 2 2

1809, Jan. 19. To butter, 1 tub, weight

   56lb. at 10½d. - 2 9 0

   To beef, 1qr. weight 105 at 3d. 1 6 3

            ——— 3 15 3

               15 17 5

Received payment in full January 23. 15 17 5

    BENJAMIN WAGGONER.

. . . .

A CARPENTERS BILL.

Mr. John Don,

   To Peter Wilson,

1808.   for Capenters work and Materials,

May 1. For 500 feet Plank at 6s. 6d. £1 12 6

   700 do. Boards at 4. 6 1 11 6

 5th. 600 Small Nails, at 11d.   5 6

   400 Large do. at 2s. 2d.   8 8

 22d. 18 day's work, at 7s. 6d. per day, 6 15 0

            £10 13 2

. . . .

A BLACKSMITH's BILL.

Mr. Dawson, To Jas. Cook,

   For Black-Smith's work and materials, Dr.

1808, June 1. To shoeing 2 horses round at 7/6 15s. 0d.

    To making a crane,   10 9

    To 16lb. of Iron, at 7½d. 10 0

           £1 15 9

Forms of Common NOTES of Hand, or Promissary Notes for Money.

. . . . . .

*£*200.   Montreal, Jan. 1st, 1809.

I PROMISE to pay to John Peters, or order, on demand, the sum of two hundred pounds sterling, for value received.   PETER WILSON.

. . . . . .

WHEN A CERTAIN TIME IS SPECIFIED.

Montreal, 1st Jan. 1809.

Three months after date, I promise to pay Mr. Solomon Hatfield, or order, the sum of twenty-four pounds ten shillings, Halifax currency, for value received.
*£*24 10.   WILLIAM MARR.

. . . . . .

A JOINT NOTE.

Montreal, 1st Jan. 1809.

We jointly and severally promise to pay Peter Robinson, esq. or order, five months after date, the sum of eighty-five pounds two shillings sterling, for value received.   JOHN GORDON.
*£*85 2s.   EDWARD PHILLIPS.

. . . . .

FORMS OF RECEIPTS.

Montreal, 1st Jan. 1809.

Received of Paul Errol, seventy-three pounds sterling, in full of all demands up to this date.

JAMES AITKIN.

. . . . . .

Montreal, 1st Jan. 1809.

Received of Stephen Millar, two hundred pounds twelve shillings, on account of Alexander Paterson, of Kingston.
*£*200 12s.   ANDREW MELVIL.

. . . . . .

AN ACQUITTANCE FOR RENT PAID.

Received this 1st day of January, 1809, of Richard Boyd, the sum of nine pounds sixteen shillings, currency, which with seven pounds laid out in fencing the farm, he now occupies in the township of Augusta, makes in the

whole sixteen pounds, and is in full of one years rent due me out of the said farm at Christmass day last.

JONATHAN JORDEN. ,

• • • • •

A Receipt for Interest.

Kingston, 3d January, 1809.

Received from Philip Jameison the sum of nine Pounds in full, for one year's Interest of one Hundred and Fifty Pounds, due me on the 1st instant £9 0 0.

DAVID WATSON.

• • • • • •

For a Legacy.

Cornwall, 7th January, 1809.

Received of Edward Philips Executor of the last Will and Testament of my Uncle James Petry, deceased the sum of one Hundred and Seventy-five Pounds in full of a Legacy bequeathed to me by the last Will and Testament of the said James Petry.

JOSEPH ANGUS.

• • • • • •

AN ACQUITTANCE TO BE INDORSED ON THE BACK OF THE DEED FOR THE PURCAASE MONEY ON EXECUTING A CONVEYANCE.

Received the day and year within written, the sum of One Hundred and Twenty Pounds of the within Allan Hodge, being the full consideration money within mentioned.

HENRY JACKSON.

A TABLE,

Containing the number of plants required to plant an **Acre** of English and Scotch and also the French Acre or Arpent, from 1 to 12 feet distance plant form plant.

Feet distance.	English Acre.	Scotch Acre.	French Arpent	Feet distance	English Acre.	Scotch Acre.	French Arpent.
1	43560	51760	36774	7	889	1117	750
1½	19360	24337	16341	7½	774	973	653
2	10890	13690	9193	8	680	855	574
2½	6969	8761	5883	8½	602	758	507
3	4840	6084	4086	9	537	676	454
3½	3556	4470	3001	9½	482	606	407
4	2722	3422	2298	10	435	547	367
4½	2151	2701	1816	10½	395	496	333
5	1742	2190	1470	11	360	452	303
5½	1440	1810	1212	11½	337	414	278
6	1210	1521	1021	12	302	380	355
6½	1031	1296	960				

A Farmer plants an acre of Potatoes, each hill 4 feet distant from another—how many hills has he? look in the table against 4 feet, the distance you have 2722.

A Farmer has a field of 16 acres French measure, planted with Indian Corn 5 feet asunder—how many hills of Corn? opposite 5 I find 1470, which Multiplied by 16 gives 23520, number required.

A Gentleman has 18 acres of barren ground which he wishes to plant with Fir trees at 12 feet distance—how many plants does he require & their price at 7¼d. per doz.

A Farmer clears a piece of Land which he plants with Turnips 4½ feet distant, he finds that he has planted 12906 hills—required the number of acres cleared.

S I M P L E   P R O P O R T I O N,

TEACHES to find a fourth from three given numbers, Of the given numbers, two are always of the same name and one of the same name with the number sought.

. . . . . .

GENERAL RULE.

Place that number for the second term which is of the same name with the number sought. Consider whether more or less be required by the question—If more, place the less of the two remaining terms for the first, and the greater for the third—But if less be required, place the greater for the first, and the less for the third. Multiply the second and third terms together, and divide the product by the first—The Quotient will be the Answer.

EXAMPLE.

If 9 yards of cloth cost £6 10s. what will 72 yards cost?

yds. £. s.
9 : 6 10 :: 72
20

130
72

260
910 20

9)9360(1040 (£52 Ans.
9 100

36 40
36 40

0

QUESTIONS.

1. If 6 yards of cloth cost 13s. 6d. what will 16 yards cost?
Ans. £1 16s.

2. If 16 do. cost £1 16s. what will 6 do. cost?
Ans. 13s. 6d.]

F .

3. If 9 yards of cloth cost £1 5 4, what will 20 yards cost ?   Ans. £2 16s. 3½d. ⅘

4. It 2½ yards cost 5s. what will 24¼ yards cost ?
Ans, £2 9s.

5. If 20 yards cost £2 16s. 3½d. ⅖, what will 9 yards cost ?   Ans. £1 5 4.

6. If 24½ yards cost £2 9s. what will 2½ cost ?
Ans. 5s.

7. If 2lbs. of sugar cost 1s. 9d. what will 1 cwt. cost ?
Ans. £4 18.

8. If 1 cwt. of do. cost £4 18s. what will 2lb. cost ?

9. If 3 oz. of tea cost 1s. ¾d. what will 24lbs. cost ?

11. Suppose I purchase 48 yards of coarse cloth for £17 8s. how many yards can I purchase for £1 9s. ?
Ans. 4 yards.

12. I have given £3 3s. for 72 feet of timber—how many feet shall I get for 15s. 9d. ?   Ans. 18 feet.

13. If 162lbs. of tobacco cost £8 18s. 10½d. how many pounds may be bought for £1 2s. 1d. ?
Ans. 20lbs.

14. If 3 oz. 10dwt. of silver plate cost £1 1s. 10½d. what will 54lb. 7 oz. 4dwt. 16grs. cost ?
Ans. £204 15 2½.

15. If 10 casks of raisins weighing each 5 cwt. 2 qrs. 18lb. cost £171 14s. 2d. how many pounds may be bought for 8s. 11¼d. ?   Ans. 16½ lbs.

16. If I purchase 9½ cwt. of flour for £9 3 6 how much will 117 barrels each containing 1 cwt. 3qr. cost me ?
Ans. £197 14 9 ₆/₉.

17. If I purchase 11½ yards of white cotton for 13s. 9d. what will 19 pieces cost, each containing 26½ yards ?
Ans. £30 2s. ³/₂₃.

18. A. has a raft of boards which he sold at £2 3 6 for every 103 boards, and received £649 4 for his raft. Required the number of boards.   Ans. 56908 ⁴⁷/₈₇.

19. A. has oak timber for which he gets 9s. 3d. for every 6½ feet—he received in all £1000. How many feet of timber had he ?   Ans. 14054 ²⁶/₃₇.

20. D. has 93 barrels of pot-ash, each weighing 4½ cwt.

—29lb. tare—and sells it for £2 12 6 per cwt. What is the value of the whole ? Ans. £1035 6 8.

21. What is the interest of £576 12 8 for one year at 6 per cent ? Ans. £34 11 11½.

22. I have insured goods to the amount of £3785 18s. from Quebec to London at 7½ guineas. What shall I pay the underwriters ? Ans. £298 2 9.

23. What length of a plank 8 inches broad will make a square foot, when it requires 12 inches of a board 1 foot broad ? Ans. 18 inches.

24. A bankrupt has effects to the value of £2820 12s. 3d. and debts to the amount of £22564 18. How much can he pay in the pound ?

25. What is the interest of 6579 pounds for 4 years, at 5 per cent ? Ans. £1315 16.

26. How many yards of carpeting 2 feet 6 inches broad, will cover a floor that is 28 feet long and 19 broad ?
Ans. 70yds. 3qr. $\frac{13}{17}$.

27. A plain of a certain extent supplied 6000 horse with forage for 21 days. How long would the same plain have supplied 2000 horse ? Ans. 63 days.

28. The governor of a besieged place having provisions for 48 days, at the rate of 1¾lb. of bread, but wishing to prolong the defence, in hopes of succour, to 80 days.— What must the ration be ? Ans. 1$\frac{1}{20}$.

29. A merchant purchases 162 pieces of Holland, for 270 pounds. How must he sell it per piece to gain 15 per cent ? Ans. £1 18 4.

30. A grocer bought 9cwt. of brown sugar for £31 14s. 8d. but finding it to be of a worse quality than expected, he is willing to loose 12½ per cent. How must he retail it per pound ? Ans. 9d.

31. If 6 men or 8 women cut down a field of wheat in 28 hours, how long will 1 man and 1 woman be in doing the same ? Ans. 96 hours.

32. How many yards of shalloon 3qrs. wide, will line 12yds. of cloth an ell wide ?

33. A merchant bought 4 tons of Madeira wine for 640 pounds—it leaked out 48 gallons. At what shall he sell it per gallon, so as to be no loser ? Ans. 13s. 4d.

34. A merchant bought 240 yards of broad cloth, & gave for it 162 pounds.   What was the price per eli English?
Ans. 16s. 10½.

35. What is the interest of 57 pounds for one year, at 4½ per cent ?   Ans. £2 11 3½.

36. How much cloth at ¾s. per ell ought to be given in barter for 6cwt. 3qr. of sugar at £3 2 6 per cwt. ?
Ans. 126 yards, 2qr. 1nl.

37. If a tailor can make a coat and vest with 3¾ yards of cloth which is 6 qrs. broad, how many yards will he require to make the same when the breadth is only three quarters ?   Ans. 7½ yards.

38. If an acre of land contains 16 perches in length and 10 in breadth, how many perches must there be in length when the breadth is only 3 perches ?
Ans 53⅓ perches.

39. If 53⅓ perches long and 3 broad are contained in an acre of land, what must the breadth be when the length is 20 perches.   Ans. 8.

40. A parcel of hay will keep 35 head of cattle six weeks.   How long will it keep 45 head ? Ans. 4 weeks.

41. Provisions are found in a garrison sufficient to last 520 men 8 months—but a reinforcement being wanted, how many additional soldiers may be received to make the provisions last 6 months ?

42. What weight will one man be able to raise who presses with the force of 1cwt. 2qr. on the end of an equipoised handspike 132 inches long, which meets with a prop at 12 inches from the end ?   Ans. 1848lb.

43. Required the length of the lever when a man pressing with the force 1cwt. 2qrs. raises 1848lbs. the prop being 12 inches from the other end of the lever ?
Ans. 132 inches.

44. A certain Turret's shadow was 144yds. 2 feet 2 inches, when my cane 3 feet 2 inches in length cast a shadow of 6 feet 3 inches.   What was the height of the Turret ?   Ans. 73 yards 11 inches $\frac{55}{75}$.

45. Suppose I sold goods to the value of £293 to be paid in a years time.   What is the discount at 4½ per cent ?   Ans. £12 12s. 4d. $\frac{280}{2000}$.

46. A Merchant bought 6cwt. 3qrs. of Cloves at the rate of 2s. 4d. per lb. & sold them for £105 8s. Whether did he lose or gain by the bargin and how much ?

Ans. Gained £17 4s.

47. A Merchant imports 16 bales of Cloth, each bale had 4 parcels and each parcel 10 pieces of 26 yards each. He paid £4 16s. for every 6 yards : what came the 16 bales to and what was the price per yard ?

They came to £13312—price 16s. per yard.

48. A Merchant bought 872 yards of broad Cloth at 8s. 6d. per yard and sold it again for 10s. 4d. What did he gain by the 872 yards ?   Ans. £79 18s. 8d.

49. A Goldsmith bought a wedge of Gold which weighed 14lbs. 3oz. 8dwt. for £514 4s. What did he pay per ounce ?   Ans. £3.

50. The sun performs an entire revolution or 360 degrees in the space of 365 days 5 hours 48 minutes and 57 seconds of time. How much does it move in one day ?

Ans 59′ 8″ 19‴.

51. I brought 5 pieces of Holland each containing 56 ells Flemish at 3s. 2d. and sold it out again by the ell English so as to gain £3 5s. 4d. What did I sell the ell English ?   Ans. 5s. 8d.

52. I bought, 96lbs. of Cloves for £58, but finding them damaged I sell them for 7¾d. per lb. How much did I lose ?   Ans. £8 8s.

53. I purchased 11 puncheons of spirit at 5s. 6d. At what shall I sell it to gain 25 per cent and how much shall I gain on the whole ?

Ans. gain £90 15—6s. 10½ per gallon.

54. I sold 35 acres 2 roods 12 poles of Land for 7s. 9d. per acre, which I bought at 4s. 9d. What do I gain per cent ?   Ans. £63 3/7.

55. I purchased 3cwt. of Leather at 1s. 8d. and gave it for 156 bushels of Wheat, which I sold for 5s. 6d. What did I gain ?   Ans £14 18s.

56. Bought for ready money 400½ yards of Flannel at 1s. 8d. per yards—54¼ yards of Shalloon at 1s. 6d.—20 cwt. of flour at 14s. 6½—10lbs. of Clover Seed at 8¼d.—

F 2

14 stones of Iron at 3s. 9½d. and 31 barrels of Herrings at £1 4s. 6d. Required the price of the whole ?

Ans. £96 19s. 9¾d. ½.

57. If £100 gain £6 in 12 months, what principal will gain the same in 5 months ? Ans. £240.

58. Shipped for Jamaica 300 barrels of flour, which sold for £3 1s. per barrel ; and I received in return Rum to the value of £476 and Sugar at 2s. 5d. Required the quantity of Sugar ? Ans. 195⅐ cwt.

59. Insured Goods in a Ship bound for Liverpool to the amount of £3876 12s. at 8 per cent—the Ship was wrecked and the goods damaged, so that they sold at ½ their value. What did the Underwriter lose ?

Ans. £1628 3s. 9½.

60. I purchase a House for £736 18s. 4. and expend in repairs £143 1s. 8d.—I then receive £94 10s. rent yearly. What to I get per cent for my money ?

Ans. £10 13s. 7d. 36/88.

COMPOUND PROPORTION

HAPPENS when several circumstances enter into the question, and accomplishes by one operation, what would need two or three by Simple Proportion.

. . . .

R U L E.

Put that number in the second or middle place which is of the same name with the number sought—Take two of the remaining terms of the same name and attending to the sense of the question, state them with the middle term as in Simple Proportion—If more be required place the less for the 1st and the greater for the 3d if less—place the greater for the first and the less for the third—Do the same with the other terms two and two—Then multiply the middle by the terms in the third place for a dividend ; and divide by the terms in the first place.

QUESTIONS.

If a family of 18 persons expend £24 in 8 weeks, how much will serve a family of 32 persons 16 weeks?

GENERAL STATING.

```
Persons.    £    Persons.
   18   :  24  ::   32
    8              16
  ----           ----
  144            192
                  32
                 ----
                 512
                  24
                 ----
                2048
                1024
                ----          £  s.  d.
           144)12288(85  6  8 Ans.
                1152
                 ----
                 768
                 720
                 ----
                  48
                  20
                 ----
            144)960(6
                864
                 ----
                  96
                  12
                 ----
           144)1152(8
                1152
                 ----
```

THE SAME BY TWO OPERATIONS.

```
Pr.      £      Pr.        w.      £  s. d.      w.
18  :   24  :: 32         8  :   42 13 4  ::  16
        32                        20
       ——                       ——--
        48                        853
        72                         12
       ——  £  s.  d.             ——-——
    18)768(42 13 4        :    :  10240
        72                         16
       ——-.                      ——-——
        48                        61440
        36                        10240
       ——                       ——-——
        12                    8)163840
        20                     ——-——
       ——--                  12)20480
    18)240(13                 ——-——
        18                2,0)170,6 8
       ——--                ——-——
        60                    £85  6  8 Ans.
        54
       ——
         6
        12
       ——
    18)72(4
        72
```

EXAMPLES.

1. If £100 in 12 months gain £6 interest, what will £75 gain in 9 months ?

$$£100 \ : \ 6m. \ :: \ £75 \ \} \text{ Ans. } £3 \text{ 7s. 6d.}$$
$$ \ 12 \ \ —— \ \ 9$$

2. If £100 in 12 months gain £6 interest, what principal will gain £3 7s. 6d. in 9 months ?

$$£6 \ : \ £100 \ :: \ £3 \text{ 7s. 6d.} \ \} \text{ Ans. } £75.$$
$$ \ 9 \ \ —— \ \ 12$$

3. If £100 gain £6 in 12 months, in what time will £75 gain £3 7s. 6d.   Ans. 9 months.

4. If the interest of £75 for 9 month be £3 7s. 6d. Required the rate per cent ?   Ans. £6.

5. If 6 horses in 14 days eat 7 bushels of oats, what quantity will serve 24 horses 52 weeks ?

Ans. 728 bushels.

6. A Lumber Merchant has 900 plank $2\frac{1}{2}$ inches thick and 14 feet long, how many boards are they equal to 12 feet long and $1\frac{1}{2}$ inch thick ?   Ans. 1750 boards.

7. If I pay £2 2s. for the carriage of 3 cwt. 150 miles —I demand how much I must pay for the carriage of 7cwt. 3qrs. 14lb. 50 miles at the same rate ?

Ans. £1 6s. 9d.

8. If I pay £4 for the labour of 8 men for 5 days, what will be the wages of 32 men for 24 days ?

Ans. £76 16.

9. If 4 horses plough $4\frac{1}{2}$ acres in $3\frac{1}{2}$ days when they work 8 hours a day—how many acres will 24 horses plough in 38 days when they work $10\frac{1}{2}$ hours per day ?

Ans 384 acres 3p.

10. If 16 masons build a wall 40 feet long and 14 high in 12 days, in how many days will 48 masons build a wall 400 feet long 4 thick and 16 feet high ?   Ans. 91days.

11. If 3 men in 16 days, when the day is 15 hours long, finish 18 poles of ditching—how many will 8 men finish in 4 days when the day is 9 hours long.

Ans. 7 $\frac{144}{720} \frac{1}{5}$.

12. If a family of 7 persons drink 32 gallons of Ale in 12 days, how many will a family of 14 persons drink in 3 days ? -   Ans. 42 gallons.

DISTRIBUTIVE PROPORTION.

RULE.

BY this rule, Merchants trading in Partnership ascertain their gain or loss in Proportion to their share of the joint Stock—Bankrupts estates are divided and legacies adjusted.

CASE 1.—When the Stock is employed for a certain time.—*Rule.* As the Stock is to the gain or loss, so is each man's particular share of the Stock to his particular share of the gain or loss.

CASE 2.

When the shares of the Stock are employed for different periods.—*Rule.* Multiply each man's Stock into the time of its continuance—then as the sum of all these Products is to the whole gain or loss so is each man's particular Product to his share of the gain or loss.

QUESTIONS.

Two Merchants A and B join in an Adventure—A puts in £250 and B £750 they gain £390. Required their respective shares ?

Here £250 + 750 = 1000 the whole Stock.
Then as £1000 : £390 : : £250 : £130 A's share.
And as   1000 : 390 : : 750 : 260 B's share.

£290 Proof.

A and B join Stock—A puts in £60 for 4 months—B £80 for 5 months, at the end of which they find £96 gained. How must it be divided ?

Here 60   80
       4   5

240 + 400 = 640
Then as £640 : 96 : : 240 : 36 A's share.
And as 640 : 96 : : 400 : 60 B's share.

96 Proof.

EXAMPLES.

1. Three Partners A. B. and C. are equally concerned —but B has £100 for management. What share will each receive of £1876 profit ?   Ans. £592.

2. A trading Company possess a Capitol of £89780 which is divided into 72 shares and yields 12 per cent. What Stock has B who possesses 5 shares and what amount of his dividend ?   Ans. share £6235.
Dividend of profit £748 4s.

3. A and B clear £160 by trading with a Capitol of £1000 of which A paid £650 and B £350. Required the share of each ? Ans. A £104, B £56.

4. A Bankrupt fails for £7200 and his effects are only worth £3400—A had given him Credit for £1200—B for £1400—C for £2000 and D for £2600. What is the share of each. Ans. A £566 13 4, B £661 2 2½ $\frac{48}{72}$, C £944 8 10½ $\frac{48}{72}$ and D £1227 15 6½ $\frac{48}{72}$.

5. Three partners, A. B. and C. join in an adventure. A. gave goods to the value of £1040—B. 2080—and C. 1699—They gained £800. What is the share of each ? Ans. A.'s £172 12 11¾—B.'s 345 5 11¾ C.'s 282 1 0½

6. A. B. C and D. ship for Portugal, goods to the value of £2400—A. had ⅛, B. ¼, C. ⅓, and D. the remainder—The ship was taken. What was the loss of each, after they had received £700 which had been insured ? Ans. A. loses £212—B. £425—C. £566 13 4 D. £495 16 8

7. Three merchants join in partnership—A. puts in £450 for 4 months—B. £170 for 8 months—and C. £800 for 5 months—they gain £533 14 6. What was each man's share.
Ans. A. gained £134—B. £101—C. £298.

8. Two merchants enter into partnership for 16 months. A. puts in at first £250, and at 8 months' end he puts in 80 more—B. put in at first £360—at 12 months' end took out 90—They gained £510. What is each man's share?
Ans. A.'s £235 13 11¼—B.'s £274 6 0¾.

9. A. and B. join in company—A. puts in £1250 on the 1st January ; but B. can advance nothing till the 1st May. What must B. then put in, to be entitled to an equal share of the profits at the year's end ?
Ans. £1888 10.

10. A company of soldiers plunder a village of money and effects to the value of £1000, which they agree to divide among them according to their rank and the time they have served. The officers and non-commissioned officers have served 6 months, and the soldiers 3—the officers have 40s. per month, the non-commissioned officers

30s. and the privates 22s.—moreover there are 4 officers, 12 non-commissioned officers, and 100 soldiers. What was the share of each?

Answer.   Each officer's share   £25 2 5 $\frac{94}{177}$.
Non-commissioned officer 17 6 9$\frac{3}{4}$ $\frac{69}{173}$.
Each soldier   6 7 2 $\frac{8}{177}$.

11. A privateer takes a prize worth £4000—required to divide the sum among — captains, 3 lieutenants, 1 surgeon, 8 warrant officers, and 120 men—giving the captain 24 shares, the lieutenants and surgeon 12 shares each, and the warrant officers 3 shares each.

Answer.   A sailor's share   £14 5 .8$\frac{18}{21}$
Warrant officer's   42 17 1$\frac{11}{21}$
Lieutenant   174 8 6$\frac{12}{4}$
Captain   342 17 1$\frac{18}{21}$

PRACTICE

IS so called from its extensive use in business.

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TABLE.

Of a shilling.		Of a pound.		Of a cwt.	
d.	*s.*	*s.*	*£.*	*lbs.*	*cwt.*
1 is	$\frac{1}{12}$	1 is	$\frac{1}{20}$	56 is	$\frac{1}{2}$
1$\frac{1}{2}$ =	$\frac{1}{8}$	1 8 =	$\frac{1}{12}$	28 =	$\frac{1}{4}$
2 =	$\frac{1}{6}$	2 0 =	$\frac{1}{10}$	16 =	$\frac{1}{7}$
3 =	$\frac{1}{4}$	2 6 =	$\frac{1}{8}$	14 =	$\frac{1}{8}$
4 =	$\frac{1}{3}$	3 4 =	$\frac{1}{6}$		
6 =	$\frac{1}{2}$	4 0 =	$\frac{1}{5}$	*lbs.*	*qrs.*
		5 0 =	$\frac{1}{4}$	14 =	$\frac{1}{2}$
		6 8 =	$\frac{1}{3}$	7 =	$\frac{1}{4}$
		10 0 =	$\frac{1}{2}$	4 =	$\frac{1}{7}$
				3$\frac{1}{2}$ =	$\frac{1}{8}$

RULE 1st.—When the price is any of the Aliquot parts found in the Table of Money—divide by that part and the Quotient will be the Answer in pounds, shillings or pence.

QUESTIONS.

1. **What** is the price of 4526 } yards of Bobbin, at ¼d. ?　Ans. £4 14 3½

2.	••	••	2263 at ¼d.	••	4	14	3½
3.	••	••	5621 •• 1d.	••	23	8	5
4.	••	••	325 •• 1½d.	••	4	0	7½
5.	••	••	868 •• 2d.	••	7	4	8
6.	••	••	969 •• 3d.	••	12	2	3
7.	••	••	4898 •• 4d.	••	81	12	8
8.	••	••	3643 •• 6d.	••	91	1	6
9.	••	••	6436 •• 8d.	•• 213	10	8
10.	••	••	878 •• 1s.	•• 43	8	0
11.	••	••	3684 •• 1s. 8.	•• 357	0	0
12.	••	••	7986 •• 2s.	•• 798	12	0
13.	••	••	979 •• 3s. 4d.	•• 163	3	4
14.	••	••	4897 •• 4s.	•• 979	8	0
15.	••	••	2368 •• 5s.	•• 592	0	0
16.	••	••	4893 •• 6s. 8d.	•• 1631	0	0
17.	••	••	2143 •• 10s.	•• 1071	10	0

RULE 2.—When the price is not an aliquot part, divide it into aliquot parts, and the sum of their several quotients will be the answer required.

1. What is the price of 1241 dozen of lemons at 5d. ?
　　　　　　　　　　　　　Ans. £25 17 1.

2.	123 pairs of buckles at 7d.	3	11	9.
3.	842 lbs. of sugar at 9d.	31	11	6.
4.	1212 lbs. of saltpetre at 10d.	50	10	
5.	896 doz. of buttons at 11s.	41	1	4.
6.	842 lbs. of candles at 3s.	126	6	
7.	543 worsted stockings at 6s.	162	18	
8.	9768 pairs of silk gloves at 7s.	3418	16	
9.	412 gallons of oil at 8s.	164	16	
10.	789 yards of cassimere at 9s.	305	1	
11.	891 yards of lace at 11s.	490	1	
12.	401 yards of paduasoy at 12s.	240	12	
13.	486 yards of cloth at 13s.	315	18	
14.	986 doz. of Port wine at 14s.	640	4	
15.	487 qrs. of barley at 15s.	365	5	
16.	216 firkins of butter at 16s.	172	16	
17.	586 cheeses at 17s.	498	2	

G

18. 797 yards of cloth at 18s.   Ans. £712 6

19. 482 yards of scarlet cassimere at 19s.   457 18

RULE 3.—When there are pounds in the price, multiply the given quantity by the pounds, and take parts for the shillings, pence, and farthings, as directed by the two last rules.

1. What will 206 cwt. of sugar come to at £3 13 2 ?   Ans. £753 12 4.

2. What will 244 hhds. of molasses come to at 5 12 6 ?   Ans. £1372 10.

3. What will 321 pieces of linen come to at 3 15 per piece ?   Ans. £1203 15.

4. What will 146 hhds. of tobacco come to at 5 16 ?   Ans. £777 15 1.

5. What will 412 cwt. of potash come to at 4 16 ?   Ans. £1977 12.

RULE 4.—When the price consists of an even number of shillings, multiply the quantity by half the number, double the first figure for shillings; the rest are pounds—or multiply by the shillings and divide by 20.

1. What will 241 ells of cloth come to at 8s. per ell ?   Ans. £96 8.

2. What will 196 gallons of vinegar come to at 4s. per gallon ?   Ans. £39 4.

3. What will 492 lbs. of tea come to at 12s. per lb. ?   Ans. £295 4.

4. What will 750 pair of stockings come to at 14s. per pair ?   Ans. £525.

5, What will 484 doz. of wine come to at 34s. per doz. ?   Ans. £411 8.

RULE 5.—Should the given quantity consist of several denominations, value the whole number by the former rules, and take parts of the given price for the odd weight or measure.

1. What will 75 cwt. 3qrs. 14lbs. of tobacco come to at £6 16 per cwt. ?   Ans. £515 19.

2. What will be the freight of 542 tons 15cwt. from London to Quebec, at £3 8 2¼ ?   Ans. £1580 8 9²⁴⁄₄₄.

3. What will 12lb. 10 oz. 15dwt. 12gr. of silver plate come to at £3 6 ?   Ans. £42 11 3¾.

4. What will 36cwt. 1qr. 24½lbs. of refined sugar come to at £3 8 ?   Ans. £123 19 8½.

Several other concise methods may be added for the exercise of students.

If the number of articles be 20, each shilling of the price makes a pound of the amount.

If the numb r be 12, each penny of the price makes a shilling of the amount.

If 240, each penny of the price makes a pound of the amount.

If 120, each penny makes 10s.

If 480, each half-penny makes a pound.

If 960, each farthing makes a pound, &c.

The expert accountant will frequently discover methods of working particular questions with great facility, which can be reduced to no general rule.

RULE 6.—When the given quantity is feet, inches, &c. multiply the length by the number of feet in the breadth, and take the aliquot part for the inches—add them together for the answer.

1. What is the product of 16ft. 8in. by 5ft. 3in. ?
         Ans. 87ft. 6in.

2. What is the product of 8ft. 5in. by 6ft. 3in. ?
         Ans. 52ft. 7in. 3.

3. What is the superficial content of a plank 18ft. 6in. by 1ft. 2in. ?   Ans. 21ft. 7in.

4. If a room be 45 feet 6 inches long, 38ft. 7in. broad, what is its area in square feet ?   Ans. 1755ft. 6in. 6.

5. How many square yards of painting are contained in a room that measures 80ft. 6in. in circumference and 9ft. 3in. in heighth ?   Ans. 82yds. 6ft. 7in. 6.

6. How many solid feet in an oak raft containing 40 pieces of 1 ft. 6in. broad, 1ft. 3in. thick, and 16ft. 3in. long ?   Ans. 1219 feet 9 inches.

7. If a window be 3ft. 8in. 9 in heighth, and 1ft. 4in. 6p. how many square feet of glass ?
         Ans. 5ft. 1in. 6p. 4.

TARE & TRET,
OR
DEDUCTIONS ON WEIGHTS.

GROSS weight is the whole weight of any commodity with the box, barrel, or package which contains it.

Tare is the allowance made for the weight of the package.

Tret is an allowance of 4lbs. for every 104lbs. for waste.

Cloff is an allowance after Tare and Tret are deducted of 2lbs. on every 3cwt.

Suttle is when only part of the allowance is deducted from the Gross.

Neat weight is what remains after all deductions are made.

RULE 1.

To find the Tare.—When the Tare is at so much per cwt. take aliquot parts of 112lbs. but when so much per cent. take aliquot parts of 100lbs.

RULE 2.

To find the Tret.—Divide the Suttle by 26, the Quotient is the Tret.

RULE 3.

To find the Cloff.—Multiply the hundred weights by 2 and divide by 3 or divide by 168 and the Quotient is the Cloff.

EXAMPLE.

1. In 29 bags of Hops containing gross 88cwt. 1qr. 19lb.—tare 4lbs. per cwt. How many cwt. neat?

cwt.	qrs.	lbs.		cwt.	qrs.	lbs.
88	1	19		88	1	19
3	0	17				4
85	1	2		112)353	2	19(3
				336		
				17		

2. In 7 bags of Cotton, each containing 2½cwt—tare 7lbs. per bag. How many pounds neat?

                 Ans. 1911lbs.

3. Required the neat weight of 730cwt. 2qrs. 18lbs. gross—tare 24lbs. per cwt. and tret 4lbs. per 104lbs.
                              Ans. 551cwt. 3qrs 26ibs. $\frac{3}{26}$.

4. What is the neat weight of 6 hogsheads of Tobacco weighing 95cwt. 2qrs. 8lbs. gross—tare 7lbs. per cwt. —tret 4lbs. per 104lbs. and cloff 2lbs. per 3 cwt.
                              Ans. 85cwt. 2qrs. 17lbs.

5. What is the neat weight of a puncheon of Prunes gross 6cwt. 2qrs. 24lbs.—tare 14ibs. per cwt.—tret as usual ?   Ans. 5cwt. 2qrs. 16ibs. $\frac{2}{13}$.

6. Suppose a Merchant buys 12 hogsheads of Tobacco, each weighing 9cwt. 1qrs. 14lbs. gross—tare 21lbs. per cwt.—tret as usual.   How much neat ?
                              Ans. 87cwt. 3qrs. 15$\frac{3}{4}$lbs.

7. In 8 bags of Cotton Yarn, each weighing 4cwt. 2 qrs. 14lbs. gross—tare 24lbs. per cwt.—tret as usual. How much neat weight ?   Ans. 27cwt. 2qrs. 8lbs. $\frac{6}{13}$.

8. In 28 barrels of Indigo, each weighing 2cwt. 3qrs. 14lbs. gross—tare 24$\frac{1}{2}$ibs. per cwt.—tret 4lbs. per 104 as usual.   How much neat weight ?
                              Ans. 60cwt. 1qrs. 24$\frac{3}{4}$lbs. $\frac{9}{26}$.

9. What is the neat weight of 32cwt. 3qrs. 12lbs. gross—tare 14lbs. per cwt. tret 4lbs. per 104 and Cloff 2lbs. per 3 cwt.   Ans. 27cwt. 1qrs. 25lbs. 13oz.

10. What is the neat weight of 64cwt. 3qrs. gross— tare 8lbs. per cwt.—tret and Cloff as usual ?
                              Ans. 56cwt. 1qrs. 24lbs. 7$\frac{1}{3}$ over.

11. In 36 chests of Sugar, each weighing 12cwt. 1qrs. 16lbs. gross—tare 21lbs. per cwt.—tret and cloff as usual.   How much neat weight ?
                              Ans. 346cwt. 1qrs. 25lbs. $\frac{15}{26}$.

12. A Merchant buys 6 hogsheads of Tobacco, each containing 9cwt. 1qrs. 14lbs. gross—tare 3qrs. 18lbs. per hogshead—tare and Cloff as usual.   How much neat weight ?   Ans. 48cwt. 2qrs. 4lbs. 12 over.

QUESTIONS.

1. A Company undertake to bring water to a town from the distance of 4⅝ miles, in wooden pipes—expence of pipes together with carrying and laying 2s. 9d. per foot, Cisterns and other charges £379 15s. 6d.—After the pipes are compleated, owing to the negligence of the undertaker, they burst by the frost, expence of repairing and deepening the pipes 10½d. per foot—thirty two families take the water into their houses at £6 0s. 1¼d. per annum. What per cent have the company for their money and what would they have got had the undertaker done his duty ?   Ans. 4 per cent. ⎫,
£5⁵⁄₇ had the undertaker done his duty. ⎬,

2. Ruquired the expence of Painting a House 44 feet long, 19 feet high and 36 wide, taking the Area of the Triangular Gable end to be equal to ½, the width multiplied by the height—the roof is 25 feet 6 inches to the eves, at 7½d. per square yard ?   Ans. £19 9s. 4⅞d.

3. A Farmer sows 4 acres with Hemp—expence of Seed £2 11s.—ploughing 3 time £6 15s.—weeding £3 12s.—pulling £3 18s.—expence of curing it £9 13s. 4d.—there being no mill he gets it manufactured by the hand at 12s. 6d. per cwt. He has 2 Tons of Merchantable Hemp and ½ a Ton of a second quality, he sells the best at £56 per Ton and the half Ton at £13 18s. If we allow him £2 5s. for the rent of his land, what does he gain ?   Ans. £59 3s. 8d. gain.

4. Suppose the Farmer had sown Wheat and received 30 bushels per acre in return—seed £1—ploughing and sowing £1 10s.—harvesting £1 12s. 6d.—threshing every twelfth bushel, sent the Wheat to mill and received for every 5 bushel 1cwt. 3qrs. which was sold at £1 per cwt. Which the more profitable method of planting the ground allowing the same rent as before ?

Gained by Wheat £23 12s. 6d.
by Hemp   59 3 8
Balance in favour of Hemp 35 11 2

5. Bought a quantity of Tea at 4s 6 and sold it at 5s. 3d. What did I gain per cent ?   Ans. £16 13s. 6d.

6. Bought a Gold Repeater for 50 Guineas and sold it for £50. What did I lose? Ans. £4 $\frac{16}{21}$.

7. If I buy Linen at 5s. per yard. What will I gain per cent if I sell it at 6s. 6d. Ans. £30.

8. Sold broad Cloth at 18s. per yard, by which I gained 13½ per cent. Required the prime cost? Ans. 15s. 10¼d.

9. At 2s. 6d. in the pound profit, what is gained per cent? Ans. £12 10s.

10. What quantity of Tea at 8s. per pound must I give in barter for 4cwt. of Coffee at 2s. Ans. 112lbs.

11. A delivered 504 yards of Cloth to B at 5s. per yard for 6 hogsheads of Wine. What was the Wine per gallon? Ans. 6s. 8d.

12. A hath cloth at 8s. 4d. per yard, ready money but in barter he will have 10s. per yard—B hath Shaloon at 20d. per yard, ready money. How must he rate his Shaloon to be no loser in bartering with A? Ans. 2s. per yard.

13. Bought 7 hogsheads of Spirits at 5s. 9d. per gallon, but discovering that 7½ gallons had leaked out of each hogshead—I am willing to sell the whole for what it cost me. How much will that come to per gallon? Ans. 6s. 6¼d. $\frac{33}{111}$.

14. At what shall I purchase 3 cwt. of Cochineal—when 17lbs. cost me £23 12s. 3d. Ans. £466 13s. 10d.

15. A Merchant purchases 3 pipes of Madeira Wine for £287 12s. 8d.—but finding it of a worse quality than he expected he is willing to lose £56 19s. in the purchase. At what shall he sell it per gallon? Ans. 12s. 9¾d.

16. What shall I pay for 3 puncheons of Rum, when 2½ puncheons cost £93 6s. 8d. Ans. £112.

17. What shall I pay for 57yds. of Holland, when 17 English Ells cost £3 12s. 9d. Ans. £68 11s. 11¼d.

18. A Merchant purchases a bale of Linen consisting of 27 pieces each piece 24½ yards at 4s. 6d. per yard—but upon inspection he finds 7 pieces damaged, at what price shall he sell the rest so as to be no loser?

19. A Merchant bought 178 Flemish Ells of Cambric at £1 17s. 6d.—at what shall he sell it per yard to gain 29 per cent ?   Ans. £3 4s. 6d.

20. A Merchant can purchase 57 hogsheads of Wine at 9s. ½d. per gallon, for which after keeping it a year he may get 11s. 6d. or he may get 10½ per cent by purchasing Stock.   Which is more profitable ?

Ans. gain by Wine £389 0s. 6d.—}
Do. by Stock £175 19s. 2d. }

21. A Manufacturer purchases 3cwt of Cotton at 3s. 9d. and he paid for Manufacturing it into Cloth 3½ yards for each lb. of Cotton 4s. 7d. and sold the Cloth at 2s. 7d. per yard.   What did he gain ?

Ans. £12 8s.

22. A Merchant purchases £478 16s. worth of goods which he exchanges for broad Cloth at 19s. per yard—he sells the broad Cloth for £605 12s.   What quantity of Cloth had he and what did he gain per cent ?

Ans. 504 yds.—£26½ nearly gain per cent.

23. A Manufacturer purchases 365 spindles of Yarn at 3s. 3d. per spindle, which he may have bleached for 3d per spindle—when it will bring him in a profit of 26½ per cent or he may get it made into Linen for 7½d per yd. the whole number of yards will be 497½ and the expences of bleaching 2½d. per yard—the Linen he can sell for 4s. 4½d. per yard.   Which way is the more profitable ?

Gain by making Linen £28 15 8¾.
Do. by selling Yarn   16 18 6¼.
_____
Balance in favour of Linen   11 17 2½.

24. A Farmer has a field of 10 Acres of Land which he may sow with Wheat or Indian Corn.—The ploughing he values at 3½ dollars an acre—if he sows Wheat the seed 1½ bushels per acre valued at 1 dollar per bushel—reaping 1/10 bushel—threshing 1/10 Bushel.   He expects to get 20 bushels worth 4s. 9d. per bushel.   If he plants Corn the plowing and sowing will cost 2 dollars and the seed 1 bushel per acre, worth 3s. 10d. and the expence of reaping and husking 1/12 bushels each, he will have 30

bushels per acre, worth 3s 7d.   Which crop is the more profitable ?   Gain by Corn £37 17 6.
                                  by Wheat 26 2 6.

——————
                Balance in favour of Corn 11 15 0.

25. A Merchant purchases a parcel of goods for £376 12s. 8d.—which he exchanges for 6½ Tons Potash.   He ships the Potash for London and pays freight £9 17s. 6d. per ton—he has no returns before 12 months when he gets £84 12s. per ton.   I demand what he got per cent deducting 6 per cent because the transaction continued one year ?   Ans. £18 14s. 10¾d.

26. A London Merchant gives his son £576 for an adventure, the young man purchases goods for the Canada market—he receives at the Custom-house as much draw back as paid the freight to Quebec.   His Personal ex-pence £57, the goods he exchanges for Staves at £29 11s. 8d. Hallifax—having first put on an advance of 33⅓ on the real cost of Landing them at Quebec—his Staves cost him £63 5s. per 1000 to bring them to London incident-al expences £2 10s. per thousand—he gets a broker to sell them for £126 Sterling per thousand.   I demand what he made by his adventure allowing the broker 2½ per cent ?   Gain £678 7s. 6¼d. Sterling.

27. A Lumber Merchant contracts to deliver 207 Masts at Quebec for £40 Halifax Currency—the Masts to be 90 feet long and of sufficient thickness, the Merchant hires 24 men at 1 dollar per day for 3 months and an overseer at 2½ dollars per day—their provisions and tools cost him 1s. 6d. for each per day--he gets the Masts drawn to the bank of the river for £5 17s. 6d. each—expences of raft-ing every 15 £29 16s. 8d.—he allows 4 men for every 15 at the above wages and provisions, they are 9 weeks on their way to Quebec and cost him for incidental ex-pences 7½ dollars per Mast, when they arrive at Quebec 1 Mast out of every 9 is rejected.   I demand what the Merchant gains by his contract ?
                        Gained £3448 16s. 7¾d.

28. A Manufacturer purchases £397 Halifax Curren-cy worth of Goods, which he carries to the distance of·

217 miles into the country at an expence of £19·17s. Halifax—here he puts an advance of £75 per cent on his goods and exchanges them for Ashes at 5d. in goods per bushels.—He builds a House to store his Ashes for £9 11s. 3d.—he purchases two Kettles for £30 each, 6 Coolers at 5s. 6d. each, his Ash Vats cost £7 12s.—the Mason charges for fixing his Kettles £12 14s.—he finds that it requires 600 bushels of Ashes to make a Ton of Potash, the expence of Manufacturing it £5 2s. 6d. He carries the Potash, when made, to market at £4 3s. per ton and he gets £48 10s. Halifax per ton. What does he gain or lose ? Gain £1668 12s. 6d.

29. Supposing the same expences as in the last, the Manufacturer is obliged to purchase Ashes for cash at the rate of 7½d. per bushel. What will his gain be on the same quantity of Ashes at the same price per ton ?

Ans. £1013 7s.

30. A black Smith purchases 2cwt. of Iron at 6½d. per lb. which he may make into horse shoes of 9½ oz. each, which will be worth 15d. per shoe ; but in working them he looses ⅙ of the iron—or he may make it into 20,000 nails worth 15½d. per 100, but he will be 3 days longer making the nails than the shoes, and he values a day's work at 7s. 6d. ; the loss of iron the same as in making the shoes. Which is the more profitable way ?

Gained by the shoes £14 17 5
By the nails . £5 14 6

Balance in favor of the shoes, £9 2 11

31. A merchant purchases 2176 barrels of flour at 6½ dollars per barrel, which he ships for Jamaica for £750 Halifax currency, attended by a supercargo who is to receive £35 per month—upon inspecting the flour at Jamaica every 11th barrel was found sour ; the remainder was exchanged for spirits worth 4s. 3d. per gallon, Jamaica currency, exchange £50 per cent, and the freight of the spirits to Quebec was 3d. per gallon Halifax currency : the voyage was performed in 4½ months—What was the gain, supposing the spirits worth 4s. 3d. per gallon, Halifax currency ? Ans. £94 13 6.

32. Sent an adventure to Charlestown of £2788 12s. and insured to cover the property at 8½ guineas—received in return 6½ tons of cotton worth 4s. 2d. per pound; freight out and home £218 12 8—What did I gain or lose by the adventure?   Lost £247 3 5¼.

33. A merchant purchases 3 hhds. of sugar, each weigh. ing 14cwt. at £3 12 6 per cwt. which he ships for Hamburgh at 3s. 6d. per cwt. freight, insurance to cover the property at 4½ per cent.—his agent in Hamburgh sells the whole for £397 Flemish. What does the merchant gain?—one pound sterling being equal to 34s. 4d. Flem. ish.   Ans. £64 9 9.

34. A. goes with £476 worth of goods from London' to Barbadoes—he insures for 12½ guineas—at Barbadoes he sells his goods at £120 advance; exchange at 55 per cent—he then purchases rum at 1s. 9d. per gallon, and returns to London, where he sells the rum for 4s. 8d.— freight out and home £99 12 8—personal expences £57 4s. 3d. What did he gain?   Ans. £1076 3 11.

35. An underwriter receives for insuring £3576 18 to Quebec 7½ guineas per cent. but the goods got damaged and sold for ⅓ of their value. What did the underwriter lose?   Ans. £2102 18 4¾.

36. A merchant at London has £7576 18 6, with which he purchases stock, and gains after the rate of 6¾ per cent—he likewise insures goods to different places to the amount of £8768 14, at an average premium of 6¾ guineas—he lost £1050 by a wreck at sea—Required the neat gain at the end of the year.   Ans. £791 1 3¾.

37. An under-writer insures on a ship bound for Ben, gal £4798 12 for 12½ guineas per cent—the ship's whole value was estimated at £39576 19—she is cast away and damaged in herself and goods to the value of £9854 4 3. How much does the underwriter lose?

                              Ans. £565 0s. 7d.

38. A gentleman buys an estate of £2785 12 per an. num for 27½ year's purchase. What did he get per cent for his money?   Ans. £3 12 8¼.

39. An English farmer emigrates to America with £1000, and purchases 756 acres of land at 2½ dollars per

acre———He clears 66 acres at £3 per acre———The
stocking of his farm and building a house and barn
require the rest of his money - - —He finds on account
of the dearness of labor that his 4 servants do little more
than earn their wages, viz. 10 dollars per month, and in
order to live within his income he is forced to work and
oversee himself. In England he could have cleared 12½
per cent on his capital and lived at his ease. After 7
years he finds that he has 246 acres cleared worth £3 an
acre—the remainder is now worth 4 dollars per acre—his
house and barn are worth £30 less than they cost.—
Whether would it have been better for him to have remain-
ed in England?

Ans. Better to have remained in England by £327 10.

¶ 40. A colony of 376 families emigrated from Scotland
to America—they have about 29 guineas each after pay-
ing their passage, which comes to £54 each family. They
procure on their landing 150 acres of land each, but they
get £50 in debt in paying the purchase and building a hut
and getting some cattle—⅓ die in 3 years from change of
climate and the fever of the country—⅓ are forced to sell
their farms to relieve them from debt, and the the remain-
der succeed in raising as much produce as supports their
families—Had they remained at home they might have got
a croft in lease for their money, and not only maintained
themselves with less labour, but also added 9 per cent to
their capital—if we suppose the unsold farms worth £150
at the end of 3 years, whether would there have been
more money among them had they remained at home?

Ans. Better to have remained at home by £9226 11 3.

41. A Ship's company consisting of 27 men use in 7
weeks, 3½ hogsheads of Wine, 13½cwt. of Flour and 17½
Butts of Water. How much of the same articles will be
sufficient for the compliments of a first rate Man of War
with 939 men for 11½ weeks?

Ans. { Wine 199hhds. 61galls. 1qts.
       { Water 996½ Butts.
       { Flour 771cwt. 1qrs. 8lb.

42. A Quarter Master wishes to Clothe a Regiment of
756 men with Cloth of 6qrs. wide, he found that 147yds.

a yard wide was sufficient for 29 men. I require the quantity of cloth necessary? Ans. 2207 yards. $\frac{5}{29}$.

43. I send a cargo of Goods to my friend, which he sells for £3798 12 4. What is his Commission at 2¼ per cent, deduction 7s. 3d. per cent to the Broker he employed? Ans. £81 2 10.

44. What is the interest of £785 12 4 from the 12th of November to the 16th of June, at 6 per cent?
Ans. £26 18 3¾.

45. A Merchant in Quebec receives from his Correspondent in London, Goods to the amount of £3985 12 per Invoice with directions to sell them at an advance of 27½ per cent and to send him Potash in return. Required the Commission at 5 per cent on the sales and 2¼ per cent on the purchase? Ans. { On the sales £254 1 7½.
{ On the purchase 120 13 9¼.

46. A Broker is employed to get a Cargo insured, amounting to £7547 12 at 10 guineas per cent—the Broker to get 3s. 2d. per cent. Required what money the Insurer had to pay the Broker, the tax on the policy being 5s. 6d. per cent. Ans. £20 15 1¼.

47. A Merchant receives a Consignment of Goods worth £1738 19 4 to sell at 2½ per cent Commission or at 5 per cent, if he run the risk of the sales—it is probable, that he may lose in bad debts £179 19. Which will be the more profitable to the Merchant?
{ Gain at 2½ per cent £113 9 5¾.
Ans. { Gain at 5 per cent 56 19 11½.
{ —————
{ Loss by taking the risk 61 9 6¼.

48. I wish to cover £2689 12 on a ship coming from the West Indies at 10 guineas per cent. What will the Insurance come to and what sum shall I Insure?
Ans. £3001 13 3¼.

49. Shipped Goods for Jamaica to the amount of £5708 18. I demand what it will cost to cover the property out and home at 8 guineas?
Ans. £6277 15 6 +¾+ to be Insured out & home.

50. A Merchant in London ships for Charlestown in Carolina a quantity of Goods amount per Invoice £1378 10s. Insurance to 8 guineas—Convoy tax 5 per cent—the

Freight was £325 15. His agents sold them at an advance of 45 per cent Currency, exchange 10 per cent and purchased with the neat proceeds, after reserving 5 per cent for Commission—Cotton wool at 2s. per lb. currency.—Freight 17s. 6d. currency in an American ship per cwt.—the Cotton wool sells in London for 3s. 6 per lb. What is gained or lost by the adventure?—

<div style="text-align:right">Ans. £4768 19 7¾ gained.</div>

51. An Underwriter begins business with a Capital of £2164 18 3—he Insures during the first year of his business, on different ships to West Indies £3708 13 at 9 guineas per cent—on ships to the Levant £1197 at 4½ guineas—on ships to the East Indies £893 19 at 7¼ guineas—at the end of the first year he is obliged to pay on account of the loss of a West India vessel £397 18 and some other loses on the other vessels came against him which average 3¼ per cent. What gain or loss had he at the end of the year and whether would it have been more profitable for him to have bought into the funds, where he might have procured 6¾ per cent without any risk of deduction?

<div style="text-align:center">Ans. { Lost by Insurance £94 5 7¼.   Might have gained by purchasing Stock } 146 2 7¼. }</div>

52. An Underwriter has a Capital of £7854 12 9, on the strength of which he Insures on a ship for China £6854 19 at a premium of 11½ guineas and on a vessel bound to Quebec £3984 11 at 6½ guineas with convoy and upon a ship for Trinidad £2867 12 without convoy for 9½ guineas per cent—in case of loss he is to receive a deduction of £5 per cent—in the mean time he places his Capital and premiums in the bank at 5 per cent and receives accounts in 9 months, that the ship for China had been damaged in a storm to the amount of £5768 12 her whole value with the Cargo is estimated at £27854 12 3 of which he must pay his share—the other vessels arrive safe at their ports. Required his gain?

<div style="text-align:right">Ans. £391 8 5¾ gain.</div>

53. A Smuggler and a Merchant each imported from Holland 75 Chests of Tea, each containing 85½ lbs. at 2s. 1d. per lb. and 27 pipes of Wine at 2s. 6d. per gallon—

the Merchant Insures his property at $2\frac{1}{2}$ per cent—he pays at the Custon House $15\frac{1}{2}$ per cent on the gross value of his Goods, the freight is £15 12 and he sells his Goods of 65 per cent advance upon the prime cost.— The smuggler loses 29 Chests of Tea and 8 Pipes of Wine which were sized by the Custom House Officers and he is obliged to sell he remainder secretly at an advance of $37\frac{1}{2}$ per cent on the prime cost. Which has the greater profit ?   Ans. $\left\{\begin{array}{l}\text{Merchant gains £468 4 3}\frac{3}{4}.\\ \text{Smuggler loses 118 8 8}\frac{1}{2}.\end{array}\right.$

54. Two young men were left £1575 12 each, one of them purchased wild Lands at 2s. 6d. except 1 farm of 108 acres the greater part of which was cleared with a House upon it, which cost him together with the stocking £376 12 the other young man entered into business as a Merchant, at the end of 10 years the Merchant found that he had gained at the rate of 20 per cent, upon his Capital Simple Interest and paid all his necessary expences—the land holder found that his wild Lands were worth 7s. 6d. per acre, but his Farm only worth what he had paid for it, together with the value of additional improvements £116 17 6, but he had paid $\frac{1}{2}$ penny per acre for taxes every year. Which of the two is the richer at the end of the 10 years ?

Ans. $\left\{\begin{array}{l}\text{Merchant worth £6148 14 9}\frac{1}{2}.\\ \text{Farmer worth 3891 4 6.}\\ \overline{}\\ \text{Balance in favour of the Merchant at the end of the 10 years} \Big\} \text{ 2257 10 3.}\end{array}\right.$

55. A. B. and C. in New York, found themselves in possession of £20,000 each, and began to consider how they might lay out their money to most advantage. A. purchased land at $2\frac{1}{4}$ dollars per acre, which remained on his hands four years ; at that time he sold $\frac{1}{2}$ at 9 dollars per acre : two years after he sold $\frac{1}{4}$ of the remainder at $10\frac{1}{2}$ dollars ; and next year the remainder at 12 dollars. B. purchased bank stock at par, which yielded him a neat profit $21\frac{1}{2}$ per cent. C. purchased stock in the bank also, but being more cunning than B. he at the same time carried on the business of insurance on his own account, upon the strength of his bank stock, which he could al-

ways sell if necessary ; and one year with another he made by insuring £2356 clear ; at the end of 7 years, they met and counted their gains. Who was the richest allowing them each £560 a year family expences ?

Ans. $\begin{cases} £67746 & 11 & 10\frac{5}{8} \text{ A's clear gain in 7 years.} \\ £26180 & 0 & 0 \text{ B's clear gain in do.} \\ £42672 & 0 & 0 \text{ C's clear gain in do.} \end{cases}$

56. A purchases a Mill Seat for £218 12 3, upon which he erects a Mill at an expence of £1657 18 ; expence of attendance per annum £117 6 5 ; repairs one year with another £35 12 ; at the end of 25 years the Mill has to be renewed ; she grinds at an average 117 bushels of Wheat every lawful day of which $\frac{1}{12}$ is given for Grinding. What Interest does A get for his money valuing each bushels of Wheat at 5s. or if he choses to make it into flour 18s. 6d. per cwt. 5 bushels making 2cwt. of flour ? Ans. £42 5 11¼.

57. A Merchant at Quebec purchases 6785 bushels of wheat for 6s. 3d. ; and sends it to Mill to be ground, he receives 1cwt. 3qrs. for every 5 bushels ; expences of carrying to Mill and back ½d. per bushel ; barrels cost him 2s. 3d. each ; packing 2½d. per barrel—he may receive 9½ dollars per barrel of 1cwt. 3qrs. or he may send it to Jamaica at 7s. 6d. per barrel, where he will get 16¼ dollars Insurance—9 guineas per cent—commission 5 per cent. Required whether it will be more profitable for him to dispose of his flour at Quebec or ship it for Jamaica?

Ans. $\begin{cases} \text{Gained by selling it at Quebec } £921 & 5 & 3. \\ \text{Gained by sending it to Jamaica } 2322 & 14 & 7\frac{1}{4}. \end{cases}$

58. A Banker receives £7854 16 to remain in his hands at 3¾ per cent. for one year—ten days after he received it, he discounted bills to the whole amount for 3 months at 5 per cent and ¼ per cent commission ; at the expiration of 3 months he again discounted other bills to the same amount at 5 per cent, and ⅓ per cent commission, but in transacting the business he lost ten days ; at the expiration of these 3 months, he discounted bills with the money to the same amount at 5 per cent, and lost only 4 days reserving ½ per cent commission ; and at the end of these 3 months, he discounted bills for 2 months for the same amount at 5 per cent, taking 1 per cent

commission and losing only 4 days. Required what he gained by the deposit at the end of the year.

59. 24 Gentlemen Subscribe £5000 each, to make a Stock for carrying on the business of Banking ; they deposit ⅓ each, to remain in specie in their vaults—they purchase a house and offices for £8768, and the expences of conducting their business is £976 12 per annum—they discount bills to the amount, of their nominal Stock with their notes at 5 per cent—they find that notes to the amount of £1439 one year with another are lost and that they lose by discounting bad bills £279 12 8. I demand how much per cent they got for their money supposing the buildings worth what was given for them, deducting only the Interest ? Ans. £14 7 3.

90. There is a company whose Stock amounts to £86984 18 ; divided into 104 share—they gained in one year £12896 10 ; A has 9½ shares. Required his share of the profits ? Ans. £1178 0 10¾.

FRACTIONS.

FRACTIONS or broken numbers express any part or parts of an unit.—If, for example, I take an apple and cut it into 6 parts, four of these parts are written thus ⁴⁄₆ ; the number 4 above the line is called the Numerator, and shews how many parts are taken ; the number 6 below the line is called the Denominator, and tells the number of parts into which the unit is divided.

Fractions are either proper, improper, compound or mixed.

A proper Fraction is when the Numerator is less than the Denominator, as ½, ⅔, ⁴⁄₅, ⁶⁄₇.

An improper Fraction is when the Numerator is equal or greater than the Denominator as ⁶⁄₅, ⁴⁄₃, ⁸⁄₅.

A compound Fraction is the fraction of a fraction as ⅔ of ⁴⁄₅ ; to explain this—if one of the sixths into which we supposed the apple cut were again divided into 6 parts, two of these subdivisions would be thus expressed, ⅔ or ¹⁄₁₈ of the apple.

H 2

A mixed number is composed of a whole number and a Fraction, as, $8\frac{1}{3}$, $3\frac{2}{7}$, $19\frac{8}{12}$.

Any number may be expressed like a Fraction by writing 1 under it as, $\frac{24}{1}$, $\frac{12}{1}$, $\frac{5}{1}$.

REDUCTION OF VULGAR FRACTIONS.

Case. 1—To Reduce Fractions to their lowest terms.

Rule.—DIVIDE the Denominator by the Numerator and that Divisor by the remainder continually till nothing remain. Divide both Numerator and Denominator by the last Divisor, which is their common measure, or Divide the Numerator and Denominator by any number at pleasure that will produce no remainder.

EXAMPLE.

Reduce $\frac{90}{144}$ to its lowest terms ?

```
90)144(1
   90                    18)90/144(=5/8 Ans.
   —
54)90(1
   54
   —
 36)54(1
    36
    —
  18)36(2
     36
```

1. Reduce $\frac{92}{712}$ to its lowest temrs.   Ans. $\frac{11}{78}$.
2. Reduce $\frac{252}{2500}$ to its lowest terms.   Ans. $\frac{63}{625}$.
3. Reduce $\frac{825}{2700}$ to its lowest terms.   Ans. $\frac{275}{909}$.
4. Reduce $\frac{96}{240}$ to its lowest terms.   Ans. $\frac{4}{10}$.
5. Reduce $\frac{500}{750}$ to its lowest terms.   Ans. $\frac{2}{3}$.
6. Reduce $\frac{873}{1248}$ to its lowest terms.   Ans. $\frac{291}{416}$.
7. Reduce $\frac{209}{8777}$ to its lowest terms.   Ans. $\frac{209}{877}$.

Case 2.—To Reduce a mixed number to an improper Fraction.

Rule.—Multiply the whole number by the Denominator, adding in the Numerator, and place this sum over the given denominator.

EXAMPLES.

Reduce $6\frac{1}{5}$ **to an improper fraction.**

$$6 \times 5 = 30 + 1 = \frac{31}{5} \text{ Ans.}$$

1. Reduce $8\frac{16}{17}$ to an improper fraction.   Ans. $\frac{152}{17}$.
2. Reduce $8\frac{1}{4}$ to an improper fraction.   Ans. $\frac{33}{8}$.
3. Reduce $7\frac{3}{8}$ to an improper fraction.   Ans. $\frac{63}{8}$.
4. Reduce $17\frac{2}{3}$ to an imperper fraction.   Ans. $\frac{53}{3}$.
5. Reduce $9\frac{2}{9}$ to an improper fraction.   Ans. $\frac{83}{9}$.
6. Reduce $81\frac{3}{7}$ to an improper fraction.   Ans. $\frac{570}{7}$.
7. Reduce $25\frac{1}{6}$ to an improper fraction.   Ans. $\frac{151}{6}$.

CASE 3.—To Reduce improper Fraction to whole or mixed numbers.

RULE.—Divide the Numerator by the Denominator.

EXAMPLES.

Reduce $\frac{31}{5}$ **to a whole or mixed number.**

$$5)31(6\frac{1}{5} \text{ Ans.}$$
$$30$$
$$\overline{}$$
$$\frac{1}{5}$$

1. Reduce $\frac{152}{17}$ to a whole or mixed number. Ans. $8\frac{16}{17}$.
2. Reduce $\frac{33}{8}$ to a whole or mixed number. $8\frac{1}{4}$.
3. Reduce $\frac{63}{8}$ to a whole or mixed number. $7\frac{9}{8}$.
4. Reduce $\frac{53}{3}$ to a whole or mixed number. $17\frac{2}{3}$.
5. Reduce $\frac{83}{9}$ to a whole or mixed number. $9\frac{2}{9}$.
6. Reduce $\frac{570}{7}$ to a whole or mixed number. $81\frac{3}{7}$.
7. Reduce $\frac{151}{6}$ to a whole or mixed number. $25\frac{1}{6}$.

CASE 4.—To reduce fractions to a common Denominator.

RULE.—Multiply each Numerator into all the Denominators except its own for a new Numerator and all the Denominators together for a common Denominator.

EXAMPLES.

Reduce $\frac{1}{2}$, $\frac{3}{4}$, **and** $\frac{5}{9}$ **to a common denominator.**

$$1 \times 4 \times 9 = 36$$
$$3 \times 2 \times 9 = 54$$
$$5 \times 2 \times 4 = 40$$
$$\overline{}$$
$$2 \times 4 \times 9 = 72$$

$\frac{36}{72}, \frac{54}{72}, \& \frac{40}{72}.$

1. Reduce $\frac{4}{5}$ and $\frac{7}{8}$ to a common denominator.

Ans. $\frac{45}{40}$ and $\frac{35}{40}$.

2. Reduce $\frac{5}{8}$, $\frac{4}{9}$, $\frac{8}{15}$ and $\frac{11}{21}$ to a common denominator.

Ans. $\frac{14}{22680}$, $\frac{75}{22680}$, $\frac{0080}{22680}$, $\frac{0006}{22680}$, $\frac{1848}{22680}$.

3. Reduce $\frac{5}{7}$, $\frac{1}{8}$, $\frac{4}{9}$ and $4\frac{1}{2}$ to a common denominator.

Ans. $\frac{328}{1608}$, $\frac{448}{1008}$, $\frac{4536}{1008}$, $\frac{710}{1008}$.

4. Reduce $\frac{3}{4}$, $\frac{5}{8}$ and $\frac{6}{16}$ to a common denominator.

Ans. $\frac{140}{7 \cdot 0}$, $\frac{00}{7 \cdot 0}$, $\frac{192}{3 \cdot 0}$.

5. Reduce $\frac{5}{16}$, $\frac{2}{8}$, $\frac{4}{1}$ and $\frac{2}{15}$ to a common denominator.

Ans. $\frac{7200}{14400}$, $\frac{5400}{14400}$, $\frac{4800}{14400}$, $\frac{8640}{14400}$.

6. Reduce $\frac{7}{12}$, $\frac{1}{17}$, $\frac{8}{7}$ and $\frac{11}{34}$ to a common denominator.

7. Reduce $18\frac{1}{7}$, $\frac{12}{16}$, $\frac{1}{8}$ and $\frac{7}{5}$ to a common denominator.

CASE 5.—To reduce a Compound Fraction to a Simple one.

RULE.—Multiply all the Numerators together for a New Numerator, and all the Denominators together for a New Denominator.

EXAMPLES.

Reduce $\frac{1}{2}$ of $\frac{3}{4}$ of $\frac{4}{5}$ to a simple fraction.

$$\frac{1 \times 3 \times 4}{2 \times 4 \times 5} = \frac{12}{40} = \frac{3}{10}$$

1. Reduce $\frac{7}{8}$ of $\frac{4}{6}$ to a simple fraction.   Ans. $\frac{28}{48}$.

2. Reduce $\frac{4}{6}$ of $\frac{5}{6}$ of 12 to a simple fraction. $\frac{240}{72}$.

3. Reduce $\frac{4}{5}$ of $\frac{4}{8}$ of $\frac{7}{9}$ of $\frac{3}{10}$ to a simple fraction. $\frac{64}{2160}$.

4. Reduce $\frac{14}{8}$ of $\frac{26}{54}$ to a simple fraction. $\frac{364}{432}$.

5. Reduce $\frac{1}{9}$ of 7 to a simple fraction. $\frac{7}{9}$.

6. Reduce $\frac{11}{12}$ of $\frac{13}{14}$ of $\frac{16}{23}$ to a simple fraction. $\frac{2288}{3864}$.

CASE 6.—To reduce fractions of one denomination to another retaining the same value.

RULE.—If it be from a higher to a lower, multiply the numerator by the inferior denomination—If from a lower to a higher, multiply the denominator.

EXAMPLES.

Reduce $\frac{2}{5}$ of a penny to the fraction of a pound by comparing it—it becomes $\frac{2}{5}$ of $\frac{1}{12}$ of $\frac{1}{20}$, which reduced by the last case is $\frac{2}{1200}$.

1. Reduce $\frac{3}{5}$ of an ounce to the fraction of a pound Avordupoise.   Ans. $\frac{3}{80}$.

2. Reduce $\frac{2}{5}$ of a penny to the fraction of a pound.

3. Reduce 27d. to the fraction of a pound.

こ

4. Reduce 12lb. to the fraction of a ton.
5. Reduce $\frac{2}{3}$ of a pound to the fraction of a guinea.
6. Reduce $\frac{4}{5}$ of a farthing to the fraction of a shilling.
7. Reduce $\frac{1}{6}$ of a pound to the fraction of a ton. $\frac{1}{4480}$.
8. Reduce $\frac{5}{360}$ of a £ to the fraction of a penny. $\frac{2}{3}$.
9. Reduce $\frac{5}{11}$ yd. to the fraction of a mile. $\frac{1}{9680}$.
10. Reduce $\frac{4}{7}$ of a £ to the fraction of a guinea. $\frac{40}{147}$.
11. Reduce $\frac{5}{7}$ of an ounce to the fraction of a cwt. $\frac{3}{8.72}$
12. Reduce 2 bush. 3 pk. to the fraction of a quarter.
13. Reduce 4 furlongs to the fraction of a league.

CASE 7.—To find the value of Fractions.

RULE.—Reduce the numerator to the next inferior denomination, and divide by the denominator. If there be a remainder, reduce it to the next denomination and divide as before

EXAMPLES.

Required the value of $\frac{3}{4}$ of a £

```
  3
 20
 ____
4)60
 ____
 15        15s. Ans.
```

1. Required the value of $\frac{4}{9}$ cwt.
                              Ans. 1qr. 21lb. 12oz. 7dr. $\frac{1}{9}$
2. Required the value of $\frac{2}{3}$ of a £.   13s. 4d.
3. Required the value of $\frac{5}{8}$ of a £.   12s. 6d.
4. Required the value of $\frac{3}{5}$ of an ell English.   3 qrs.
5. Required the value of $\frac{3}{14}$ of a mile.
6. Required the value of $\frac{3}{7}$ lb. Avoirdupoise.
                              6 oz. 13$\frac{5}{7}$ drs.
7. Required the value of $\frac{3}{7}$ lb. Troy.
                              5 oz. 2 dwts. 20$\frac{4}{7}$ dr.
8. Required the value of $\frac{3}{8}$ ell English.   1 qr. 3$\frac{1}{2}$ nails.
9. Required the value of $\frac{4}{5}$ of a mile.
10. Required the value of $\frac{5}{6}$ of a hhd. of wine.
                              52 gal. 2 qts.
11. Required the value of $\frac{3}{8}$ of an acre.   1 rood 20 poles.

12. Required the value of $\frac{3}{5}$ of a day.   14 hours 24 m.
13. Required the value of $\frac{7}{16}$ of a ton.   8 cwt. 3 qrs.

CASE 8.—To reduce mixed Fractions to single ones.

When the numerator is the integral part—RULE: Multiply the numerator of the fraction by the denominator of the fractional part, to which add its numerator for a new numerator.   Then multiply the denominator of the fraction by the denominator of the fractional part for a new denominator.

Reduce $\frac{6\frac{3}{4}}{8}$ to a single fraction.

$6 \times 4 = 24 + 3 = 27$ New Numerator.
$8 \times 4 = \overline{} 32$ New Denominator.

EXAMPLES.

1. Reduce $\frac{3\frac{7}{8}}{8}$ to a simple fraction.   Ans. $\frac{31}{64}$.

2. Reduce $\frac{8\frac{2}{7}}{9}$ to a simple fraction.   Ans. $\frac{58}{63}$.

3. Reduce $\frac{18\frac{1}{3}}{25}$ to a simple fraction.

When the denominator is the integral part.

RULE.—Multiply the denominator of the fraction by the denominator of the fractional part, to which add its numerator for a new denominator—then multiply the numerator of the fraction by the denominator of the fractional part, for a new numerator.

Reduce $\frac{8}{7\frac{1}{3}}$ to a simple fraction.

$8 \times 3 = 24$
$7 \times 3 = 2 + 1 = \overline{22}$

Reduce $\frac{4}{8\frac{7}{5}}$ to a simple fraction.

$4 \times 5 = $ $\frac{20}{47}$ Ans.
$8 \times 5 = 40 + 7 = $

EXAMPLES.

1. Reduce $\dfrac{8}{12\frac{4}{5}}$ to a simple fraction.   Ans. $\frac{24}{40}$ $\frac{3}{5}$

2. Reduce $\dfrac{7}{31\frac{1}{8}}$ to a simple fraction.

3. Reduce $\dfrac{33}{41\frac{6}{9}}$ to a simple fraction.

ADDITION OF VULGAR FRACTIONS.

R U L E.

REDUCE the fractions, when necessary, to a common denominator. Add the numerators and place the sum over the common denominator.

EXAMPLES.

Add $\frac{2}{5}$ and $\frac{3}{4}$ together.

$$2 \times 4 = 8$$
$$5 \times 3 = 15$$

$$\frac{23}{5 \times 4 = 20} \quad 1\frac{3}{20} \text{ Ans.}$$

1. Add $\frac{1}{3}$ of a £, and $\frac{5}{8}$ and $\frac{6}{10}$ of a penny.
   Ans. 13s. 11d. $\frac{3}{4}$ $\frac{4}{5}$

2. Add $\frac{3}{8}$ of a guinea to $\frac{3}{4}$ of a crown, $\frac{3}{7}$ of a shilling, and $\frac{4}{9}$ of a penny.   Ans. 12 1 $\frac{44}{75}$

3. Add $\frac{2}{4}$ of a foot, $\frac{2}{3}$ of a yard, and $\frac{7}{8}$ of a mile together.   Ans. 1540 yards, 2ft. 9in.

4. Add $5\frac{1}{2}$ yards, $4\frac{2}{3}$ ells English, and $\frac{3}{4}$ of a nail together.   Ans. 11yds. 1na. $\frac{1}{3}$.

5. Add $\frac{1}{3}$ of a day and $\frac{3}{4}$ of an hour together.
        Ans. 8 hours, 12 min. 30 sec.

6. Paid to A. £37$\frac{1}{8}$, to B. £25$\frac{5}{12}$ to 7$\frac{1}{4}$. Required the amount.   Ans. £59 15 10.

7. A. purchases $\frac{7}{15}$ of a bank stock for £8468, and he wishes to purchase $\frac{1}{6}$ for £12202. What will be his share and the price?   Ans. $\frac{5}{13}$—£20670.

SUBTRACTION OF VULGAR FRACTIONS.

. . . . . .

RULE.

PREPARE the fractions as directed in Addition—then subtract one numerator from the other, under which write the common denominator.

EXAMPLES.

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

$$\frac{1}{9} \text{ of } \frac{1}{1} = \frac{60}{5} \quad \frac{2}{6} \qquad \frac{60 \times 6}{5 \times 2} = \frac{360}{10}$$

$$5 \times 6 = 30) 360 (11s. 8d. \text{ Ans}$$
$$\underline{30}$$
$$\begin{array}{c}50\\30\\\hline20\\12\\\hline\end{array}$$
$$30) 240 (8$$
$$\underline{240}$$

1. From $\frac{2}{3}$ of a guinea take $\frac{1}{3}$ of a £.   Ans. 2s. 4d.
2. From $\frac{4}{5}$ of a ton take $\frac{2}{7}$ of an cwt.
                  Ans. 15 cwt. 2 qrs. 22 lb. $\frac{2}{37}$.
3. From $\frac{1}{2}$ of a chaldron take $\frac{12}{24}$ of a bushel.
                  Ans. 17 bush. $\frac{4}{6}$ of a pk.
4. From $\frac{4}{5}$ oz. take $\frac{3}{8}$ of a dwt.   £.
5. From $3\frac{1}{2}$ cwt. take $15\frac{2}{16}$ lb.
                  Ans. 3 cwt. 1 qr. 12 lb. $\frac{1}{16}$.
6. Four merchants build a ship—A. takes $\frac{1}{2}$, B. $\frac{1}{7}$, and C. $\frac{7}{9}$. What is the share of D. who gets the remainder?
                  Ans. $\frac{31}{16}$.

MULTIPLICATION OF VULGAR FRACTIONS.

R U L E.

MULTIPLY the numerators together for a new nu-
merator, and the denominators for a new denominator.

EXAMPLES.

Multiply $\frac{3}{4}$ by $\frac{4}{7}$.

$$3 \times 4 = 12$$
$$\overline{} \qquad \frac{3}{7} \text{ Ans.}$$
$$4 \times 7 = 28$$

1. Multiply $\frac{6}{5}$ by $1\frac{3}{5}$. Ans. $1\frac{1}{3}$.
2. Multiply $\frac{7}{8}$ of $7\frac{1}{2}$ by $\frac{1}{3}$ of $3\frac{2}{3}$. Ans. $7\frac{7}{16}$.
3. Multiply $\frac{1}{3}$ of $\frac{3}{4}$ by $\frac{5}{6}$. Ans. $\frac{5}{24}$.
4. Multiply $48\frac{1}{4}$ by 7. Ans. $337\frac{3}{4}$.
5. What cost $14\frac{1}{4}$ yards at £$1\frac{17}{40}$? Ans. £3 18 $4\frac{1}{2}$.
6. What is the price of $27\frac{1}{4}$ yards of scarlet at £$1\frac{1}{6}$?
    Ans. £31 15 10.

Note.—In multiplying by proper Fractions, the pro-
duct is always less than the multiplicand ; for since mul-
tiplying by a unit neither increases nor decreases the
multiplicand, multiplying by less than a unit must de-
crease the multiplicand : thus, multiplying by $\frac{1}{4}$ or $\frac{1}{3}$ is
the same as dividing by 2 or 3.

DIVISION OF VULGAR FRACTIONS.

R U L E.

MULTIPLY the numerator of the dividend by the
denominator of the divisor for a new numerator, and the
denominator of the dividend by the numerator of the di-
visor, for a new denominator—or invert the divisor and
proceed as in multiplication.

EXAMPLES.

Divide $\frac{3}{9}$ by $\frac{2}{3}$. $\frac{3}{2} \times \frac{4}{9} = \frac{12}{18} = \frac{2}{3}$ Ans.
1. Divide $\frac{3}{4}$ by $\frac{1}{2}$. Ans. $1\frac{1}{2}$.
2. Divide $1\frac{1}{2}$ by $\frac{5}{6}$. Ans. $1\frac{7}{10}$.
3. Divide $\frac{4}{5}$ by $\frac{5}{8}$. Ans. $\frac{27}{24}$.
4. Divide $7\frac{1}{2}$ by $\frac{3}{4}$. Ans. $\frac{110}{12}$.
5. Divide $3\frac{3}{4}$ by 12. Ans. $\frac{25}{34}$.
6. Divide 100 by $\frac{3}{4}$. Ans. 133.

7. Divide $456\frac{1}{7}$, $3\frac{1}{3}$.   Ans. $130\frac{16}{49}$.

8. Divide $8\frac{1}{4}$ by $\frac{1}{3}$ of $\frac{9}{11}$.   Ans. $32\frac{1}{12}$.

9. Divide a prize of $£4900\frac{2}{3}$ into $80\frac{4}{5}$ shares.

Ans. $£60$ 12 $11\frac{20}{101}$.

10. Divide $£47$ among 7 beggars, 3 men, 2 women & 2 boys ; giving the woman $\frac{1}{2}$ a man's share, and the boys $\frac{1}{3}$ a woman's.

11. Divide $37\frac{1}{2}$ yards of scarlet among 4 men and a boy, giving the boy $\frac{1}{3}$ a man's share.

12. Sold $27\frac{1}{2}$ quarters of wheat for $£56\frac{2}{12}$. What was that per quarter ?

NOTE.—If you divide by a fraction less than unity the quotient will be greater than the dividend, because any number contains more thirds, fourths or fifths than it does units.

PROPORTION OF VULGAR FRACTIONS.
R U L E.

STATE the terms as directed in Proportion of whole numbers ; invert the divisor and proceed as in Multiplication.

EXAMPLES.

1. If $5\frac{1}{4}$ yards cost $£5$ 8 $16\frac{1}{2}\frac{2}{3}$, what will $\frac{2}{4}$ yards cost? yd. $2\frac{1}{4}$: $\frac{15675}{3}$: : $\frac{2}{4}$ Ans. $£\frac{7}{9}$.

2. If $\frac{7}{32}$ of a ship cost $£780$ 1 3, what will $\frac{1}{8}$ cost ?

Ans. $£445$ 15.

3. If $£\frac{5}{8}$ purchase $\frac{1}{4}$ of a yard, what will $31\frac{1}{3}$ ells Flemish cost ?   Ans. $£19$ 11 8.

4. When 3d. purchases 2qr. what quantity of gold will $£61\frac{5}{7}$ sterling purchase ?   Ans. $1\frac{5}{7}$ lbs.

5. If 50 trees, each containing $24\frac{1}{2}$ solid feet of timber, be sold for $£52$ 18 $7\frac{1}{2}$, what will $40\frac{1}{2}$ solid feet be worth ?   Ans. $£1$ 15.

6. When 5 hhds. of sugar, each containing $2\frac{1}{4}$ cwt. cost $£16$ 17 6, what will $3\frac{1}{2}$ cwt. cost ?   Ans. $£5$ 5.

7. There is a coal mine worth $£380$. A. has $\frac{3}{4}$ share. What is the value of $\frac{1}{4}$ of his share ?   Ans. $£171$.
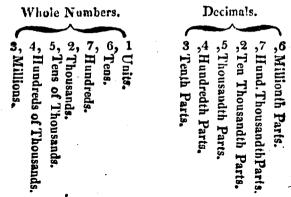
8. If $3\frac{3}{4}$ yards of cloth $1\frac{1}{2}$ yards broad be sufficient for a soldier's coat and waistcoat, what quantity of cloth is required for a regiment of 897 men ?

9. How much in length that is $4\frac{1}{2}$ inches in breadth, will make a foot square ?

DECIMAL FRACTIONS.

AN unit may be divided into ten equal parts, and each of these again into ten smaller parts. The whole unit will then contain 100 equal parts. We can conceive this division by 10 continued so that the unit shall be divided into 10, 100, 1000, 10000, &c. These parts are called Decimal Fractions.

Whole Numbers.	Decimals.

3, 4, 5, 2, 7, 6, 1   3 ,4 ,5 ,2 ,7 ,6

Millions. Hundreds of Thousands. Tens of Thousands. Thousands. Hundreds. Tens. Units.   Tenth Parts. Hundredth Parts. Thousandth Parts. Ten Thousandth Parts. Hund. Thousandth Parts. Millionth Parts.

From this table it is evident that Decimal Fractions are regulated by the same scale as whole numbers. The first figure of the line of Decimals signifies tenth parts, the next hundredth parts, &c. Decimals are distinguished by a point which separates them from Integers to which they are frequently annexed.

3,5   Signifies three and five tenths.

 ,35   Three tenth parts and five hundredth parts.

 ,035 Three hundredth parts and five thousandth parts.

 ,305 Three tenth parts and five thousandth parts.

3,05   Three and five hundredth parts.

3,005 Three and five thousandth parts.

Any Decimal may be reduced to a Vulgar Fraction by placing 1 below it with as many cyphers annexed as there are places in the Decimal.

_____

REDUCTION OF DECIMALS.

Case 1.—To reduce Vulgar to Decimal Fractions.
RULE. Annex cyphers to the numerator and divide by the denominator.

EXAMPLES.

1. Reduce ⅛ to a decimal.

    8)1000(,125 Ans
      8

      ―――

       20
       16

       ―――

        40
        40

2. Reduce ½, ⅓, ¼, ⅖, ⅗, ⅝, to decimals.
3. Reduce ⁵⁄₉, ⁷⁄₁₁, ¹⁄₂₇, ¹⁵⁄₁₇, to decimals.

Case 2.—To reduce numbers of different denominations to decimal fractions. RULE—Reduce it to a vulgar fraction and work by the last rule.

EXAMPLES.

Reduce 8d. to the decimal of a £.

    ²⁴⁰)800(,033+ Ans
      720

      ―――

      800
      720

      ―――

       80

1. Reduce 15s. 8¼d. to the decimal of a £.
                     Ans. £ ,778125.
2. Reduce 9d. to the decimal of a £.   Ans. £ ,0375.
3. Reduce 8s. 6d. to the decimal of a £. Ans. £ ,425.
4. Reduce 13s. 8½d. to the decimal of a guinea.
                     Ans. ,655158+.

5. Reduce 6½d. to the decimal of a sh.   Ans. ,5416.

6. Reduce 8oz. 12dwts. 16grs. to the decimal of a lb. Troy.   Ans. ,719444$\frac{256}{}$.

7. Reduce 2qrs. 16lb. to the decimals of a cwt.
                                    Ans. ,642857$\frac{16}{}$.

8. Reduce 20yds. 2feet 6inch. to the decimal of a mile.
                                    Ans. ,0118371 $\frac{1344}{}$.

9. Reduce 2qrs. 2nails to the decimal of a yard.
                                    Ans. ,625.

10. Reduce 1 rood 2poles to the decimal of an acre.
                                    Ans. ,375.

11. Reduce 3bush. 1peck to the decimal of a quarter.
                                    Ans. ,40625.

12. Reduce 6¾ inches to the decimal of a foot.
                                    Ans. ,5625.

CASE 3.—To find the value of any given Decimal.

RULE.   Multiply by the next inferior denominator, cut off as many places from the right hand as there are places in the given Decimal; Multiply the figures pointed off by the next Denominator and cut off as before.   Proceed thus till you come to the lowest.

EXAMPLES.

1. What is the value of ,85 of a £.

$$85$$
$$20$$
$$\overline{17,00}=17s.\text{ Ans.}$$

2. What is the value of ,028125 of a £.   Ans. 6¾d.
3. What is the value of ,1875 of a £.   Ans. 3s. 9d.
4. What is the value of ,125 of a sh.   .   Ans. 1½d.
5. What is the value of ,6845 of a cwt.
                    Ans. 2qrs. 20lbs. 10grs. 9drs. $\frac{240}{}$.
6. What is the value of ,121 of a Tun of Wine.
                    Ans. 30gals. 3pts. $\frac{236}{}$.
7. What is the value of ,03125 of a barrel of Beer.
                    Ans. 1gall. 1pt.
8. What is the value of ,28 of a Mile.
                    Ans. 2far. 9p. 3yds. 10in. 2b. $\frac{40}{}$.

CASE 4.—To find the Decimals of Shillings, pence and farthings by Inspection.—RULE.   Take half the number

of shillings for the first Decimal, then the number of farth-
ings in the remainder increased by 1 for every 24, will be
the two next Decimal places. To complete the Decimal call
these 2 figures or their excess above 25, 50, 75, pence,
the farthings in them increased by 1 for every 24 give
other 2 figures ; continue this method till the decimals end
or repeat.

Find the decimal of 16s. 4½d. by inspection.

    8   =½ of 16s.
      18 =Farthings in 4½d.
      ——
      818

Find the decimal of 10s. 8¼d. by inspection.

   5 =½ of 10s.
    3¼ farthings in 8¼d. increased by 1 for 24.
   37 Excess of 34 above 25 turned into farthings and
                           increased by 1 for 24.
   50 Excess of 37 above 25 turned into farthings, &c.
   ——————
   ,5343750

1. Find by inspection the decimal of 6s. 4½d.
                             Ans. ,31875.

2. Find by inspection the decimal of 15s. 8½d.
                             Ans. 785.

3. Find by inspection the decimal of 19s. 11¼d.

4. Find by inspection the decimal of 6s. 2d.

5. Find by inspection the decimal of 1s. 11¼d.

CASE 5.—To find the value of the Decimal of a pound
by inspection.—RULE. Double the first figure for shil-
lings, if the second figure be 5 or upwards, add 1 to the
shillings, then the second figure it below 5 or its surplus,
if above with the figure in the 3rd. place, become farthings
abating 1 for every 25.

EXAMPLES.

Find the value of ,318 of a £.

    6 first figure 3 doubled.
    4½ next 2 figures turned into farthings.
    ——
    6s. 4½d. Ans.

1. Find the value of ,478 of a £.   Ans. 9s. 6¾d.

2. Find the value of ,534 of a £.   Ans. 10s. 8¼d.
3. Find the value of ,871 of a £.   Ans. 17s. 5¼d.
4. Find the value of ,094 of a £.   Ans. 1s. 10¼d.

CASE 6.—To reduce Repetends or Circulates to their equivalent Vulgar Fractions.—RULE. Place as many 9's for the Denominator as the Repetend occurs when the Decimal is a pure repeater or Circulate.—When the De- cimal is mixed, annex as many cyphers as there are finite places, to as many 9's as there are figures in the Repetend, for the Denominator and subtract the finite part from the whole Decimal—the remainder is the numerator.

EXAMPLES.

What is the Vulgar Fraction equivalent to ,53 the De- nominator is 90, that is 9 with as many cyphers as there are finite places in the Decimal—for the numerater take 5 the finite Decimal from 53=48 $\frac{48}{90} = \frac{8}{15}$.

What is the vulgar fraction equivalent to ,59′25′.

$$5925-5=5920 \qquad = \qquad \text{Ans. } \frac{16}{27}.$$
$$\overline{9990}$$

Reduce ,3.   Reduce ,95 83′.   Reduce ,037′.
Reduce ,81′2.

ADDITION OF DECIMALS.

. . . .

RULE 1.—Write down the numbers under each other according to the value of their places so that the points may be directly in a line—then proceed as in whole num- bers.

EXAMPLES.

```
    2,64
   85,6
     ,945
   14.8
    5,3456
   84,
  ──────────
  193,3306
```

Add 785,1+84,35+1,654+,8956+,009 and 10,161;
Ans. 882,1696.

Add 6845+8,67+8,490+,684+12,67+168,1+2,0680+,8045.

Add 23,13+1,8+6,3+71,01+9,+,81+1,23+81,65.

Add 80,01+,324+,621+,423+10,23+60,03.

RULE 2.—If any of the given Decimals repeat, give every Repetend the same number of places and one place more than the largest finite—in adding carry 1 for every 9 in the right hand column, but in all the rest, carry as usual, by ten.

EXAMPLES.

Add 24⅓, 18⅛, 17⅚ and 14⅚ together.

$$\begin{aligned}
\text{Thus } 24\tfrac{1}{3} &= 24,333 \\
18\tfrac{1}{8} &= 18,125 \\
17\tfrac{5}{6} &= 17,8333 \\
14\tfrac{5}{9} &= 14,1111 \\
\hline
74\tfrac{2}{72} &= 74,4027
\end{aligned}$$

Reduce £14 13 4, £17 6 8, £9 3 4, £74 19 11, £13 13 8, £17 6 4, £9 7 2 and add them together.
Ans. £156 10 5, £ 156,52083.

RULE.—When the given Decimals terminate in a circle make all the circles similar and conterminous—find the number of nines in the left hand column of circles—add them to the sum of the right hand column and proceed as in finite Decimals.

NOTE.—Similar circles consists of an equal number of places.—Dissimilar circles may be made similar—thus, find the least multiple of the number of places in the given circles and extend each of them to as many places as there are units in the least multiple. Thus 3,27 and 78,3476 are dissimilar because the one contains two places and the other three but as 6 is the least multiple of 2 and 3, extend them to 6 places and they will be similar.

EXAMPLES.

6,434443	$\frac{5}{14} = $,35714285
7,478478	$\frac{1}{26} = $,03846153
9,353535	$\frac{19}{28} = $,67857142
44,317846	$\frac{3}{11} = $,27279727
23,909090	$\frac{4}{27} = $,148. 314
41,307307	
————	————
132,800601	1,49505124

Reduce & add $£23\frac{7}{17}$, $£45\frac{3}{27}$, $£68\frac{9}{44}$, $£57\frac{1}{30}$, $£68\frac{7}{7}$.

SUBTRACTION OF DECIMALS.

RULE 1.—Arrange the numbers as taught in Addition, and proceed as in whole numbers.

EXAMPLES.

From 56,1275	18,7684	24,1
Take 27,8136	9,8932	17,987
————	————	————
28,2839	8,8752	6,113

Find the difference between 40 yards, 2 quarters and 25,625 yards.   Ans. 10 yds. 3 qrs. 2 na.

RULE 2.—When you have repeaters make them similar and conterminous, and subtract as usual—but if the repetend of the minuend be less than that of the subtrahend, take 1 from the right hand figure of the remainder.

EXAMPLES.

From 987,333	721,0375	342,25416
Take 18,125	576,77777	97,41666
————	————	————
969,207	144,25972	244,83739

From £29 13 4 take £13 16 8.
From £218 11 2 take £25 18 6.

MULTIPLICATION OF DECIMALS.

RULE 1.—Proceed as in whole numbers—from the product cut off as many figures on the right as are equal to the decimal places in both factors—if the product has not so many figures, add cyphers on the left hand.

EXAMPLES.

```
    ,075              4,785
    ,064              2,689
  ────────          ────────
    300               43065
    450,              38280
  ────────            29710
  ,004800 Ans.        9170
                    ────────
                    12,766865 Ans.
```

Multiply 74567.8 by ,345.   Ans. 25725,8910.
——— 87,65 by ,125.   Ans. 10,956200.
——— 3685 by ,0475   Ans. ,0161 33 75.

RULE 2.—To contract the operation so as to retain as many places in the product as are necessary—Invert the multiplier and make the units place stand under the place of decimals which you want to retain in the product—then in multiplying reject all the figures to the right hand of the multiplying digit, and set down their products so that their right hand figures may fall in a strait line below each other, observing to increase the first figure of every line by carrying 1 from 5 to 15, 2 from 15 to 25, &c. from the preceding figures when you begin to multiply, and the sum is the product required.

EXAMPLES.

Multiply 27,14986 by 92,41035, and retain 4 places of decimals in the product.

Contracted.	Common way.
27,14986	27,14986
53,01429	92,41035
───────	───────
24434874	13 574930
542997	81 41958
108599	2714 9860
2715	108599 44
81	5 29997 2
14	2443487 4
───────	───────
25 8,9280	2508,9280 650516

Multiply 2,38645 by 8,2175 and retain only 4 decimal places.   Ans. 19,6107.

Multiply 375,13758 by 16,7324 and retain only 4 de-
cimal places. 　　　　　　　　　　　Ans. 6276,9520.

Multiply 395,3756 by ,75642 and retain only one de-
cimal place. 　　　　　　　　　　　Ans. 299,1.

RULE 3.—When the given numbers are repetends,
reduce them into their equivalent vulgar fractions, and
find the product of these fractions—Reduce the fraction
expressing the product to a decimal, and it will be the
answer.

EXAMPLES.

Multiply 3̇3̇ by 2̇0̇.

$$33 = \tfrac{33}{99} = \tfrac{11}{3}$$
$$20 = \tfrac{20}{99} = \tfrac{4}{15}$$
$$\tfrac{11}{3} \times \tfrac{4}{15} = \tfrac{44}{495} = ,088 \text{ Ans.}$$

Multiply 57,2̇3̇ by 2̇6̇. ,　　　Ans. 9,928.
　Multiply 7,7̇2̇ by 297.　　　　Ans. 2,297.
　　Multiply 91,7̇6̇ by 84,6̇.　　Ans. 8023,57.

————

DIVISION OF DECIMALS.

...

RULE 1.—Proceed as in whole numbers, and from
the quotient point off as many decimals as the decimal
places in the dividend exceed those in the divisor—If the
quotient has not so many places, supply the defect by
cyphers.

EXAMPLES.

Divide 45,3496 by 3,68.

$$3,68)45,3496(12,32\tfrac{120}{368}$$
　　　　368
　　　　———
　　　　851
　　　　736
　　　　———
　　　　1189
　　　　1104
　　　　———
　　　　856
　　　　736
　　　　———
　　　　120

Divide 24,694 by ,45.   Ans. 54,9??

Divide 8496 by ,546.   Ans. 15566??

Divide ,21468 by 2,5.   Ans. ,08584?

Divide ,80468 by ,075.   Ans. 10,72?4.

RULE 2.—To contract division—Having found the first figure of the quotient in the common way, for every after figure divide the last remainder, omitting a figure at each stop on the right of the divisor, but remembering to carry for the increase of the figures—cut off as taught in Multiplication.

Contracted.	Common way.
12,269)754,34738(61,48	12,269)754,34738(61,4
73614	73614
1820	1820 7
1227	1226 9
593	593 83
490	490 76
103	103 078
98	98 152
5	4 926

Divide 12,169825 by 3,14159 and retain 5 places of decimals in the quotient.   Ans. 3,87377.

Divide 25,1367 by 217,3543 and retain five places of decimals.   Ans. ,11564.

Divide 514,75498 by 12,34254 retaining 41,705757.

RULE 3.—When you meet with a repetend, change the divisor and the dividend into their equivalent vulgar factions—find the quotient—reduce it to a decimal, and it will be the answer required.

EXAMPLES.

Divide 33 by 26.

$$33=\tfrac{33}{99}=\tfrac{11}{3}\text{ and }26=\tfrac{74}{9c}=\tfrac{4}{15}$$
$$\tfrac{11}{33}\div\tfrac{4}{15}=\tfrac{65}{32}=1\tfrac{11}{32}\text{ Ans.}$$

Divide 234,6 by 7.   Ans. 301.714385.

Divide 81,964 by 4,36   Ans. 18,83416.

Divide 35293,8666666 by 555,2312165.   Ans. 45,9

PROMISCUOUS QUESTIONS IN FRACTIONS.

1. TAKE $9\frac{7}{15}$ days from 7 weeks.
Ans. 5w. 4d. 7h. 12m.

2. A merchant purchases $3\frac{1}{2}$ pieces of silk, each piece containing $24\frac{1}{2}$ yards at 6s. $\frac{1}{4}$d. per yard. I demand the value of $3\frac{1}{2}$ pieces at that rate. Ans. £25 14 $6\frac{1}{2}$ $\frac{4}{12}$.

3. A Merchant has Tea at $8\frac{1}{3}$s. per lb. which he wishes to Barter for Sugar at $6\frac{3}{4}$ per lb. I demand how much Sugar he will receive for $43\frac{6}{424}$ lbs. Ans. $5\frac{8}{9}$.

4. Bought 120lbs. of Tea at $8\frac{5}{3}$s. per lb. and sold it for £70. What was the gain per cent.
Ans. £35 5 $3\frac{3}{4}$ $\frac{75}{1031}$.

5. If $4\frac{7}{8}$ yards of cloth $\frac{4}{7}$ of a yards wide, be sufficient to make a cloak, how much must I have $1\frac{1}{3}$ yard wide to make a cloak of the same dimensions? Ans. $3\frac{1}{4}$ yds.

6. When $\frac{3}{4}$ yard broad require $31\frac{4}{24}$ yards long to make a Garment, what length will $1\frac{1}{4}$ yard require?
Ans. $20\frac{1}{2}$ yards.

7. If 20 men receive for $100\frac{1}{4}$ days work £305 0 8 $\frac{96}{401}$ —what will 3 men receive for $19\frac{1}{2}$ days work?
Ans. £8 $\frac{9}{10}$.

8. A Man and his wife with their 2 sons laboured $10\frac{1}{2}$ days, and received £4 17 $1\frac{1}{2}$. What would the man and wife earn in one day without the assistance of their sons? Ans. $4\frac{5}{8}$s.

9. A garden measures $\frac{3}{5}$ of an acre—the grass walks measure $\frac{1}{3}$ of a rood—the gravel walks $5\frac{1}{4}$ poles and the flower borders take up $\frac{1}{8}$ of the whole garden. How much remains for a kitchen garden?
Ans. 1r. 21p. 5yds. 6feet.

10. A has $\frac{1}{3}$ of a ship—B $\frac{1}{4}$ and C $\frac{1}{5}$ of the same; the remainder belongs to the Master. What is his share.
Ans. $\frac{13}{60}$.

11. If $\frac{3}{7}$ of a ship be worth £250 10s.—what part of her is worth £73 1 3? Ans. $\frac{1}{8}$.

12. If a Courier perform a journey in $40\frac{515}{932}$ days travelling $11\frac{9}{16}$ hours a day. How long would he be in performing the same when the day is $13\frac{3}{8}$ hours long?
Ans. $35\frac{1}{2}$ days.

K

13. If 1,75 gallons of wine cost 16s. 9½d..4. **What** will 6,25 hogsheads cost ?   Ans. £189.

14. When ,175 of a ship is worth £222 17 6. What are $\frac{7}{32}$ worth ?   **Ans.** £390 7½d.

15. The Length of Noah's Ark was 300 cubits, the breadth, 50, and the height 30 cubits. How many cubic yards did it contain, the length of the cubit being 1,7325 ?
                                                                Ans. 22875.

16. What will the pay of 540 men amount to at £1 5s. 6d. per man ?   Ans. £688,500.

17. If the carriage of 1½ cwt. 40 miles come to 6d.— what will the carriage of 16¼ cwt. 100 miles cost.

18. What will 32 cwt. of Sugar come to if ¼ of ¾ of 2 cwt. cost £9 ?   Ans. £262 8s.

19. If a man's allowance daily be 1 lb. of fresh beef or 1¼ lb. salt beef or ¾ of a pound of pork with $\frac{1}{14}$ gallon of Rum or in place of it $\frac{1}{12}$ gallon of wine and 1½ lb. of bread. What quantity of provisions will serve an army of 12576 men, suppose the beef and pork, the wine and rum to be used in Rotation.

20. By selling cloth at 7s. per yard I gained £10 per cent. What shall I gain per cent by selling the same at 8,5s. per yard ?   Ans. £33 11 5¼.

SIMPLE INTEREST,

IS a premium allowed by the borrower of any sum of money to the lender, which by law, cannot exceed 6 per cent in Upper and Lower Canada, nor 5 per cent in Great Britain.

Principal is the money lent.

Rate is the sum per cent.

Amount is the principal and Interest added together.

RULE.—Multiply the interest by the rate and divide by 100, the Quotient is the interest for one year—if the interest be required for several years, multiply the interest for one year by their number.—For parts of a year as months or days, take aliquot parts of a year, or work by Proportion.

N. B.—Commission, Brokage, Insurance, Discount and purchasing of Stocks may be all calculated by this Rule.

QUESTIONS.

1. What is the Interest of £95 at 6 per cent.

$$95$$
$$6$$

$$\overline{}$$

$$5,70$$
$$20$$

$$\overline{}$$

14,00 = £5 14s. Ans.

2. What is the interest of £357 10 for 1 year at 5 per cent.

£357 10
        5

$$\overline{}$$

17,87 10
    20

$$\overline{}$$

17,50
  12

$$\overline{}$$

6,00=£17 17s. 6d. Ans.

3. What is the interest of £1265 for 3 years at 6 per cent.   Ans. £227 14s.

4. What is the interest of £315 at 8 per cent for 6 years.   Ans. £391 4.

5. What is the interest of £978 12 for 4½ years at 7 per cent.   Ans. £308 5 2 $\frac{16}{100}$.

6. What is the interest of £845 10 for ¼ year at 5 per cent.   Ans. £10 11 4½.

7. I have at interest £1765 12 at 6 per cent—£345 18s. at 7 per cent and I can always make 6 per cent upon £2678 without running any risk. At what can I afford to live per annum.   Ans. £344 7 9¼.

8. A Merchant in London sends his agent in Quebec, Goods to the value of £4765 12 to be sold on his account, and allows him 2½ per cent. Required the Commission.   Ans. £119 3 9½.

9. What is the commission on £345 at 2¼ per cent.
                                        Ans. £8 12 6.

10. What is the commission on £478 12 4 at 4 per cent.   Ans. £9 2 10¼.

11. A Commission Merchant transacts business with another to the value of £28976 18 4 at an avarage, commission of 3 per cent. Required his neat profits per annum.   Ans. £869 6 6.

12. What is due my Broker for finding sale for Goods to the value of £152 at 4s. 6d. per cent.

13. What is the brokage of £640 at ½ per cent.
                                        Ans. £1 12.

14. Negociated bills for my employer to the amount of £18786 18 4 at ½ per cent. What do I receive.
                                        Ans. £93 18 7½.

15. A and B dispute about their gains—A does commission business to the amount of £38456 10 per annum—which yields him at an average 2½ per cent—B is a Broker and not only does A's business, but 17 other Merchants, whose concerns are as extensive as those of A and his contingent Brokage is equal to 3 more and he charges ¼ per cent. Which of the two gains more.

Ans. { A gains £961 8 3.
      { B gains £2018 19 3¼.⁶⁄₁₆

THE following Table calculated for the 9 digits, will give the Interest or Commission of any sum of money, at several rates, with great ease.

T A B L E.

2½ pr. cent.	3 pr. cent	3½	4	4½	5	5½	6	6½	7½	8	9
1	,025	,03	,035	,04	,045	,05	,055	,06	,065	,07	,08	,09
2	,05	,06	,07	,08	,090	,10	,110	,12	,13(	,14	,16	,18
3	,075	,09	,105	,12	,135	,15	,165	,18	,195	.21	,24	,27
4	,100	,12	,140	,16	,180	,20	,220	,24	,26(	,28	,32	,36
5	,125	,15	,175	,20	,225	,25	,275	,30	,32?	,35	,40	,45
6	,150	,18	,210	,24	,270	,30	,330	,36	,39(	,42	,48	,54
7	,175	,21	,245	,28	,315	,35	,385	,42	,455	,49	,56	,63
8	,200	,24	,280	,32	,360	,40	,410	,48	,52(	,56	,64	,72
9	,225	,271	,315	,36	,405	,45	,495	,54	,565	,63	,72	,81

Required the Interest of £348 12 for 4 years at 7½ per cent—the Tabular number opposite 4 in the left hand column and under 7½ per cent is 28.

Then 348.6 × 28 = 97608 = £97 12 1½.

Required the interest of £476 for 8 years at 8 per cent.

476 × 64 = 304,64 = £304 12 9½.

What is the Interest of £54 for 3 years at 4½ per cent.

54 × 135 = 7290 = £7 5 9½.

The numbers in the right hand column represent the time or the principal at pleasure—thus the decimals corresponding to 9 express the interest for £9 or of £1 for 9 years—consequently the interest columns are equal to the time, rate and principal—moreover the tabular numbers will not only answer for units, but also for tens, hundreds, or thousands by removing the Decimal point one, two, or three places to the right hand—thus the interest of £1 for 4 years at 9 per cent is, ,36 and by removing the Decimal point two places £36, it becomes the interest of £100 for the same time and rate.

Required the Interest of £348 6s. for 12 years at four per cent per annum.

$$£348\ 6 × 12 = 4183,2$$

BY THE TABLE.

```
4000 = 160,0
 100 =   4,0
  80 =   3,2
   3 =    ,12
   2 =    ,0008
 ———   ————————
```

£167,328 or £167 6 6¾ Interest.

· To Calculate Interest at five per cent for Days.

RULE.—Multiply the principal by the number of days, and divide the product by 7300 and for any other rate, take a proper propotion—or,

To Calculate Inestest at any rate per cent for days.

RULE.—Multiply the principle by the number of days and double of the rate per cent, then divide the product by 73000.

QUESTIONS.

1. What is the interest of £641 at 5 per cent per annum for 50 days.　　　　　　Ans. £4 7 9½

2. What is the amount of £5800 16 8 for 260 days at 4 per cent.   Ans. £5966 2 4 $\frac{12}{13}$.

3. What is the interest of £1000 10 6 for 12 days at 5 per cent.   Ans. £1 12 10$\frac{1}{2}$.

4. What is the interest of £378 14 for 127 days at 5 per cent.   Ans. £6 11 9.

5. What is the interest of £17 5 for 117 days at 4$\frac{3}{4}$ per cent.   Ans. £0 5 3.

6. What is the interest of £690 for 80 days at 5 per cent.   Ans. £7 11 2$\frac{1}{2}$.

7. What is the interest of £92 from May 12th to Nov. 19th at 5 per cent.   Ans. £2 8 1$\frac{1}{2}$ $\frac{106}{365}$.

WHEN PARTIAL PAYMENTS ARE MADE.

RULE.—Multiply the principal and the different balances by the number of days they are at interest—add the products and divide the sum by 7300, remembering to take a proper Proportion for any other rate.

A Bill of £400 was due April 20th, of which £110 was paid June 15th, £28 August 4th and the balance October the 2d. Required how much interest is due at 6 per cent.

April 20th $400 \times 56 = 22400$
June 15th paid $\frac{110}{290} \times 50 = 14500$
August 4th paid $\frac{28}{262} \times 56 = 15458$

$\qquad\qquad\qquad\qquad\quad 52358$
Add $\frac{1}{5}$ being 6 per cent   10471

$\qquad 7300)62829 = £8 \ 12 \ 1\frac{1}{2}$ Interest.

Lent A November 11th, 1807, £800, which I received in the following partial payments—January 15th, 1808, £250 ; April 17th, £152 ; June 18th, £100 ; August 19th, £125 ; September 25th, received the balance. Required the Interest at 6 per cent.

$\qquad\qquad\qquad$ Ans. £25 1 4$\frac{1}{4}$ $\frac{45}{73}$.

TABLE.

To the first day, &c.

Months	Jan.	Feb.	March	April	May	June	July	August	Sep.	Oct.	Nov.	Dec.
Jan.	365	31	59	90	120	151	181	212	243	273	304	334
Feb.	334	365	28	59	89	120	150	181	212	243	273	303
March	306	337	365	31	61	92	122	153	184	214	245	275
April	275	306	334	365	30	61	91	122	153	183	214	244
May	245	276	304	335	365	31	61	92	123	153	184	214
June	214	245	275	304	334	365	30	61	92	122	153	183
July	184	215	243	274	304	335	365	31	62	92	123	153
August	153	184	212	243	273	304	334	365	31	61	92	122
Sep.	122	153	181	212	242	273	303	334	365	30	61	91
Oct.	92	123	151	182	212	243	273	304	335	365	31	61
Nov.	61	92	120	151	181	212	242	273	304	334	365	30
Dec.	31	62	90	121	151	182	212	243	274	304	335	365
Days.	31	28	31	30	31	30	31	31	31	31	30	31

From the first

This Table will be found very useful in calculating Interest in accounts current or parts of a year—the number of days from the 1st, 10th, 20th, &c.—of one month to the 1st, 10th, 20th, &c.—of any other month may be seen by inspection.

Thus, from 1st July to 1st April are 274—look for July in the left hand and opposite under April, you have 274 the number sought.—From March 10th to August 1st, =153-10=143 days.

A runs a cash account with a Banker to the extent of £500 at 5 per cent for the Balances due—but the Banker allows only 4 per cent for such balances as are in A's favour. What interest is due and by whom on the following account.

January 8, drew for £200, March 10, paid £350, May 15, drew for £310, July 20, paid £240, September 10, drew for £410, November 9, paid £420, December 20, drew for £250 ; in January 8, settled accounts. How does it stand.

1808.		£		Dr.	Cr.
Jan. 8.	Dr.	200	61	12200	
March 10.	Cr.	350			
	Cr.	150	66		9900
May 15.	Dr.	310			
	Dr.	160	66	10560	
July 20.	Cr.	240			
	Cr.	80	52		4160
Sept. 10.	Dr.	410			
	Dr.	330	52	17160	
Nov. 1.	Cr.	420			
	Cr.	90	49		4410
Dec. 20.	Dr.	250			
1809.					
Jan. 8.	Dr.	160		3040	
				42960	18470
				14776	4
				7300)28184	5)73880

Ans. £3 17 2½   14776

A owed his Banker on the 31st of Dec. 1807, £150 he paid himself the 19th of Feb. £75 and March 14th, £45 9s. and 12th June £176 and 28th July £73 11s, and 30th Dec. £86 3s. and 21st of August £140 and 19th Sept. £45 12—he also receives from him 31st March £200 and 12th May £360 and 8th Aug. £320 and 12th Oct. £76 5s. and 19th Nov. £19. Required the state of the accounts and interest to the 31st Dec. 1808, allowing 5 per cent, when the balance is in favor of the Banker and 4 per cent, when against him.

Required the interest on the following account from Jan. 8th to July 30th, allowing 6 per cent when the balance is due to B. and 4 per cent when due to M.

Dr. Mr. B. his account current with Mr. M. Cr.

Jan. 8. To balance £100 | March 15. By cash £250
Feb. 14. To cash 114 | May 30. By cash 100
April 24. To cash 400 | July 1. By cash 400
June 18. To cash 70 |

Ans. Balance due B. £3 15 2¼.

When partial payments are made on constituted debts at considerable distance of time, it is usual to calculate the interest to the date of each payment, and to add it to the principal, and then from the amount deduct the payment EXAMPLE.

Borrowed on bond June 1, 1801, the sum of £1000 at 5 per cent, and made partial payments as follows. Required the state of the affair Aug. 14, 1805.

1801.		£.
June 1.	Principal borrowed	1000
	Interest for 1 year and 129 days	67,671
1802.	Amount	1067,671
Oct. 8.	Paid in part	250
	Balance	817,671
	Interest for 1 year and 85 days	50,4
1804.	Amount	868,071
Jan. 1.	Paid in part	408,071
	Balance	460
	Interest for 1 year and 225 days	37,178
1805.	Amount	497,178
Aug.14.	Paid in full	497,178

Lent on the 11th Nov. 1796, the sum of £1500, to bear interest at 6 per cent.

Received 1st Jan. 1802, £500
11th Nov. 1803, 450
12th May, 1805, 300
15th June, 1806, the remainder is to be paid up. How much is it?

D I S C O U N T.

DISCOUNT is an allowance made for the payment of money before it becomes due, and is reckoned at so much per cent.

To find the discount.—RULE. As the amount of £100 for the given rate and time is to the interest of £100 for that time, so is the given sum or debt to the discount.

To find the present worth.—RULE. As the amount of £100 for the given rate and time is to £100, so is the debt to the present worth.

Required the discount on a bill of £210, payable a year hence at 5 per cent.

$$£ \qquad £ \qquad £$$
$$105 \; : \; 100 : : 210$$
$$210$$

105)21000(200 present worth.

£210—200= £10 the discount.

This is the true method of calculating the discount or present worth ; but men of business generally consider Interest and Discount the same. The difference between them will appear by doing the above example in the common manner.

$$£210$$
$$5$$

10,50
20

10,00= £10 10s.

The holder of the bill looses 10s. according to the usual method of calculating Discount. By the true rule the Discount came only to £10, but by considering Interest and Discount the same, it comes to £10 10s.

QUESTIONS.

1. What is the present worth of £240 due 100 days hence at 5 per cent, calculated by the true rule ?

Ans. £236 15 1½.

2. Sold goods for £842 5 to be paid 350 days hence. What is the true discount for the present payment ?

Ans. £38 10 7.

3. A bill is presented May 5, for discount, value £350 16s. payable July 27. What sum does the bearer receive after deducting interest and ¼ per cent commission ?
Ans. £345 15 9½.

———

EQUATION OF PAYMENTS

TEACHES to find the time at which several sums of money due at different periods may be paid at once without disadvantage to either party.

COMMON RULE.

Multiply each payment by the time at which it is due. Then divide the sum of the products by the sum of the payments, and the quotient is the time required.

I owe B. £100, payable at 4 months—120 at 8 months—and 212 at 10 months.—At what time should I pay the whole together ?

$$100 \times 6 = 600$$
$$120 \times 8 = 960$$
$$212 \times 10 = 2120$$

———

$$432)3680(8,5 \text{ months.}$$
$$3456$$

———

$$2240$$
$$2160$$

———

$$80$$

I am to pay £480 as follows— 60 in 40 days, 180 in 96 days, 50 in 200 days, and the rest in a year and 45 days. I desire to know the equated time for paying the whole.

Common method.
$$60 \times 40 = 2400$$
$$180 \times 96 = 17280$$
$$50 \times 200 = 10000$$
$$190 \times 410 = 77900$$

———

$$480)107580(224\frac{1}{2}$$

Method 2d.

Whole debt £480	40=19200
Paid at 40 days 60	
———	56=23520
420	
Paid at 96 days 180	
———	104=24960
240	
Paid at 200 days 50	
———	210=39900
190	

480)107580(224

In the second method we subtract each payment as it falls due from the whole debt. We then multiply the respective balances by the number of days between each sum becoming due—the sum of these products divided by the whole debt gives the equated time as before 224½.

Method 3d.

£60	56=3360
Paid 180	
———	
240	104=24960
Paid 50	
———	
290	210=60900

480)89220(185⅞.

Here we multiply the first sum by the number of days to the second sum falling due. Then we add the first and second payments and multiply their sum by the days intervening between the second and third payment, &c.— The sum of these products divided by the whole debt gives 185⅞ days to be reckoned backward from the last payment. This method has been recommended as most convenient in business, but it does not appear to possess more correctness than the first, and certainly less simplicity.

A merchant purchases goods from a manufacturer to the value of £1000, of which he promises to pay 100 at 2 months, 250 at 3 months, 240 at 4 months, 300 at 5 months, and the balance at 8 months. Required the c-quated time for paying the whole. Ans. 4¼ months.

· A merchant purchases a certain quantity of goods upon credit, and was to pay ¼ at the end of every 3 months till the whole should be discharged—but afterwards he a-greed to pay the whole at once. Required the equated time. Ans. 7½.

INSURANCE

IS an allowance of so much per cent given to certain persons or companies who engage to make good the loss of ships, houses or merchandize, happening from storms, fires, &c.

The per centage given is called the Premium, and the paper in which the contract is written the Policy.

· · · · · ·

What is the Insurance of a parcel of goods, value £1000 at 10 guineas per cent ?

$$
\begin{array}{r}
1000 \\
105 \\
\hline
5000 \\
1000 \\
\hline
£105000 \quad\quad \text{Ans. } £105.
\end{array}
$$

To cover property is to insure the premium as well as the value of the cargo—in this case we subtract the pre-mium from £100—then as that remainder is to £100 so is the value of the property to the sum which covers it.

What sum must be insured to cover £5370 premium, ten guineas per cent ?

L

100
10 10   £   £

＼89 10 : 100 : : 5370
                100

89,5)537000(6000 sum to be insured.

1. What is the insurance of £900 at 8 per cent ?
                                          Ans. £72.
2. What is the insurance of £600 at $7\frac{5}{8}$ per cent ?
3. What is the premium on £1870 at 4 guineas ?

PURCHASING OF STOCK.

STOCK is a general name for the capitals of trading companies, and also for the debts of government.

TABLE.

Consols 3 per cent	S. S. Stock $3\frac{1}{2}$ per cent	Consols 4 per cent	Navy & Irish Stock, 5 per cent	Canal & reg. each in shares, 6 per ct.	English Bank Stock, 7 per ct.	Irish Log. La. Ins. 10 per cent	India Stock, $10\frac{1}{2}$ per cent	Years Purchase	Interest Gained £. s. d.
45	$52\frac{1}{2}$ 60	75	90	105	150	$157\frac{1}{2}$	15	6	13 4
46	$53\frac{3}{8}$ $61\frac{1}{4}$	$76\frac{2}{3}$	92	$107\frac{1}{3}$	$153\frac{1}{2}$	$161\frac{2}{3}$	$15\frac{1}{4}$	6	10 $8\frac{1}{2}$
$46\frac{1}{2}$	$54\frac{1}{4}$ 62	$77\frac{1}{2}$	93	$108\frac{1}{2}$	155	162	$15\frac{1}{2}$	6	9 $8\frac{1}{2}$
48	56 64	80	96	112	160	168	16	6	5 0
$49\frac{1}{2}$	$57\frac{3}{4}$ 66	$82\frac{1}{2}$	99	$115\frac{1}{2}$	165	$173\frac{1}{4}$	$16\frac{1}{2}$	6	1 $2\frac{1}{2}$
51	$59\frac{1}{4}$ 68	85	102	119	170	$178\frac{1}{2}$	17	5	17 $7\frac{1}{2}$
$52\frac{1}{2}$	$61\frac{1}{4}$ 70	$87\frac{1}{2}$	105	$122\frac{1}{2}$	175	$183\frac{3}{4}$	$17\frac{1}{2}$	5	14 $3\frac{1}{2}$
54	63 72	90	108	126	180	189	18	5	11 $1\frac{1}{2}$
$55\frac{1}{2}$	$64\frac{3}{4}$ 74	$92\frac{1}{2}$	111	$129\frac{1}{2}$	185	$194\frac{1}{4}$	$18\frac{1}{2}$	5	8 $1\frac{1}{2}$
57	$66\frac{1}{2}$ 76	95	114	133	190	$199\frac{1}{2}$	19	5	5 3
$58\frac{1}{2}$	$68\frac{1}{4}$ 78	$97\frac{1}{2}$	$116\frac{1}{2}$	$136\frac{1}{3}$	195	$204\frac{3}{4}$	$19\frac{1}{2}$	5	2 $6\frac{3}{4}$
60	70 80	100	120	140	200	210	20	5	0 $0\frac{3}{4}$
$61\frac{1}{2}$	$71\frac{3}{4}$ 82	$102\frac{1}{2}$	123	$143\frac{1}{2}$	205	$215\frac{1}{4}$	$20\frac{1}{2}$	4	17 $6\frac{3}{4}$
63	$73\frac{1}{2}$ 84	105	126	147	210	$220\frac{1}{2}$	21	4	15 2
$64\frac{1}{2}$	$75\frac{1}{4}$ 86	$107\frac{1}{2}$	129	$150\frac{1}{2}$	215	$225\frac{3}{4}$	$21\frac{1}{2}$	4	13 0
66	77 88	110	132	154	220	231	22	4	10 10
$67\frac{1}{2}$	$78\frac{3}{4}$ 90	$112\frac{1}{2}$	135	$157\frac{1}{2}$	225	$236\frac{1}{2}$	$22\frac{1}{2}$	4	8 10
69	$80\frac{1}{2}$ 92	115	138	161	230	$241\frac{1}{2}$	23	4	6 11
$70\frac{1}{2}$	$82\frac{1}{4}$ 94	$117\frac{1}{2}$	141	$164\frac{1}{2}$	235	$246\frac{3}{4}$	$23\frac{1}{2}$	4	5 1

. All questions relative to Stock are expeditiously ans. wered by the help of this Table. First it may be observ. ed that the manner of purchasing Stock, is to give a real sum for a nominal one—thus if the 4 per cent be £80, I pay this sum for £100 Stock and receive a dividend of £4 per annum, which is equal to £5 per cent, on the sum actually paid. When you can purchase into the three per cents at £60, &c. you are said to purchase at par and get 5 per cent for your money—if you purchase any of these securities lower than the sums mentioned you have more than 5 per cent, if you purchase higher, &c. you have less than 5 per cent—thus, if I purchase £100 Stock in the three per cents for £45 my interest amounts to £6 13 4, if I pay 70½ for £100 Stock, I have only £4 5 1 interest for my money.—As the different Funds vary in their prices so do they sometimes vary in the proportional value they bear to one onther, so that it is frequently profitable to sell one kind of Stock and purchase another—thus, if I find that £100 of three per cents can be purchased for £46½ and that £100 of 5 per cents, sell at £95—it is my advantage to sell if I hold 5 per cents and purchase 3 per cents, because I find from the Table that at £95 per cent, they produce only £5 5 3 per annum, while the 3 per cents at 46½ per cent produce £6 9 8½ per cent.—From this Table may also be learned the proprotion which the purchasing into the Funds bear to landed Estates or life annuities.

QUESTIONS.

1. What is the purchase of £313 10s. at 3 per cent annuities. Ans. £233 11 1½.

2. What does £1200 Capital Stock in the 4 per cents come to at 84⅛ per cent. Ans. £1008 10s.

3. What is the purchase of £640 8s. India Stock at 120 per cent. Ans. £768 9 7⅘.

4. What is the purchase of £926 Bank Stock at 130½ per cent. Ans. £1208 8 7½.

5. My Broker informs me that he can purchase into the 3 per cents for £66, or into the 5 per cents at £112½. Which is the more profitable.

6. I have £1700 Bank Stock which I may sell at 136¾ per cent and purchase 3 per cents at £55½ per cent. Required the difference of the Dividends.

7. I am offered an Estate at 23 years purchase or I can purchase Bank Stock at £140. How shall I decide.

8. A Gentleman purchased £12000 of East India Stock at £189 and soon after the Funds rising, he sold out at £231. What did he gain.

EXCHANGE

TEACHES to find what sum of the money of one Country is equal to any given sum of another according to a certain given course of Exchange.

Par of Exchange is the Standard to which the course is compared and points out the intrinsic value of the money of different countries compared with each other, estimating by their weight and fineness.

SPAIN.

			Sterling values		
34 Marvedies make	1 Rial,		£0	0	5¾.
8 Rials	· · · · 1 Piastre or piece of 8,		0	3	7.
10 Rials	· · · · 1 Dollar,		0	4	6.
32 Rials	· · · · 1 Pistole of Exchange,		0	14	4.
375 Marvedies · · · ·	1 Ducat,		0	4	11¼

Par 43d. Sterling per Piastre.

PORTUGAL.

			Sterling value.		
1 Milrea	make 1000 Reas,	£0	5	7¾.
1 Testoon	· · · · 100 Reas,	0	0	6¾.
1 Crusado of Exchange · · · · 400 Reas,		0	2	8.
1 New Crusado	· · · · 480 Reas,	0	2	8¼.
1 Moidore	· · · · 4800 Reas,	1	7	0.
1 Joannis	· · · · 6400 Reas,	1	16	0.

Par 67½d. per Milrea.

HOLLAND.

			Sterling value.		
16 Phennings make 1 Stiver (or 2d. Flem.)	£0	0	1 7/16
20 Stivers	· · · · 1 Guilder or Florin,	0	1	9¾.
2¼ Guilders	· · · · 1 Rix Dollar,	0	4	6¼.
6 Guilders	· · · · 1 Pound Flemish,	0	10	6.

OR,

8 **Phennings** make 1 Groat or 1d. Flem. £0   0 0$\frac{2+}{4+0}$.
12 Pence   •••• 1 Shilling,   0   0 6$\frac{1}{4}\frac{1}{5}$.
20 Shilling   •••• 1 Pound,   0 10 6. —
Par 36s. 7d. Currency.

The difference between the money in the bank at Amsterdam and currency is commonly from 3 to 6 per cent—on account of the greater fineness of the former.

To reduce Banco into Currency and the contrary.

As 100,100 with the agio added :: Banco : Curency.
As 100 with the agio : 100 :: Curency : Banco.

HAMBURGH.
Sterling value.

12 Phennings make 1 Shilling,   £0   0 1$\frac{1}{2}$.
16 Shillings   •••• 1 Mark,   0   1 6.
2 Marks   •••• 1 Dollar,   0   3 0.
3 Marks   •••• 1 Rix Dollar,   0   4 6.
7$\frac{1}{4}$ Marks   •••• 1 Pound grossor flemish 0 11 3.
Par 35s. 6$\frac{3}{4}$d. Sterling.   Agio from £20 to 25 per cent.

ITALY.

Here money is distinguished into Banco and current
Agio £20 per cent.

Venice exchanges with G. }   Ducat Banco   par 4 2$\frac{1}{4}$.
    Britain on the }
Genoa   Perro=5$\frac{3}{4}$d.   par 4 6.
Leghorn   Piatre=6 lires   par 4 4.
Florence   Crorin =7$\frac{1}{2}$ livres par 5 2$\frac{1}{4}$.
Naples   Ducat=5 tarins par 3 4.
Sardinia   Seudi=6 lires   par 4 6.
Sicily   •   Ducat =13 tarins = 3 4.

DENMARK & NORWAY.
Sterling value.

1 Mark   make   16 Shillings,   £0 0 9.
6 Marks   ••••   1 Rix Dollar,   0 4 6.
4 Marks   ••••   1 Ort,   0 3 0.
11 Marks   ••••   1 Ducat,   0 8 3.
Par 4s. 6d. Sterling per Rix-Dollar.
Peterburgh exchange by the Ruble = 4s. 6d.
Stockholm exchange by the copper dollar, par 9d.
A great number of nations have a coin = to 4s.6d. Sterling.—The Rix-Dollar of Holland, Hamburgh, Austria,

Denmark and Brazil.—The Dollar which not only passes in Spain, Portugal and America, but also in Barbary, Morocco, Arabia and Egypt.

Were Exchange entirely guided by the intrinsic value of coins, the dollar would be, in many cases, a safe and easy med.um—And in some instances, it may be used with advantage,:—For example, in America where so many different currencies are used, any given currency may be turned into any other currency required.

RULE.—Express the dollar in shillings or pence in each of the currencies, in the form of a fraction, of which let the given currency be always the numerator,— Then multiply by any sum of the currency given by the denominator, and divide by the numerator—the quotient is the answer in the currency required.

EXAMPLES.

How many pounds New-York currency are equal to £ 100 Halifax ?

Here a dollar═5s. Halifax, &═8s. New-York currency.

The given sum 100×8=800÷5=£160 Ans.

How many pounds sterling in £400 Halifax ?

Here a Dollar, 10 six-pences Halifax.
And   9 Sterling.
£400×9=3600÷10=£360 Ans.
OR,
A Dollar 60 pence Halifax.
And 54 Sterling.
£400×54═21600÷60=£360 Ans.

A TABLE.

Shewing how to Reduce Halifax Currency to any of the Currencies in North America or the West Indies, and also into Irish money ; and Vice versa—Likewise the amount of £100 Halifax or Sterling in the several Currencies.

			Halifax to Sterling or the different Currencies, & contra.	
	£90	Sterling.	$-\frac{1}{10}$	$+\frac{1}{4}$
	£97 10	Irish.	$-\frac{1}{40}$	$+\frac{1}{39}$
	£125	Jamaica.	$+\frac{1}{4}$	$-\frac{1}{5}$
£100 Halifax	£120	Virginia N. Hampshire Rhode-Island Connecticut Massachusetts	$+\frac{1}{5}$	$-\frac{1}{6}$
	£150	New-Jersey Pennsylvania Delaware Maryland	$+\frac{1}{2}$	$-\frac{1}{3}$
	£160	New-York N. Carolina	$+8\div 5$	$+5\div 8$
	£93 6 8	Georgia S. Carolina	$-\frac{1}{15}$	$+\frac{1}{14}$

A TABLE, &c. CONTINUED.

Sterling to Halifax or the different Currencies, & contra.

£100 Sterling			£.	s.	d.	Halifax.	
	£90	Sterling.	111	2	$2\frac{2}{3}$	$+ \frac{1}{9}$	$- \frac{1}{10}$
	£97 10	Irish.	108	6	8	$+ \frac{1}{12}$	$- \frac{1}{13}$
	£125	Jamaica.	138	17	$8\frac{1}{2}$	$+\frac{1}{9}$ $+\frac{1}{4}$	.72
	£120	Virginia N. Hampshire Rhode-Island Connecticut Massachusetts	133	6	8	$+ \frac{1}{3}$	$- \frac{1}{4}$
	£150	New-Jersey Pennsylvania Delaware Maryland	166	13	4	$\times 5 \div 3$	$\times 3 \div 5$
	£160	New-York N. Carolina	177	15	$6\frac{2}{3}$	$\times 16 \div 9$	$\times 9 \div 16$
	£93 6 8	Georgia S. Carolina	103	16	$0\frac{8}{9}$	$+ \frac{1}{27}$	$- \frac{1}{7}$

From this table we may turn Sterling or Halifax into each other, or into any of the currencies with facility.—For example, to reduce Halifax to Sterling we deduct $\frac{1}{10}$—to reduce Sterling to Halifax we add $\frac{1}{9}$—to reduce Halifax to Irish we deduct $\frac{1}{40}$—to reduce Irish to Halifax we add $\frac{1}{32}$—the currency of Georgia and South Carolina is exactly of the same value as army pay.

1. In £465 Jamaica currency, how many pounds Halifax. To Reduce Jamaica currency to Halifax, I find by the Table that I must deduct $\frac{1}{5}$.

     5) 465

       ———

        93

       ———

2. In £465 Jamaica currency—how many pounds Sterling ?

By the Table multiply by ,72.

$$465$$
$$,72$$

$$9,30$$
$$3255$$

$$334,80$$
$$20$$

16,00 £334 16s Ans.

3. £400 Halifax—how many pounds Irish ?

By the Table deduct $\frac{1}{40}$.

$$40)400$$

$$10$$

£390 Irish, Ans.

4. £390 Irish—how many pounds Sterling ?

By the Table deduct $\frac{1}{13}$.

Ans. £390—$\frac{1}{13}$=£360 Sterling.

5. In £860 Virginia, &c. currency—how many pounds Sterling.

By the Table deduct $\frac{1}{4}$.

£860—$\frac{1}{4}$=£645 Sterling, Ans.

6. In £450 Halifax—how many pounds N. Jersey, &c. currency ?

By the Table add $\frac{1}{2}$.

£450+$\frac{1}{2}$=£675 Ans.

7. In £675 N. Jersey, &c. currency—how many pounds Sterling ?

By the Table × 3 ÷ 5.

$$675$$
$$3$$

$$5)2025$$

£405 Sterling, Ans.

8. In £140 Georgia currency—how many pounds Halifax ?

By the Table add $\frac{1}{14}$.

$140 + \frac{1}{14} = £135$ Ans.

9. In £140 Georgia currency—how many pounds Sterling.   deduct $\frac{1}{28}$.

QUESTIONS.

1. A Merchant in Madrid draws upon his correspondent at London, for 13824 Piastres. What does the bill amount to in Sterling money exchange 50d. Sterling to a Piastre ?   Ans. £2880.

2. Bristol remits to Cadiz £520 3 $3\frac{6}{68}$ Sterling—how many Piastres will the bill amount to ;

Ans. 2600 Piastres 6 real 20 marks.

3. A Merchant remits 13824 Piastres to Barcelona their value in Sterling is £2880. What is the rate of Exchange ?   Ans. 50d. per Piastre.

4. In 1500 Milreas, how many pounds Sterling at $67\frac{1}{2}$ per milree.   Ans. £421 17 6.

5. In 14624 Milreas—how many pounds Halifax at $66\frac{2}{3}$ per milrea ?   Ans. £4062 4 5.

6. How much Sterling money will 1350 milreas 875 reas amount to at 64d. per milrea ?   Ans. £360 4 8.

7. How much bank money can I get at Amsterdam for 1491 Guilders current money the agio being 5 per cent.

Ans. 1420 Guilders.

8. How much current money at Amsterdam is equal to 1420 Guilders banco ?   Ans. 1491 Guilders.

9. In 7400 Guilders banco—how many pound Sterling. Exchange $35\frac{1}{9}$d. per pound Flemish.

Ans. £691,83.

10. In £595 Flemish—how many pounds Sterling at 34s. per pound Sterling.   Ans. £350.

11. In £1072 Sterling—how many marks exchange 36s. 4d. der pound Flemish.   Ans. 14606 marks.

12. In 1170 Rix Dollars 2 sol gross current money, agio $4\frac{9}{16}$ per cent. How many pounds Sterling.

Ans. £250 14 8.

13. In 537 marks 15 sols Current agio $3\frac{1}{2}$ per cent, 192 dollars 1 sol gross agio $4\frac{7}{8}$ per cent—Exchange 35 sol gross 7 Phennings. How many pounds Sterling.

Ans. £64 13 $3\frac{1}{2}$.

14. A Merchant in Copenhagen sends a bill to London for 278 Rix Dollars—how many pounds Sterling does it amount to Exchange $4\frac{1}{2}$ Rix Dollars per pound Sterling ? Ans. £61 15 $6\frac{1}{4}$.

15. In £557 15 6 Sterling—how many Piastres of Leghorn Exchange $47\frac{1}{4}$d. per Piastre ?

Ans. 2825 Piasters 13 sols 4 den.

16. In £415 17 4 Sterling—how many ducats Current in Venice agio 23 per cent and Exchange 53d. per ducat.

BILLS OF EXCHANGE.

AS no part of a mercantile education admits of greater variety than that of Exchange, so there is no part of greater importance. Every person should be acquainted with the nature of Bills of Exchange or Notes of Hand, whether merchant, gentleman, or shop-keeper. A few general observations, therefore, relative to them will not be useless.

A Bill of Exchange is a short order for money to be received in one place or country for the value paid in another, to which men of credit pay the strictest regard. When a merchant wishes to remit money to any distance, he draws two and sometimes three bills of the same date, (each excepting against the others :) these are sent by different conveyances, and if one reach the place of destination and is paid, the others are of no force. A bill of exchange should be immediately tendered for acceptance upon coming to hand.

Acceptance is performed on a bill after date by the person on whom it is drawn, writing his name at the bottom : But when it is a bill after sight, the acceptance must likewise mention the day of the month in writing when accepted, in order to ascertain the time of payment.

INDORSING.—A bill is endorsed when the possessor writes his name across the back : By this he becomes accountable for the payment to any person to whom he shall pay it away.

PROTESTING takes place in case of non-acceptance, and is the business of a Notary Public ; or where there is none of a substantial person, in the presence of two creditable witnesses. The holder of the bill can then have recourse to the drawer and all the endorsers, not only for the value of the bill but also for interest or damages, but if he neglect to protest he has no claim. All bills of exchange are payable to the person in whose favour they are drawn, or to his order (even tho' the word order should not be mentioned in the body of the bill) and are, according to the custom of merchants, indorsable ;—it is however more correct to insert the words "or order."

Payment of a bill should be made exactly when due.— In order to determine when a bill falls due, it is necessary to be acquainted with Usance and Days of Grace.

USANCE is the customary time allowed for the payment of foreign bills, and is more or less according to the custom of different places.

Usance between Canada and London,			3 months.
Between	Britain	and France,	1 month.
do.	do.	the Netherlands,	1 month.
do.	do.	Spain,	2 months.
do.	do.	Portugal,	3 months.
do.	do.	Italy,	3 months.

Amsterdam allows Spain, Portugal & Italy, 3 months.
do. do. France, Flanders, Geneva, 1 month.

DOUBLE USANCE is double the customary time. It is usual with merchants to grant a certain number of days to the acceptor after the bill becomes due, called Days of Grace. In Britain 3 days are allowed—In Holland, Portugal and Venice, 6 Naples, Denmark and Norway, 8—France, Dantzick and Konningsberg, 10—Hamburgh and Sweden, 12—Spain 14—Rome 15.

(No. 1.)   Montreal, 17th Oct. 1808.

£600 Sterling.

Ninety Days after date, pay this my first of exchange (my second and third of same tenor and date unpaid) to the order of Mr. James Ferguson, Six Hundred Pounds, value received, and charge the same without further advice to the accompt of

JAMES PATTERSON.

To Mr. Peter Laing, London.

Accepted 3d January, 1809.

PETER LAING,

In drawing the second bill, write "(my first and third of same tenor and date unpaid)"—in the third bill "(my first and second of same tenor and date unpaid)".

. . . .

No. 2.   LONDON ON HAMBURGH.

London, 5th Feb. 1809.

£147 8 10.

At usance pay this my first of exchange to Mr. John Gordon, or order, one hundred and forty-seven pounds eight shillings and ten pence, value received as per advice.

SAMUEL BLAKE.

To Mr. Jas. Evans, Hamburg.

Accepted—JAMES EVANS.

. . . .

No. 3.   HAMBURGH ON LONDON.

Hamburg, 19th May, 1809.

2656 marcs lubs.

At Usance pay this my first of Exchange to Samuel Blake, or Order, two thousands six hundred and fifty six marcs lubs, value received and place the same to my accompt as per advice.   JAMES EVANS.

To Mr. John Gordon, London.

No. 4.   Lisbon, 5th June, 1809.

350 Milreas.

At double usance pay this my first of Exchange to the Order of Mr. Alexander Bremner, three hundred and fifty milreas at five shilling and six pence per milres, value received and place it to my accompt as per advice.

GEORGE WATT.

To Mr. James Logan, London.

M

8700 Livers Tournois.   Paris, 9th August, 1809.
 At usance pay this my first bill of Exchange to Mr.
Robert Dixon, or Order, the sum of eight thousand seven
hundred livres, Tournois, value received and place the
same to my accompt as per advice.

         JACOB MASON.

 To Peter Hill, Esq. London.

ARBITRATION OF EXCHANGE.

 AS the course of Exchange between different nations is
almost continually varying. Arbitration teaches to re-
mit to, or draw upon foreign places in such a manner as
shall turn out the most profitable. In Simple Arbitration
three places only are concerned—for Example if the Ex-
change from Montreal to London, be 10 pounds for 9
pounds Sterling and from Lisbon to London, 64d. per
milrea. Then as £9 Sterling is to the Quebec currency
so is 64d. Sterling to the value of the milrea.
 A Merchant in Montreal wishes to pay £500 Quebec
currency, to his correspondent in Dublin, which he may
remit direct at £97 10s. Irish per £100 Currency, or he
may purchase a bill on London at ten per cent and from
London to Dublin, he may remit at a discount at 12 per
cent. Which is the more profitable.
     £500 Currency=150 Sterling.
   Then £100 Ster. : £112 :: £450 :: £504
    Gain £14, Irish by remitting through London.
 Money may be circulated through several places for
the same purpose—this is called Compound Arbitration.
All Questions in Simple or Compound Arbitration may
be performed by one or more statings in the Rule of Three.

COMPOUND INTEREST

 IS calculated by making the amount at each stated
time of payment the principal for the next.
 1. What is the amount of £500 in 3 years at £4 per
cent ?

```
 500            520           520
   4              4            20 16  2d year's inter-
 ----           ----          -----            [est.
20,00 1st year  20,80         540 16
                    20          4
                               -----
            16,00 2d year 21,63  4
                               20
                              ------
                              12,64
                                12
                              ------
                               7,68
                                 4
                              ------
                               2,72
```

```
   £20  0  0     = 1st year's interest.
    20 16  0     = 2d     do.
    21 12  7½ 18/25 = 3d    do.

   £562  8  9½ 18/25 Ans.     [Ans. £57 17 6½.
```

2. What is the interests of £410 for 3 years at 4½ per ct.

When Compound Interest is calculated by Decimals, the usual method is to find the amount of one pound for a year at the given rate per cent. Involve the amount thus found into such a power as is denoted by the number of years and the product multiplied by the given sum or principal will give the amount required. To find the Interest, subtract the principal from the amount.

What is the compound interest of £364 for 4 years at 5 per cent?

```
     1,05                1.21550625
     1,05                     364
     ----                -----------
      525                486202500
     1050                729303750
     ----                364651875
     1,1025              -----------
     1,1025              442,44427500
     ------                    364
     55125               -----------
     22050               78,44427500 = £78 8 10½ Ans.
    110250
   110250
   ----------
   1,21550625 = 4. power of 1,05.
```

A TABLE OF THE AMOUNT OF £1 FOR ONE YEAR.

Rates per cent	Annuities of £1.	Rates per ct.	Annuities of £1.	Rates per cent	Annuities of £1.
3	1,03	5½	1,055	8	1,08
3½	1,035	6	1,06	8½	1,085
4	1,04	6½	1,065	9	1,09
4½	1,045	7	1,07	9½	1,095
5	1,05	7½	1,075	10	1,1

A TABLE,

Shewing the times in which any sum doubles itself at various rates per cent.

Rates per cent.	Doubles at Simp. Interest.	Doubles at Compound Interest.	Rates per cent.	Doubles at Simp. Interest.	Doubles at Compound Interest.
	years			years	
2	50	35,0028	5	20	14,2067
2½	40	28,0701	6	16⅔	11,8957
3	33⅓	23,4498	7	14²/₇	10,2448
3½	28⁴/₇	20,1488	8	12½	9,0065
4	25	17,6730	9	11¹/₉	8,0432
4½	22²/₉	15,7473	10	10	7,2725

As computations are very tedious in Compound Interest and Annuities, Tables are commonly used in business.

TABLE 1st—shews the amount of £1 at Compound Interest.—Table 1st is thus made, $1,03 \times 1,03 = 1,0609$, amount of £1 for 2 years, $\times 1,03 = 1,092727$ amount for 3 years, &c. The other rates of interest are involved in the same manner.

EXAMPLES.

1. What will £300 amount to in 3 years at 5 per cent per annum ?

$1,05 \times 1,05 \times 1,05 = 1,157625 \times 300 = 347,287500$

$$\begin{array}{r} 20 \\ \hline 5,750000 \\ 12 \\ \hline 9,000000 \\ = £347\ 5\ 9. \end{array}$$

Opposite 3 years and under 5 per cent, I find the amount of £1, 1,157625, which multiplied by £300 gives the answer;—hence to find the amount multiply the tabular number for the given rate and time by the principal.

2. What is the amount of £700 for $3\frac{1}{2}$ years at 5 per cent?   Ans. 835,9593757.

3. What is the amount of £20 for 7 years at 6 per cent?   Ans. £30 1 5$\frac{1}{4}$.

4. What is the amount of £500 for 15 years at 5 per cent compound interest.

To find the principal divide the amount by the tabular number for the given rate and time.

1. What principal at 6 per cent interest for 7 years amounts to £30,0726?

$$30,0726$$
$$\overline{}$$

Tabular number 1,50363=£20.

2. What principal put out at 5 per cent compound interest will amount to £243,2025 in 4 years?
            Ans. £200.

3. What principal put out at 5 per cent compound interest will amount to £1039,2025 in 15 years?
            Ans. £500.

To find the rate per cent—Divide the amount by the principal and the quotient corresponds with the tabular number opposite the time and under the rate sought.
EXAMPLES.

1. If £200 in 4 years amount to £243,2025, what is the rate per cent?

200)243,2025(1,216=5 per cent.

2. If £500 in 15 years amount to £1039,465 what is the rate per cent?   Ans. 5 per cent.

To find the time—Divide the amount by the principal and the quotient will correspond to one of the numbers under the given rate, opposite to which you will find the time.   EXAMPLES.

1. In what time will £300 amount to £500 at 5 per cent?

$\frac{500}{300}$=1,66666 corresponds to 10 years & $\frac{1,66666}{1,62888}$=1,0232.

M 2

NOTE.—When the number does not correspond to the table, the number of days to be added may be found by this proportion—as the difference between the next lower and next higher numbers in the table is to the difference of the given number and the next lower, so is 365 days to the days nearly.

2. In what time will £200 amount to 243,2025 at 5 per cent ?   Ans. 4 years.

3. In what time will £500 amount to £1039,465 at 5 per cent ?   Ans. 15 years.

NOTE.—To find the amount of any sum for a greater number of years than are to be found in the table—take two or more numbers from the table whose sum is equal to the given number of years and multiply them into each other ; the product is the amount proposed.

Required the amount for 40 years.

$$
\begin{aligned}
\text{Amount for } 20 &= 3,207135 \\
\text{for } 20 &= 3,207135 \\
\hline
\text{For } 40 &= 10,28577
\end{aligned}
$$

TABLE 2—shews the present value of £1 compound interest—This table is constructed by dividing £1 by its amount for one year, for the present worth the first year and the present worth for the first year divided by the amount gives the second, &c.

Thus, $1 \div 1,05 = 952381$ first year & $952381 \div 1,05 = 90705 = $ 2d year, and $90703 \div 1,05 = 863838 = $ 3d year or divide £1 by the numbers in the 1st table successively, and the quotienes will be the numbers in the second.

A gentleman leaves his godson £500 to be paid him when he comes of age—the boy is now four year's old and the executors wish to pay him at present—required the present worth at 5 per cent.

Multiply the tabular number for the rate and time.   436296
                          By the annuity   500
                          ——————
                          218)118000
Or divide £500 by 2292018 the corresponding number in table 1st=218,148 as before.

2. What is the present worth of £757 9 8½ due 4 years hence, discounting at the rate of 6 per cent per annum.
By table 1st.

Tabular number 1,2624769)757,48542(600

By Table 2d—Amount £757,48542

× by tabular number ,792091

599,999+ = £600

ANNUITIES.

. . . .

AN Annuity is any periodical income arising from money lent or from houses, lands, salaries, pensions, &c, payable yearly every half year or quarterly to continue for a certain number of years, for life, or forever. When an annuity continues unpaid after it falls due, it is then said to be in arrears. When it does not commence for some time after, it is said to be in reversion. Annuities are commonly computed at compound interest—this method being more equitable both for the buyer and seller.— The amounts of annuities, or their present values, are easiest found by the two following tables for the annuity of £1.

TABLE 3.

To make this table, take the first years amount, which is £1—multiply it by 1,05+1=3,05, the second year's amount, at 5 per cent, which again multiply by 1,05+1=3,1525=third year's amount. Or to £1, the first year of this table, add the first year of Table 1st—their sum is the second year of this table, to which add the second year of Table 1st—their sum will be the third year.

To find the amount of an Annuity forborne any number of years.

Take out the amount of £1 for the proposed time and rate of interest —then multiply it by the given annuity— the product will be the amount.

Find the amount of an annuity of £50 forborne 20 years at 6 per cent.

On the line of 20 years and column of 6 per cent
stands   36,78559 amount of £1 for 20
years, which ✕ by   50

$$\begin{array}{r} \hline 1839,27950 \\ 20 \\ \hline 5,59000 \\ 12 \\ \hline 7,08000 \end{array}$$

In what time will £50 amount to £1839 5 7 at 6 per cent ?

Divide the amount   1839,27950
By the annuity $\overline{50}$ = 36,78559

Then look for the nearest tabular number in the column of 6 per cent, which, in this instance, is found exactly.—

To find the rate which gives £1839 5 7 for annuity of £50 in 20 years.

Divide 1839,27950 by 50 as before—the quotient is 36,78559—then looking along the line of 20 years you will find 36,78559 in the column of 6 per cent.

EXAMPLES.

1. What is the amount of an annuity of £5 5s. per annum at the rate of 5 per cent for 30 years ?
           Ans. £348,8039.

2. Sought the yearly annuity which in the space of 15 years will amount to £1000 at $4\frac{1}{2}$ per cent.
           Ans. £48,114.

3. In what time will an yearly annuity of £48,114, amount to £100 at $4\frac{1}{2}$ per cent, Compound Interest ?
           Ans. 15 year.

TABLE 4.

To make this Table divide £1, by 1,05=95238 at 5, per cent (for any other rate divide by that rate)=the present worth the first year ; divide this again by, 1,05, =90703 added to the first year's present worth gives 1,85941 for the second year's present worth—then 90703

$2-1,05-1,85941=1,723248=$3d year's, &c. The first year's in this Table and Table 2d. are the same—The first year of this Table and the second year of Table 2d. added make the second in this—and the second in this added to the third in Table 2d. gives the third.

To find the present value of an annuity of £50, which he is to continue 20 years at 1 per cent ?

By the Table the present value of £1 annuity for the rate and time is $11,46992 \times$ by $50=573,49600=£573$ 9s. 11d.

To find the present value of an annuity of £50 to commence 20 years hence, and then to continue 30 years, or to terminate 50 years hence at 6 per cent.

Subtract the tabular value of one term from that of the other, and multiply by the annuity

Tabular value for 50 years 15,76186

     for 20   do.   11,46992

      the difference   4,29194

        × by   50

       214,59700

          20

       11,94000

          12

       11,28000

          4

Ans. £214 11 $11\frac{3}{4}$ 1,12000

EXAMPLES.

1. What is the present worth of an annuity of £100 to continue 15 years at 5 per cent ? Ans. £1037,966.

2. What is the present value of £30 annuity to continue 19 years at 4 per cent. Ans. £394,021.

3. A gentleman purchases an estate for £1000, and is allowed to retain the purchase money in his own hands, upon condition of paying to the former proprietor 4 per cent per annum—He lets the estate so as to have 6 per cent for his money. Requird when the estate will clear itself ? Ans. 31,886.

4. A puts £1500 to interest, B hath an annuity of £75 to continue 50 years. Which of them will amount to the greatest sum at the end of 50 years, and what is the present worth of the difference at 4½ per ct. per annum.

The am't of £1500 for 50 yrs at 4½ per ct. £13548,945
of 75 annuity for 50 years   13387,727

A's amount exceeds that of B by   161,218
The present worth of which is £17,848

5. How long may a lease of £30 be had for £167 9 5 at 6 per cent ?   Ans. 7 years.

6. A hath a term of 7 years in an estate of £50 per annum ; B hath a reversion of the same estate 14 years after A : C hath a further reversion of 21 years after A and B : sought the present worth of the different terms at 4½ per cent.

First find the present worth of each of the terms separately as if they had been to run the whole period, that is C for 42 years, B for 21 and A for 7, subtracting the second from the first and the third from the second and we have A worth £294,635 — B = £375,601 — C = 265,9415.

7. Sought the value of a freehold estate the rent of which is £150 at 3½ per cent ? $\frac{150}{035}$ = £4285,7 Ans.

8. A gentleman purchases an estate for £14000, at what yearly rent must he let it to have 4 per cent for his money ?   Ans. £560.

9. An estate which cost £8000 is let for £360 a year sought the number of years purchase and what rate of interest the purchaser has for his money ?

Ans. 22,22 years purchase and 4½ per cent.

10. Sought the present value of a reversion in perpetuity which is to commence 40 years hence the yearly rent of which is £70 discounting at 4 per cent ?

Present value £364,5.

11. Suppose the national debt January 1, 1809, to be six hundred millions—in what time will it be extinguished by a sinking fund of 6 millions.   Ans. 37 years nearly.

ANNUITIES ON LIVES

DEPEND on the continuance of some particular life or lives; their value is derived from two circumstances—the interest of money and the chance or expectation of the continuance of life. The Tables of annuities already given make no provision for any contingency; but the expectation of life being a thing not certain and only possessing a certain chance—it is evident that the value of a certain annunity must be diminished in proportion, as this expectation is below certainty. Thus if the present value of an annuity certain be any sum, suppose £100 and the value or expectancy of life ½, then the value of the life annuity would be only half the former or £50 ; and if the value of that life be only ⅓, the value of the life annuity will be ⅓ of £100 that is £33 6 8, &c.

"Calculations on Lives are deduced from the comparison of bills of mortality for the different ages. Thus if 50 persons die out of 100 in any proposed time, then half the number only remaining alive, any one person has an equal chance to live or die in that time or the value of his life for that time is ½, but if ⅔ of the number die then the value of any of the survivor's lives is ⅓, and if ¾ die the value of any of the survivor's lives is ¼, &c. Consequently the probability of life is greater or less according as there appears more or fewer chances for a person's living or dying at any given stage of life." Thus the probability that a person now 40 shall live to 60 is $\frac{1+7}{3\,2\,2}$ by the London bills of Mortality, and $\frac{2\,0\,3\,8}{4\,6\,3\,5}$ by the Northampton, and the chance of his dying $\frac{1\,7\,5}{3\,2\,2}$ by the former, $\frac{1\,5\,9\,7}{3\,6\,3\,5}$ by the latter.

The extremity of life is that period beyond which there is no probability of surviving. This period is fixed at 97 years in the Northampton Tables.

The complement of Life is the number of years which a person's age wants of the full extremity—thus the complement of an age of 40 is 57.

Expectation of Life is the number of years that a man of any given age may hope to live, or it is the number of year's purchase which the annuity is worth in ready money

Reversion of a Life Annuity is the expectancy after the death of some other person or persons.

PROBLEM 1.—To find the probability or proportion of chance that a person of a given age continues living a proposed number of years.

Let the age be 20 and the years proposed 18.

In the London table against 20 years stands 494 and against 38, 341; which shews that of 494 persons that attain the age of 20, only 341 attain the age of 38—consequently 153 die between the ages of 20 and 38. The chance therefore is as 341 : 153. When several persons are given, find their chances separately and then multiply them into one another.

} PROB. 2.—To find the value of an annuity for a proposed life—Take from the tables the value of £1 for the age and rate of interest proposed, and multiply by the given annuity.

EXAMPLES.

1. What is the value of an an annuity of £30 on a person's life whose age is 60 at 5 per cent ?

Value of an age of 60 from the tables   8,39

$$\times \; by \;\; 30$$

$$250,70$$

$$= £250 \; 14.$$

In solving the different cases we use the Northampton tables as better adapted for general practice.

PROB. 3.—To find the value of an annuity during the joint lives of two persons, and to cease when one of them dies.

EXAMPLE.

What is the value of £300 annuity for the joint lives of two persons ;

The one 35 and the other 55, interest 5 per cent.

Value of two joint lives 35 & 55=7,85

$$300$$

$$£2255,00$$

PROB. 4.—To find the value of an annuity to continue during the longest of two lives.—Subtract the value of the

joint lives from the sum of the value of the two lives, and the remainder is the value of an annuity for £1 on the longest of the two lives.

EXAMPLE.

What is the value of £60 annuity upon the longest of two lives, the one 45 and the other 65 years, interest 5 per cent.

Value of a life of 25 years	13,57
of 65 years	7,28
	20,85
	6,52
	14,33
	60
	£859,80

Prob. 5.—To find the value of an estate in perpetuity after the death of the persent possessor. Find the value of the estate, subtract the value of the life of the person in possesion, the remainder is the value of the reversion.

A Person has the perpetuity of an estate of £800 afte the death of the possessor aged 65. What is the value of the reversion ?
Value of the estate at 5 per cent. 20 years.
of the life of the possessor 7,28

	12,72
	800
	10176,00 =value of the re- [version.

Prob. 6.—To find how much a married man should pay annually during his marriage to secure an annuity for his Widow.

Let the woman's age be 35, the man's 45, the rate 4 per cent, and the annuity £30. From the value of the woman's age, take the value of the joint lives, and the remainder multiplied by the annuity, give the value in a single payment, and that divided by the value of the joint

ives, increased by 1 gives the annual payments during marriage

Value of a life of 35 years=1250
Subtract the value of the joint lives= 8,92

3,58
$\times$ by the Annuity = 30

[ment.
Divide by the value of the joint } =107,40=a single pay-
    lives increased by 1·}

9,92=£10,82 an-
[nual payment.

TABLE of the rates of assurance of a single life in the society for equitable assurances—the sum assured £100.

Age	For one year.			For 7 years at annual payment of.			For the whole life annual payment of.		
	£	s.	d.	£	s.	d.	£	s.	d.
10	1	9	6	1	10	7	2	2	10
15	1	11	0	1	12	7	2	6	6
20	1	13	11	1	16	0	2	12	10
25	1	17	7	2	0	2	3	0	6
30	2	2	6	2	6	0	3	8	11
35	2	8	7	2	14	2	3	17	9
40	2	19	2	3	5	1	4	7	11
45	3	11	0	3	18	6	5	0	0
50	4	4	8	4	11	2	5	12	11
55	5	0	9	5	11	7	6	9	3
60	5	19	1	6	16	10	7	17	7
65	7	0	1	8	13	0	10	3	9

SELECT QUESTIONS.

1. What will £246 amount to in 30 years at 5 per cent ?   Ans. £1063,1978.

2. What is the amount of £150 for 91 year ?
    Ans. £12715,932495.

NOTE.—As the Table is calculated only for 30 years, take any numbers whose sum is 91 and multiply their

tabular numbers continually into each other and that
product by the given sum.—This last product is the a-
mount—For example the number corresponding

to 20 and 30 years multiplied together give 11,4674000
to 20 and 21 years   · do. ·   give 7,3919881

And these multiplied give the amount $\bigg\}$ =84,7668833
                                for 91 years
                                Multiply by   150

                                    £12715,032495

3. What is the present worth of £246 due at the end
of 30 years allowing 5 per cent compound Interest ?

Ans. £56,9189.

4. What is the present worth of £70 7 1,2048 due
7 years hence at 5 per cent Compound Interest ?

Ans. £50.

5. What sum will £1000 amount to at 4½ per cent
per annum in 5 years ?   Ans. £2246 3 7½, 624.

6. In what time will £500 become £607 15 0¾ at 5
per cent Compound Interest ?   Ans. 4 years.

7. My Servant James Arnold, receives on the 18th of
July, 1808, from Mr. William Jarvis, forty pounds in
full of an account delivered.   What receipt ought he to
give.

8. My friend Peter Careful, lends me on the 1st Jan-
uary, 1809, £550, which I agree to repay him in two
months.   Required the form of the promissory note.

9. Mr. John Torgan, gives me on the 7th Febuary,
1809, fifty six pounds ten shilling in part payment of a
debt he owes me.   Required a copy of the receipt.

10. Mr. Thomas Paris pays on the 11th of December,
1808, twenty five pounds, fifteen shillings and eight
pence by a bill on Simon Taylor, Merchant in Quebec, be-
ing part of a debt. What kind of a receipt shall I give him ?

11. Mr. Samuel Craig, of Liverpool owes Simon Sny-
der, of Montreal, two hundred and ninety six pounds
18s. which Craig draws for at three months sight.   Re-
quired a copy of the bill of Exchange.

12. Nathan Patterson, of Quebec owes James Demps-
ter of Montreal, £197 12s. which Patterson, draws for

on the 17th November, 1808, payable to Peter Wharton, or Order at one month. I demand a copy of the bill of Exchange and the receipt that Wharton sould give Dempster who received the above on account.

13. Richard Moorston, receives from Jacob Campbell, on the 11th of July, 1808, twenty seven pounds on account for the use of his son. I demand a copy of the receipt.

14. On the 25th of October, 1808, William Provost receives of Allen Morrice, eighty pounds twelve shillings in money, and also an assignment on William Sangster for the same sum. I demand a copy of the receipt that Provost must give Morrice who received it for half a years annuity.

15. On the 2d of February, 1809, Patrick Lawrence, receives of George Philips by the hands of Joseph Waggoner twenty three pounds in full for an account delivered. I demand a copy of the Receipt.

16. What will an annuity of £40 per annum amount to in 3 years at 5 per cent?   Ans. £126 2s.

17. What will the same annuity amount to in 15 years?
                                          Ans. £863,1425400.

18. What will an annuity of £75 per annum amount to in 12 years at 4 per cent, Compound Interest?
                                          Ans. £1126,935405.

19. What is the value of an estate of £250 per annum to continue forever, allowing the purchaser 5 per cent for his money?   Ans. £5000.

20. I have an estate that yields me £75 yearly rent—what is it worth in ready money at 5 per ct. Ans. £1500.

21. A Gentleman gives 25 years purchase for a freehold estate—what interest has he for his money?
                                          Ans. 4 per cent.

22. What annuity may an inhabitant of London aged 45 purchase for £1000 reckoning Compound Interest at 3 per cent?   Ans. £81,3.

23. A person aged 40 desires to secure himself an annuity of £20 in case he live to 60 for the remainder of his life, and proposes to purchase the same by annual payments, till he reach that age. How much should he pay, reckoning interest at 4 per ct.   Ans. £4,08.

TABLES OF COMPOUND INTEREST.

TABLE I.

THE AMOUNT OF £1 AT COMPOUND INTEREST.

3 per cent.	4 per cent.	5 per cent.	6 per cent.	7 pr. cent	8 per ct.
1,030000	1,040000	1,050000	1,060000	1,07000	1,08000
1,060900	1,081600	1,102500	1,123600	1,14490	1,16640
1,092727	1,124864	1,157625	1,191016	1,22504	1,25971
1,125508	1,169858	1,215506	1,262476	1,31079	1,36048
1,159274	1,216652	1,276281	1,338225	1,40255	1,46932
1,194052	1,265319	1,340095	1,418519	1,50073	1,58687
1,229873	1,315931	1,407100	1,503630	1,60578	1,71382
1,266770	1,368569	1,477455	1,593848	1,71818	1,85093
1,304773	1,423311	1,551328	1,689478	1,83845	1,99900
1,343916	1,480244	1,628894	1,790847	1,96715	2,15892
1,384233	1,539454	1,710339	1,898298	2,10485	2,33163
1,425760	1,601032	1,795856	2,012196	2,25219	2,51817
1,468533	1,665073	1,885649	2,132928	2,40984	2,71962
1,512589	1,731676	1,979931	2,260903	2,57853	2,93719
1,557967	1,800943	2,078928	2,396558	2,75903	3,17216
1,604706	1,872981	2,182874	2,540351	2,95216	3,42594
1,652847	1,947900	2,292018	2,692772	3,15881	3,70001
1,702433	2,025816	2,406619	2,854339	3,37293	3,99601
1,753506	2,106849	2,526950	3,025599	3,61652	4,31570
1,806111	2,191123	2,653297	3,207135	3,86968	4,66094
1,860294	2,278768	2,785962	3,399563	4,14056	5,03383
1,916103	2,369918	2,925260	3,603537	4,43040	5,43654
1,973586	2,464715	3,071523	3,819749	4,74052	5,87146
2,032794	2,563304	3,225099	4,018934	5,07206	6,34118
2,093777	2,665836	3,386354	4,291870	5,42743	6,84847
2,156591	2,772469	3,555672	4,549382	5,80735	7,39635
2,221289	2,883368	3,733456	4,822443	6,21386	7,98806
2,287927	2,998703	3,920129	5,111686	6,64883	8,62710
2,356565	3,118651	4,116135	5,418387	7,11422	9,31727
2,427262	3,243397	4,321942	5,743187	7,61225	10,06266

TABLE II.

THE PRESENT VALUE OF £1 COMPOUND INTEREST.

Yrs.	3 per cent.	4 per cent.	5 per cent.	6 per cent.	7 per cent.	8 per cent.
1	,970874	,961538	,952381	,943396	,934579	,925926
2	,942596	,924556	,907029	,889996	,873438	,857338
3	,915142	,888996	,863838	,839619	,816297	,793832
4	,888487	,854804	,822702	,792094	,762895	,735029
5	,862609	,821927	,783526	,747258	,712986	,680583
6	,837484	,790315	,746215	,704961	,666042	,630169
7	,813092	,759918	,710681	,665057	,622749	,583490
8	,789409	,730690	,676839	,627412	,582009	,540268
9	,766417	,702537	,644609	,591898	,543933	,500249
10	,744094	,675564	,613913	,558395	,508349	,463193
11	,722421	,649581	,584679	,526788	,475092	,428882
12	,701380	,624597	,556837	,496969	,444012	,397113
13	,680951	,600574	,530321	,468839	,414964	,367698
14	,661118	,577475	,505068	,442301	,387817	,340461
15	,641862	,555265	,481017	,417265	,362446	,315241
16	,623167	,533908	,458112	,393646	,338734	,291890
17	,605016	,513373	,436297	,371364	,316574	,270269
18	,587395	,495628	,415521	,350344	,295864	,250249
19	,570286	,474642	,395734	,330513	,276508	,231712
20	,558676	,456387	,376889	,311805	,258419	,214548
21	,537549	,438834	,358942	,294155	,241513	,198655
22	,521893	,421955	,341850	,277505	,225713	,183940
23	,506692	,405726	,325571	,261797	,210947	,170315
24	,491934	,390121	,310068	,246979	,197146	,157699
25	,477606	,375117	,295303	,232999	,184249	,146018
26	,463695	,360689	,281241	,219810	,172195	,135201
27	,450189	,346817	,267848	,207368	,160930	,125186
28	,437077	,333477	,255094	,195630	,150402	,115913
29	,424346	,320651	,242946	,184557	,140562	,107327
30	,411987	,308319	,231377	,174110	,131367	,099377

A L L I G A T I O N

TEACHES to mix two or more simples of different qualities, so that the composition may be of a middle quality ; and consists of two kinds : Alligation Medial and Alligation Alternate.

. . . .

ALLIGATION MEDIAL

IS when the quantities and prices of several things are given, to find the mean price of the compound.

R U L E.

Multiply each quantity by its price—add the products and divide their sum by the whole composition—the quotient gives the price of the compound.

EXAMPLES.

. 1. A corn-dealer mixes 10 bushels of wheat at 6s. per bushel, with 12 bushels of rye at 4s. 7d. per bushel and 18 bushels of barley at 2s. 6d. per bushel—What is the value of 1 bushel of the composition ?

Bushels 10 × 6s. = 60s. value of the wheat.
— 12 × 4s. 7d. = 55s. — — rye.
— 18 × 2s. 6d. = 45s. — — barley.

40) 160(4s. { value of one bushel of the mixture.
160

2. A vintner mixes 6 gallons of wine at 4s. 10d. per gallon with 12 gallons at 5s. 6d. and 8 gallons at 6s. 3¼d. What is a gallon of this composition worth ? Ans. 5s. 7d.

3. A goldsmith melts 4 ounces of gold 22 carats fine, 10 oz. of 21 carats fine, and 5 oz. of 18 carats fine—Required the degree of fineness of the composition.
Ans. $20\frac{8}{19}$ carats.

4. A composition being made of 5 lbs. of tea at 7s. per lb. and 9 lbs. at 8s. 6d. per lb, and 14½ lbs. at 5s. 10d. per lb.—what is one pound worth ? Ans. 6s. 10½d.

5. A grocer mixes 18 lbs. of raisins at 4d. per lb. with 28 lbs. at 6d. per lb. and 12 lbs. at 8d. per lb.—What is the price of a lb. of the mixture ? Ans. $6\frac{6}{51}$d. per lb.

ALLIGATION ALTERNATE

IS the method of finding what quantity of each of the ingredients whose rates are given, will compose a mixture of a given rate.

RULE I.

1. Write the rates of the simples in a column under each other.

2 Connect or link with a continued line the rate of each simple which is less than that of the Compound with one, or any number of those which are greater than the Compound, and each greater with one or any number of the less.

3. Write the difference between the mixture rate, and that of each of the simples opposite the rates with which they are linked.

4. Then if only one difference stand against any rate, it will be the quantity belonging to that rate; but if there be several, their sum will be the quantity.

NOTE.—From this Rule it appears that many of the quotients will admit of a variety of answers, by increasing or decreasing the quantities in any proportion.

EXAMPLES.

1. A vintner would mix 4 sorts of wine at 12s. per gallon, at 18s. per gallon, at 24s. per gallon, and at 26s. per gallon—What quantity of each must be taken?

$$
20\begin{cases}12\\18\\24\\26\end{cases}
\begin{matrix}6 \text{ at } 12 = 72\\4 \text{ at } 18 = 72\\2 \text{ at } 24 = 48\\8 \text{ at } 26 = 208\end{matrix}
$$

$$20 \qquad) \quad 400 \;(20 \text{ Proof.}$$
$$400$$

2d.

$$
20\begin{cases}12\\18\\24\\26\end{cases}
\begin{matrix}4 \text{ at } 12 = 48\\6 \text{ at } 18 = 108\\8 \text{ at } 24 = 192\\2 \text{ at } 26 = 52\end{matrix}
$$

$$20 \qquad) \quad 400(20 \text{ Proof.}$$

3d.

$$
20\begin{cases}12\\18\\24\\26\end{cases}
\begin{matrix}4+6 = 10\\6+4 = 10\\8+2 = 10\\2+8 = 10\end{matrix}
$$

In the last of these, the numbers are doubly combined.

2. I would mix teas at 5s. at 6s. and at 10s. per lb. so that I may sell the mixture at 8s.   What quantity shall I take of each? Ans. 2 lb. at 5s. 2 lb. at 6s. & 5lb. at 10s.

3. How much corn at 2s. 6d. at 3s. 8d. at 4s. and at 4s. 8d. per bushel must be mixed together, that the compound may be worth 3s. 10d. per bushel ?

Ans. 2 at 2s. 6d.—2 at 3s. 8d.—3 at 4s. & 3 at 4s. 8d.

4. A druggist has several sorts of tea—one sort at 12s. per lb. another at 11s. a third at 9s. and a fourth at 8s. What quantity must he take of each, to sell his compound at 10s.

Aus. 3lb. at 12s.—2lb. at 11s.—2lb. at 9s. 3d. & at 8s.

5. What quantity of gold 19 carats fine, 23, 21, 18 & 17 carats fine, must be taken to make up a compound of 2 carats fine ?

Ans. 2 at 17, 18, and 19, and 3 at 21 & 23 carats fine.

RULE II.

When the whole composition is limited to a certain quantity—Connect them and find an answer as before—then say as the sum of the quantities or difference thus determined is to the given quantity so is each ingredient found by linking to the required quantity of each.

EXAMPLES.

1. A merchant has wines at 6s. at 8s. at 11s. and at 15s. per gallon, of which he wishes to make a mixture of 50 gallons worth 9s,—how much shall he take of each sort ?

$$
9 \begin{array}{|c|c|}
6 - & 2 \\
8 - & 6 \\
11 - & 3 \\
15 - & 1 \\
\hline
& 12
\end{array}
$$

Then as 12 : 2 : : 50 : $8\frac{1}{3}$
       12 : 6 : : 50 : 25
       12 : 3 : : 50 : $12\frac{1}{2}$
       12 : 1 : : 50 : $4\frac{1}{6}$

50 Proof.

2. A grocer has currants at 4d. at 6d. at 9d. and at 11d. per lb. and he would make a mixture of 240 lbs. so that it might be afforded at 8d. per lb.—How much of each sort must he take ?

Ans. 72 lbs. at 4d.—24 at 6d.—48 at 9d. and 96 at 11d.

3. A merchant has tea at 5s. at 6s. at 8s. and at 9s. 6d. per lb. from which he wishes to make a mixture of 87 lb. to be sold at 7s. per lb.—How much must be taken of each sort ?

Ans. 29 lbs. at 5s.—29 at 9s.—14½ at 6s. & 14½ at 8s.

4. A goldsmith has gold 25 carats fine, some 22 and some 18 carats fine, of which he wishes to make a mixture of 60 ounces of 20 carats fine—How much must he take of each ? Ans. 12 of 24, 12 of 22 & 36 of 18 car. fine.

RULE III.

When one of the ingredients is limited to a certain quantity—Take the difference between each price and the mean rate as before : then, as the difference of that simple whose quantity is given is to the rest of the differences severally, so is the quantity given to the several quantities required. **EXAMPLES.**

1. How much wine at 12s. and at 8s. shall I mix with 40 gallons at 15s. per gallon, to be able to sell the mixture at 10s. per gallon?

$$10 \begin{vmatrix} 16-2 & 2 \\ 12-2 & 2 \\ 8-6+2=8 \end{vmatrix}$$

$$\begin{array}{l} 2:2::40: 40 \\ 2:2::40: 40 \\ 2:8::40:160 \end{array}$$

12

2. A tobacconist has tobacco at 1s. at 9d. and at 7d. per lb.—how much of each must he take to mix with 30 lb. at 24d. per lb. ?

Ans. 12 lb. of each sort to mix with the 30 lb.

SINGLE POSITION

TEACHES to resolve a variety of questions that cannot be wrought by any of the former rules. The results are always in proportion to the supposition.

RULE.

Take any number at pleasure and perform with it the conditions required in the question. Then as the false result is to the supposed number, so is the result in the question to the true number.

EXAMPLES.

1. Three merchants join in an adventure, with a stock of £1000—of this A. gave a certain sum, B. half as much as A. and C. as much as both—how much did each contribute?

Suppose A. gave £200, then B.=£100, & C.=£300, the sum of all the shares = £600—but it should have been £1000—therefore,

I say if £600 £200 £1000
                1000
                ————

600)200000(333⅓ A's share.
     1800   166⅔ B's share.
     ————   500 C's share.
     2000   ————
     1800   1000 Proof.
     ————
     2000
     1800
     ————
      200

2. Two gambles quarrelling about their game, each seized as many of the guineas on the table as he could—B. found that he had ¾ of the number, which exceeded ₄⁄₁₂ the share A. got by 18—Required the number of guineas on the table.   Ans. 54 guineas.

3. What number is that which being increased by ½, ⅓, and ¼ of itself, the sum will be 100?   Ans. 48.

4. A gentleman distributes 6s. 6d. among some poor people, consisting of men, women and children. To each man he gave 6d. to each woman 4d. and to each child 2d.—there were twice as many women as men, and twice as many children as women. How many were there of each?   Ans. 3 men, 6 women, 18 children.

5. What sum of money is that from which £5 being subtracted ⅔ of the remainder will be 40?   Ans. £65.

6. A. and B. having received equal sums of money, A. paid out of his £25, and B. of his £60—and then it appeared that A. had just twice as much money as B.—how much did each receive?   Ans. £95.

7. What sum is that whose $\frac{1}{3}$ part, $\frac{1}{4}$ part, and $\frac{1}{5}$ part, added together, shall amount to £94 ?   Ans. £120.

8. There was a delicious Cake among the Greeks, called Thrium, $\frac{1}{4}$ of which was of the finest flour, $\frac{1}{3}$ of Eggs and $\frac{1}{8}$ of Lard and Honey, to these were added 9 ounces of Milk. Required the weight of the whole Cake and of each ingredient ?   Ans. 240 ounces in all.

DOUBLE POSITION:

TEACHETH to resolve questions by two suppositions of false numbers.

RULE.

1. Take any two numbers and proceed with them according to the conditions of the question — find the differences or errors between the results and the given number.

2. Multiply each of these errors into the others supposition, and if both are of the same kind, that is both less or, both greater than the given number, divide the difference of the products by the difference of the errors.

3. But if the errors are not of the same kind, that is, if the one be greater, and the other less, then divide the sum of the products by the sum of the errors, the Quotient will be the answer.
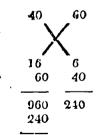
EXAMPLES.

1. Three persons discoursing about their ages—I am 18 years of age says A—I am as old as A and half as old as C, says B, and I am as old as you both said C. Required their respective ages.

Suppose C's age be 40   Suppose C's age to be 60
| Then B must be 20 | the half 30 |
| And A's age added 18 | add 18 |

| 38 B's age. | 48 = B's age |
| add A's age 18 | add A's = 18 |

| 56 | 66 |
| subtract C's 40 | 60 |

| 16 1st. error. | + 6 the error. |

```
   40      60
        X
   16       6
   60      40
  ─────   ─────
  960      240
  240
  ───
```

720=10)720(72 age of C—54=B's.—18 A's. Ans.

2. I think you have 20 Geese this year said A to B — no said B, but if I had as many as I have and half as many and two Geese and a half, then I should just have twenty—how many had he.   Ans. 7.

3. A Drunkard goes to a tavern and requests the host to lend him as much money as he had in his pocket, which being done, he drank six pence; he then went to a second, borrowing as much money as he had in his purse and spending six pence, he went to the third ale house and did likewise, but when he had spent his six pence, he found that he had nothing remaining—how much had he at first.   Ans. 5½d.

4. There is a Cistern with four cocks—the first cock will empty it in 6 hours, the second in 4 hours, the third in 3 hours, and the fourth in 2 hours—now I demand in what time they will empty it, if all a running at once.

5. A Gentleman hired a servant for 20 days at 18d. per day for every day he wrought, but for every day he was idle, he was to lose 12d.—at the end of the 20 days, the servant received 8 shillings—how many days did he work and how many was he idle.

Ans. 11d. 2h. 48m. at work—8d. 19h. 12m. idle.

6. A and B quarrel about £100 and each snatched as much as he could, but agreeing, B gives A ⅕ of what he had snatched and A gave B ⅓ and they had just £50 each —how much money did each snatch up.

A = £37 10s.
B =   62 10
      ─────
      £100 Ans.

O

7. A man stealing apples was met by A who took half his apples and returned 12. he then met B who took half of what he had and returned 7 ; afterwards meeting C he took half of what was left and returned 4, and he found that he had twenty apples left—how many had he at first. Ans. 76 apples.

8. A Gentleman has two horses and a saddle worth £50—now if the saddle be put on the back of the first horse, his value is double that of the second, but if it be put on the second, his value is triple that of the first— what is the value of each horse.   Ans. £30 and £40.

PERMUTATION OF QUANTITIES

DISCOVERS how many ways any given number may be placed or changed.

RULE.

Multiply all the terms in their natural order from one to the given number.

EXAMPLES.

How many changes might be rung in 6 music bells ?
$1 \times 2 = 2 \times 3 = 6 \times 4 = 24 \times 5 = 120 \times 6 = 720$ Ans.

2. How many changes may be rung in 12 bells, and what time would it require, supposing 10 changes to be rung in one minute, and the year to consist of 365 days 5 hours and 49 minutes ?
Ans. 479001600 changes ; and 91 years, 26 } days, 22 hours, 41 minutes.   }

3. In how many positions may a family of 9 persons be placed ?   Ans. 362880.

4. A gentleman gives an inkeeper £100 for liberty to lodge in his house as long as he could place the family, consisting of 7 persons, in different positions at table— The innkeeper accepted the offer—Now supposing they sat down at table 4 times a day—how long would the gentleman remain according to his agreement ?
Ans. 27 years, 8 months, 1 day.

EVOLUTION; OR, EXTRACTION OF ROOTS.

TO EXTRACT THE SQUARE ROOT.
RULE.

1. DIVIDE the given number into periods of two figures each, begining at the unit's place—

2. Find the nearest Root of the first period, which place in the quotient. Subtract its square from that period, and to the remainder bring down the next period—

3. Double the part of the root found for a new divisor—find how often it is contained in the dividend, excluding the unit's place—annex the number to the former quotient and also to the divisor—.

4. Multiply the divisor thus increased by the last figure placed in the Root—Subtract the product from the dividend—bring down the next period, and proceed as before.

Find the Square Root of 34969 root 187

```
                              of 31688   —  187  8 rem.
      34969(187               of  161    —   12  6885775
      1                       of 20736    — 144
      ———                     of   53    — 72801099
   28)249                     of 14161   — 119
      224
      ———
  367)2569
      2569
```

——————

SQUARE ROOT OF VULGAR FRACTIONS.
RULE.

REDUCE the fractions to their lowest terms—then extract the square root of the numerator for a new numerator, and the square root of the denominator for a new denominator—or reduce the fraction or fractions to decimals, and extract the root as in whole numbers.

What is the square root of $\frac{16}{25}$?

The square root of $16 = \frac{4}{5}$ Answer.
do. of $25 =$

What is the square root of $\frac{36}{49}$?
do. of $6\frac{1}{4}$?
do. of $\frac{144}{196}$?

Before you proceed to the following questions, illustra-
tive of the use of the square root, observe the following
rules—

1. To find a mean proportional between any two num-
bers—multiply the two numbers together and extract the
square root.

2. To find the side of a square equal in area to any
given superfices, extract the square root of the given su-
perfices, which root is the side of the square sought—

3. To increase diameters or diminish a circle in any
given proportion—Square the diameter, enlarge or dimin-
ish it in the proportion required—then extract the square
root of the result, which will be the diameter of the pro-
posed circle.

What is the mean proportional between 18 and 36 ?

```
            36
            18
           ───
           288
            36
           ───
           648(25,45+  Ans.
            4
           ───
        45)248
           225
           ───
       501)2300
          2016
          ────
      5085)28100
          25425
          ──  ───
           2975
```

What is the side of a square equal in superficial content
to a circle whose area is 2304 ?

```
           2304(48 Ans.
            16
           ───
         88)704
           704
```

A gentleman has a fish-pond, 16 yards in diameter, which he wishes to make four times the bigness—Required the area of the new pond.

Having the area of a circle, to find the diameter; as 355 : 452, or as 1 : 1,2732, so is the given area to the square of the diameter. What is the diameter of a circle whose area is 500 feet ?

$$1 : 1,2732 :: 500$$
$$5$$

636,6000(25,2+

16
16
——
96
16
——
256
4
—— yds.
1024(32 Ans.
9
——
62)124
124

To find any side of a right angled triangle, having the other two sides given—First for the longest side, or hypothenuse, extract the square root of the sum of the squares of the base and perpendicular—second, for the perpendicular or height, extract the square root of the difference of the hypothenuse and base—thirdly, for the base, extract the square root of the difference of the perpendicular and hypothenuse.

Let there be any right angled triangle, whose perpendicular is 48 and base 20 feet—what is the length of the hypothenuse ?

20	48	2704(52 feet, length of the
20	48	25 hypothenuse.
———	———	
400	384	102)204
2304	192	204
———	———	
2704	2304	

Suppose the hypothenuse 52 feet and the base 20 feet—required the perpendicular.

From 2704 square of the hypothenuse,
Take 400 square of the base.
———
2304(48 feet = perpendicular.
16
———
88)704
704

Suppose the hypothenuse 52 feet, and the perpendicular 48 feet—Sought the base.

From 2704 square of the hypothenuse,
Take 2304 square of the perpendicular.

$$\overline{}$$

400(20 feet=length of the base.
4

There is a round magazine whose ground floor contains just 1681 square feet—required the side of a square building of an equal area.   Ans. 41 feet.

A baker has an oven 12 feet in diameter, which is too large by ½—required the diameter of an oven to answer his purpose.   Ans. $10,\frac{9}{10}$.

A general has 32400 men which he forms into a square —how many in rank or file ?   Ans. 180.

CUBE ROOT.

RULE.

1. DIVIDE the given number into periods of three figures each, begining at the place of units—find the nearest root of the first period, place it in the quotient, and subtract its cube from that period and to the remainder annex the following period—which call the resolvend.

2. Square the part of the root found, and multiply it by 300 : Divide the resolvend by it, and put the quotient figure for the second place in the root—

3. Multiply the part of the root first found by the last figure placed in it, and this product by 30, which place under the divisor ; and under this put the square of the figure last placed in the root—

4. Multiply the sum of these three by the last figure placed in the root ; subtract the product from the resolvend, and to the remainder bring down the next period for a new resolvend, with which proceed as before.

What is the cube of 68921 ?

$$
\begin{array}{ll}
4^2 \times 300 \quad = 4800 & 68921(41 \text{ Ans.} \\
4 \ \times 1 \times 30 = 120 \quad 4^3 & 64 \\
1^2 \qquad\qquad\quad 1 & \overline{} \\
\overline{4921} &)4921 \\
& \quad 4921
\end{array}
$$

What is the Cube Root of 225911037643264(6090
216

9911037 resolvend

$60^2 \times 300$ = 1080000
$60 \times 9 \times 30$ = 16200
9×9 = 81

1096281
9=9866529

44508643264 resolvend.

$6090^2 \times 300$ = 11126430000
$6090 \times 4 \times 30$ = 730800
4^2 = 16

11127160816
4=44508643264

What is the cube root of 6967871 ?   Ans. 191.
of 7880599 ?   199.
of 456533 ?   77.
of 85184 ?   44.
of 163039787847 ?   5463.
of 94996712418949125 ?
Ans. 456285.

To find the side of a Cube equal in solidity to any giv_
en solid.—Extract the cube root of the solid content.

EXAMPLES.

The Solid content of a marble stone is 35937. Re-
quired the side of a cube of equal solidity ?

35937(33 Ans
27

$3^2 \times 300$=2700   8937
3×30= 270
9

2979
3=8937.

The solid contents of similar figures are to one another as the cubes of their diameters.

If a leaden bullet 4 inches diameter weigh 18lb. What will a bullet 7 inches weigh ?

```
    4              7
    4              7
   ——             ——
   16             49
    4              7
   ——             ——
   64 : 18 :: 343
   •               18
                  ———
                  2744
                  343
                  ———
              64)6174(96,468½)
                  576
                  ———
                   414
                   384
                  ———
                   300
                   256
                  ———
                   440
                   384
                  ———
                   560
                   512
                  ———
                    48
```

To find the diameters of a solid body, having those of another similar one given either greater or less.—Cube· the dimension given—augment or diminish them accord-ing to the required proportion and extract the cube root of the result.

A ball whose diameter is 10 inches, weighs 62½ lbs. Required the diameter of another ball whose weight is 13¼ lbs.

$$10$$
$$10$$
$$\overline{}$$
$$100$$
$$10$$
$$\overline{}$$

625 : 1000 :: 135=216 root 6 inches.

2. The circumference of a cable being 7¼ inches, one fathom weighs 16¼ lbs. How many pounds does one fathom of a cable weigh whose circumference is 11¾ inches.

square.   pounds.   square.   pounds.
As 52,5625 : 16,25 :: 138,0625 : 42,6828 Ans.

To find two mean proportionals between any two given numbers—divide the greater extreme by the less and the cube root oft he quotient multiplied by the less extreme gives the less mean ; multiply the same cube root by the less mean and the product is the greater mean proportional.

EXAMPLE.

What are the two mean proportionals between 4 & 500.
$$4)500$$
$$\overline{}$$

$$125(5 \text{ cube.}$$
$$4$$
$$\overline{}$$
$$20 \text{ less mean.}$$
$$5$$
$$\overline{}$$
$$100 \text{ greater mean.}$$

ARITHMETICAL PROGRESSION.

ANY rank of numbers that increase or decrease, by a common difference are said to be in Arithmetical Progression, as, 1, 2, 3, 4, 5, &c. and 11, 9, 7, 5, 3, 1, &c. the numbers composing the series are called, the terms of the Progression.

Any three of the five following terms being given, the other two may be found.

1. The first term.
2. The last term.
3. The number of terms.
4. The common difference.
5. The sum of all the terms.

PROBLEM 1.—Given the extremes and number of terms to find the sum of all the terms.

RULE.—Multiply the sum of the extremes by half the number of terms and the product will be the answer.

EXAMPLES.

The first term is 3, the last 33 and the number of terms, 11. Required the sum of the series ?

33 greater extreme.
 3 the less.

36 the sum.
5,5 half the number of terms.

⌐⌐⌐
180
180
⌐⌐⌐
198,0   Ans. 198.

1. A man bought 7 yards of Cloth and gave for the first yard 3s. and for the last 27s. What did the 7 yards amount to ?   Ans. £5 5s.

2. How many strokes does a clock strike in 12 hours ?
Ans. 78.

3. How many strokes doth the Venitian clocks strike in a revolution which go 24 hours ?   Ans. 300.

4. If 100 stone are placed in a line exactly 1 yard assunder and the first a yard from a basket. What length of ground will that man go over who gathers them up singly, and returns with them one by one to the basket ?
Ans. 1¾ mile, and 120 yards.

PROB. 2.—Given the extremes and the number of terms to find the common difference.

RULE.—Divide the difference of the extremes by one less than the number of terms, the quotient is the common difference.

EXAMPLES.

Let the extremes be 4 and 68 and the number of terms 17.   Required the common difference.

$$68$$
$$-4$$
$$\overline{}$$

Divide by $17 - 1 = 16)64($ common difference.
$$64$$

2. If a person purchases 7 yds. of Cloth and gives for the first yard 3s. and for the last 27s.   What is the common difference of the price of each yaad ?   Ans. 4s.

PROB. 3.—Given the extremes and common difference to find the number of terms.

RULE.—Divide the difference of the extremes by the common difference—the quotient increased by 1 is the number of terms.

1. Let the extremes be 2 and 56, and the common difference 3.   What is the number of terms ?
$$56 - 2 = 54 \div 3 = 18 + 1 = 19 \text{ Ans.}$$

2. If the extremes be 3, and 33, and the common difference 3.   What are the number of terms?   Ans. 11.

PROB. 4.—Given one extreme, the common difference and the number of terms, to find the other extreme and the sum of the series.

RULE.—Multiply the common difference by the number of terms less one, and the product will be the difference of the extremes.   Add this product to the less extreme for the greater, or subtract it from the greater for the less.

The last term is 56, the number of terms 19, and the common difference 3 — what is the first term ?

$$3$$
$$18$$
$$\overline{}$$
$$54$$
$$56$$
$$\overline{}$$
$$2 \text{ less extreme.}$$
$$54$$
$$\overline{}$$
$$56 \text{ greater do.}$$

If the greatest term be 70, the common difference 3, and the number of terms 21—What is the least term and sum of the series ? Ans. 10, the last term, & the sum 810

A debt can be discharged in a year by paying 1 shilling the first week, 3 shillings the second week, and so on always 2 shillings more every week—What is the debt, and what will the last payment be ?

Ans. £135 4s. the debt, and the last payment £5 5.

GEOMETRICAL PROGRESSION.

When any rank or series of numbers increase by one common multiplier, or decrease by one common divisor, it is said to be in Geometrical Progresssion—thus, 1, 4, 16, 64, 256, &c. ; here the common multiplier or ratio is 4—and 81, 27, 9, 3, &c. ; here the common divisor or ratio is 3.

PROBLEM 1.— Given the extreme and ratio to find the sum of the series.———RULE. Multiply the last term by the ratio, and subtract the first term from the product—the remainder divided by the ratio less one, will give the sum of the series.

EXAMPLES.

1. The extremes of a geometrical progression are 2 and 8192 and the ratio 2—what is the sum of the series?

```
      8192
         2
      ―――
     16384
         2
      ―――
2—1  )16382(=16382          Ans. 16382.
```

2. A gentleman sold 800 acres of land for which he got 2s. for the 1st 100 acres, and for the last 32768s. ; the ratio was 4—what were the 800 acres sold for ?

```
20)4369,0
――――
£2184 10s. Ans.
```

3. A nobleman demands of a Jeweller the price of a casket containing 12 very brilliant diamonds—the jewel-

ler demanded 5s. for the 1st. 10s. for the 2d, doubling the price each time—the price of the 12th was £512—What was the price of the whole ? Ans. £1023 15s.

PROB. 2.—Given the first term, the ratio, and number of terms to find any term assigned.

RULE 1.—Find a few of the leading terms over which place their indices, begining with a cypher.

2. Find what fignres of the indices when added togeth-er, give the index less by one than that of the term sought.

3. Multiply the numbers standing under such indices, into each other and make the product a dividend.

4. Raise the first term to a power whose index is one less than the number of terms—multiplied, and make the result a divisor.

5. Divide the dividend by this divisor and the quotient is the term sought.

NOTE.—The indices must begin with an unit, when the first term of the series is equal to the ratio—and in this case the product of the different terms, instead of being only a dividend, would be the term sought.

EXAMPLES.

1. A Jeweller wishing to purchase 9 rich pearls, a-greed to give 1 guinea for the first, 2 for the second, &c.—doubling the price each time as he proceeded to the last. What was the price of the pearls.

First $\begin{cases} 0, 1, 2, 3, 4, 5, \text{ Indices.} \\ 1, 2, 4, 8, 16, 32, \text{ Terms.} \end{cases}$

And $\begin{cases} 5+3= \text{number of terms less one.} \\ 32\times8=256 \text{ Guineas.} \end{cases}$ Ans. 256 guineas

2. There is a Geometrical series whose first term is 3 and second term 6,—required the 12th term.

$$\frac{6}{3}=2 \text{ the common ratio.}$$

$\begin{cases} 0, 1, 2, 3, 4, 5, 6, \text{ Indices.} \\ 3, 6, 12, 24, 48, 96, 192, \text{ Terms.} \end{cases}$

Then $6\times5=$ Index to 12th term,

And $192\times96=18432=$ the dividend which in this case is divided by 3 the first power of 3, because the number of terms multiplied being only 2 and 2—1 = 1

P

the power to which 3 is to be raised—therefore $\frac{18432}{3}=$
6144 the term required, otherwise.

$2+1+5=$ Index of 12th power.

$12 \times 18 \times 96 = 55296 \div$ by the square of three,
because in this case 3 terms are used and $\frac{55296}{9} = 6144$ as
before.

EXAMPLES.

1. An Indian having first discovered the game of Chess,
shewed it to his king, who was so delighted with the in-
vention, that he bid him ask what he would, as a reward
for his ingenuity ; upon which he requested 1 grain of
wheat for the first square on the Chess board, 2 for the
second, 4 for the third, &c. doubling continually to 64
the whole number of squares.   The King astonished at
the apparent insignificance of the request, commanded the
wheat to be given him.   Now supposing 640,000 grains
$=$ t bushel.   It is required, how many ships of 200 tons
burthen, were necessary to carry off the wheat—allowing
40 bushels to make a ton ?   Ans. 3602879701 $\frac{2}{5}$.

2. A Gentleman gives his daughter 4s. on her marri-
age day, promising to triple the sum on the first day of
every month for 9 months.   What was the lady's por-
tion ?   Ans. £1968 4s.

ARTIFICER'S WORK.

THE common method of calculating feet and inches
by Duodecimals or cross Multiplication and also by Prac-
tice, has already been given, but the best method is to
take the dimensions of all sorts of Artificer's work by
feet, tenths and hundredths, because the computations
may then be performed by Simple Multiplication, or by
the Sliding Rule now to be described.

SLIDING RULE.

THIS instrument consists of two pieces of a foot in
length each, which are connected together by a brass joint.
On the sliding side of this rule are four lines of num-
bers, marked A, B, C, D,—The two middle ones B and
C are upon the slider.   Three of these lines A, B and C

are double because they proceed from one to ten twice over, and the fourth line D is single, proceeding from 4 to 40 and is called the girt line.

The use of the double lines A and B is for working proportions and finding the areas of plane figures. And the use of the girt line D and the other double line C is for measuring solids.

When 1 at the begining of any line is counted 1, then the 1 in the middle will be 10 and the 10 at the end 100 —and when 1 at the beginning is counted 10, then 1 in the middle is 100 and the 10 at the end 1000, &c. and all the small divisions are altered in value accordingly.

PROBLEM 1.—To find the product of any two numbers, 6 and 24.

RULE.

Set 1 upon A. to one of the numbers 24 upon B. then against the other number 6 upon A. will be found the product 144 upon B.

NOTE.—When the third term runs beyond the end of the line, seek it on the other part of the line and increase the product ten times.

PROB. 2.—To divide one number by another, as 664 by 8.   RULE.

Set the divisor 8 on A. to 1 on B. then against 664 on A. is the equivalent 83 on B.

NOTE.—When the dividend runs beyond the end of the line, diminish it 10 or 100 times to make it fall on A, and increase the quotient accordingly.

PROB. 3.—To square any number, as 25.

RULE.—Set 1 upon D. to 1 upon C. then against 25 upon D. will be the square 625 on C.

If you would square 250, reckon the 1 on D. to be 100; then the 1 on C. will be 100 and the product be 62500.

PROB. 4.—To extract the square root of any number, as 1296.   RULE.

Set 1 upon C. to 1 upon D. then against 1296 the number upon C. is 36 on D. the true root.

PROB. 5.—To perform proportion by the sliding rule —suppose the number : 8 : 34. and 58.

RULE —Set the first number 8 upon A. to the second 34 upon B. then against the third number 58 on A. is the fourth proportional 246½.

NOTE.— When one of the middle numbers runs off the line, take the 10th part of it only, and augment the an- swer ten times—To find a third proportional is exactly the same, the second number being twice repeated.

Thus suppose a third proportional was required to 2 and 42—Set the first 26 on B. to the second 42 on A. then against the second 42 on B. is 67,8 which is the third proportional required.

OF TIMBER MEASURE.

PROBLEM 1.—To find the area or superficial content of a board or plank.

RULE.—Multiply the length by the breadth and the product is the content sought.

NOTE.—When the board is tapering, add the breadth of the two ends together, and take ½ the sum for the mean breadth.

1. Required the area of a plank 15 inches broad and 18 feet long.

Decimally.	Duodecimally.	Practice.	By Reduction.
18	18	3-¼)18	18
1,25	1 3	———	12
———	———	4 6	———
90	18	———	216
36	4 6	22 6	15
18	———		———
———	22 6		1080
22,50			216

141)3240(22
288
———
360
288
———
72 } = ¼
———
141

BY THE SLIDING RULE.

Set 15 inches on B. to 12 on A. and against 18 on B.
is 22,6 on A.　　　EXAMPLES.

1. At 1½d. per foot, what is the value of a plank 13½
feet long by 11 inches wide?

2. Find the value of 5 oaken planks at 3d. per foot.
each being 17½ feet long, and their particular breadth as
follows, viz. 2 of 13½ inches in the middle, one of 14½
inches in the middle, and the two remaining ones each 18
inches at the broader end, and 11¼ at the narrower.
　　　　　　　　　　　　　　　　Ans. £1 5 9¼.

PROB. 2.—To find the solidity of squared or four sided
timber.——RULE. Multiply the mean breadth by the
mean thickness, and the product again by the length, and
it will give the solidity required.

EXAMPLES.

1. If a piece of timber squared be 2ft. 9in. thick, 1ft.
7in. broad & 16ft. 9in. long. how many feet of timber in
the piece?　　　BY THE SLIDING RULE.

Set the length in feet on C. to 12 on D. then against ½
the girt on D. you have the answer.

Decimally.	Duodecimally.	Practice.	Reduction.
2,75 thickness.	2 9	$6=\frac{1}{2}$　2 9	23
195, 8×breadth.	1 7	1 4 6	19
——	——	$1=\frac{1}{6}$　2 9	——
2200	2 9'		297
1375	1 7 3	4 4 3	33
275	——	$6=\frac{1}{2}$　16	——
——	4 4 3		627
4,3450	16 8 0	69 8 0	201
1675	———	$3=\frac{1}{4}$ 2 2 1 6	——
——	69 8 0	1 0 9	627
217250	3 3 2 3	——— 12540	
304150	72 11 2 3	72 11 2 3 ———	
260700		$\Big\{$　　131)126027(875	
43450		12)875=72f. 11 2 3	

72,778750

2. The length of a piece of timber is 21.5 feet, and its
ends are equal squares whose sides are each 1,04 feet—
what is the solidity?　　　　　　Ans. 25,6 feet.

3. The length of a piece of timber is **20,38 feet**, and the ends are unequal squares—the side of the greater being 19⅝ inches, and that of the less 9⅜ inches—Required the solidity.   Ans. 29f. 4.

PROB. 3.—To find the solidity of round or unsquared timber.   RULE 1.

Multiply the square of the greater girt (or ¼ of the circumference) by the length, and the product will be the content, according to the common practice.

BY THE SLIDING RULE.

Set the length upon C. to 12 on D. and against ¼ the girt upon D. you have the answer on C.

EXAMPLES.

1. The length of a tree is 25 feet, and the girt 2½ feet—what is the solidity?

$$7,5 = \tfrac{1}{4} \text{ the girt.}$$
$$7,5$$

$$
\begin{array}{r}
375 \\
525 \\
\hline
56,25 \\
25 \\
\hline
28125 \\
11250 \\
\hline
\end{array}
$$

144)140625(9,75=9ft. 9in.   Ans. 9ft. 9in.

RULE 2.—Multiply the square of ⅓ of the girt by twice the length, and the product will be the solidity, extremely near the truth.

Take the last example, ⅓ the mean girt=6

$$
\begin{array}{r}
6 \\
6 \\
\hline
36 \text{ square.}
\end{array}
$$

twice the length 50

$$18,00 = 12\tfrac{1}{2} \text{ feet.}$$

EXAMPLES.

1. The length of a tree is 14½ feet, and its girt in the middle 3,15—Required the solidity.   Ans. 9 feet, nearly.

2. The girts of a tree in four different places are 5 feet 9 inches, 4ft. 5in. 4ft. 9in. and 3ft. 9in.—the length of the tree is 15 feet. Required the solidity. Ans. 20ft. 5in.

3. Required the solidity of an oak tree 45ft. 7in. long, and its quarter girt 3ft. 8in, allowing ½ for the bark.

Ans. 515 feet nearly.

4. If the length of a tree be 24 feet and the girt . . 10'. out 8 feet, what is the content ? Ans. 132 feet, nearly.

5. If the tree girt 14 feet at the thicker end and 2 feet at the smaller end—required the solidity, the length being 32 feet. Ans. 128.

Note.—The usual way to measure round timber is to gird the tree in the middle with a small cord—then ¼ of the girt is taken for the side of the square. Tapering timber is measured by girding it in two or more places and dividing the sum of the girts by their number for the mean girt.

6. What is the solid content of a round tree 25 feet long and the girt in the middle 45 inches ?

Ans. 21ft. 11in. 8″ 9‴.

ARTIFICERS estimate or compute the value of their work by different measures.

. . . .

BRICK-LAYER's WORK.

BRICK-LAYERS measure their work by the rod of 16½ feet, whose square is 272¼ and the standard thickness they reckon a brick and a half thick. To this thickness other dimensions must be reduced, which is done by multiplying by the half bricks in the thickness and dividing by 3 half bricks or the standard thickness.

. . . .

MASON's WORK.

TO Masonry all sorts of Stone Work belong ; and the measure made use of is a foot, either solid or superficial. Pavements, slabs, chimney-pieces, &c. are measured by the superficial foot—Walls, blocks of marble or stone, columns, &c. are measured by the solid foot.

CARPENTER's & JOINER's WORK

CARPENTER's and Joiner's Work consists of floor-ing, partitioning, roofing, &c. and is measured by the square of 100 feet.

. . .

SLATER's & TILER's WORK.

THE content of a roof is found by multiplying the length of the ridge by the girt from eve to eve ; and in slating, allowance must be made for the double row at the bottom ; and double measure is commonly allowed for gutters, vallies, &c. but no deductions are made for chimnies.

. . . .

PLAISTERER & PAINTER's WORK.

PLAISTERING and Painting are measur'd by the square yard—deductions are made for all vacancies.

. . . .

GLAZIER's WORK.

GLAZIERS take their dimensions in feet, inches and parts, and estimate their work by the square foot. Win-dows of every form are measured as if they were squares, on account of the waste attending the cutting of the glass.

PRACTICAL QUESTIONS.

1. THERE is a wall 72ft. 6in. long, 19ft. 3in. high, and 5½ bricks thick—Required the number of rods.
Ans. 16r. 3quar. 12ft.

2. If a wall be 245 feet 9 inches long and 16½ high and 2¼ bricks thick, required the number of rods of brick-work. Ans. 24r. 3qua. 24ft.

3. I wish to build a house 45 feet long and 15 feet broad within the walls, the height to be 20 feet, and the gable 6 feet high above the wall, the whole being 2 bricks thick—Required the content in rods. Ans. 12,1761.

4. Required the solid feet in a stone wall that is 97ft. 5in. long, 18ft. 3in. high, and 2ft. 3in. thick.
Ans. 400ft. 2in.

5. What is the value of a marble slab whose length is 5ft. 9in. breadth 3ft. 4in. at 7s. 6d. per square foot ?
Ans. £7 3 9.

6. I wish to wainscot a room that is 15 feet 9 inches high, and 126 feet 3 inches in compass—How many yards does it contain ? Ans. 220 yards 8 feet.

7. A floor is $53\frac{1}{2}$ feet long and 47 feet 9 inches broad. Required its content in squares ? Ans 25 yds. 54 ft.

8. A Carpenter undertakes to build a house 45 feet long, the breadth 24 feet and height 14 feet, at £4 6s. the square. What will it cost ? Ans. £81 2s. $10\frac{1}{2}$d.

9. If a house measure within the walls 52 feet 8 inches in length and 30 feet 6 inches in breadth and the roof be of a true pitch. What will it cost roofing at 10s. 6d. per square ? Ans. £12 12s. $11\frac{4}{4}$d.

10. A Tiler wishes to know how many squares there are in a roof $40\frac{1}{2}$ feet in length and girt $40\frac{3}{4}$ feet ?

 Ans. 20,55375.

11. What will the tiling of a barn cost at 25s. 6d. per square, the length being 43 feet 10 inches and the breadth 27 feet 5 inches on the flat, the cave boards projecting 16 inches on each side ? Ans. £24 9s. $5\frac{1}{2}$d.

12. There is a quantity of partitioning that measures 231 feet 8 inches about and 11 feet 6 inches high and is rendered between quarters ; the lathing and plastering 8d. per yard and the whiting 2d. per yard. What will the whole come to ? Ans. £13 17s. $2\frac{1}{4}$d.

Note.—In rendering between quarters, you deduct $\frac{1}{5}$ and in whiting and colouring you add $\frac{1}{5}$.

13. If a cieling be 59 feet 9 inches long and 24 feet 6 inches broad. How many yards are in that room ?

 Ans. 162 yards 5 feet.

14. If a room be painted whose height is 16 feet 6 inches. How many yards are in that room ?

 Ans. 179 yard 2 feet.

15. A house has three rows of windows, five in a row, the height of the first is 5 feet 6 inches, the second 5 feet 3 inches and the third 4 feet 9 inches, the breadth 2 feet 6 inches. Required the number of feet and the expence of Glazing at $9\frac{1}{2}$d. per square foot ?

 Ans. 193 feet 9 inches, Expence £7 13s. $4\frac{1}{2}$d.

A CARPENTER'S ACCOUNT.

JAMES BREBNER, ESQ. DR.

1808. To DANIEL THOMPSON

July 15. To 753 yds. 3 ft. 8 inches of Flooring at 6s. 4d.
    To 151 yards 9 inches Painting at 7 1-2d.
    To 158 yards 1 foot 3 inches Plastering at 4½d.
Aug. 8. To 1737 feet of Timber at 1s. 6 1-2d.
    To 6 squares 6 yards 6 feet Slating at 14s, 6d.
    To 196 feet 10 inches 6 pt. Sawing at 1-2d.
Sept. 12. To 12 boards, each 14 feet 8 inches long and 10 1-2
    broad at 2½d. per foot.
    To 6 square Logs each 14½ feet long and 11¾
    inches, the side of the square at 1s. 8d.
    the solid foot.

Answer £286 17 4¾d

LAND SURVEYING.

NO man can be a skilful surveyor, who is not completely master of arithmetic, geometry, and trigonometry. Here therefore, we can only give a few practical rules, which may be useful to the gentleman or farmer, who may be desirous of finding the true content of a piece of ground. OF THE CHAIN.

LAND is measured with a Chain, called Gunter's chain, (from its inventor,) of 4 poles or 22 yards or 66 feet in length. It consists of 100 equal links, and the length of each link is therefore $\frac{22}{100}$ of a yard or $\frac{66}{100}$ of a foot or 7,92 inches.

Land is estimated in acres, roods, and perches. An acre is equal to 10 square chains—that is, 10 chains in length and 1 in breadth—or, it is $220 \times 22 = 4840$ square yards—or, it is $40 \times 4 = 160$ square poles—or, it is $1000 \times 100 = 100000$ square links ; these being all the same quantity.—— A square pole, or the square of 5½ yds. long, or the square of ¼ of a chain, or of 25 links is 625 square links.

In measuring lines, it is best to set down the links as integers, and when the content is found it will be in square links ; then cut off 5 of the figures on the right hand for decimals, and the rest will be acres—The decimals cut off are multiplied by 4 for roods, and by 40 for perches.

A cross staff is 5½ feet long, made sharp at one end to enter into the ground : On the top a round brass plate or a piece of wood is placed. If the plate be brass, it is

furnished with sights : If it be of wood, saw two sticks a quarter of an inch deep, at right angles. This staff is useful to measure small and crooked pieces of ground, and to raise perpendiculars. When chaining in the field, if you have occasion to raise a perpendicular to any assigned point or corner, your eye can inform yon, if you are near the place, on which it should fall : Then stick down your cross staff perpendicularly, fixing one of its lines directly over your chain & parallel to it : Apply your eye to the other end of the line on the staff head— and looking along the same, if you perceive the assigned point in a direct line with that which you look along, you have found the place ; but if the mark lies to the right or left, you must move your staff, and place it accordingly.

An off-set staff, divided into ten links or 6½ feet, is a very useful instrument for measuring off-sets and other short distances.

Ten small arrows, or rods of iron or wood, are used to mark the end of every chain's length in measuring lines.

• • • • • •

PROBLEM 1.—To find the content of a square piece of land.——Measure one of the sides with the chain, which being multiplied into itself, gives the content required.

EXAMPLE 1. What is the content of a square garden whose side is 4 chains 5 links ?

$$
\begin{array}{r}
4.05 \\
4,05 \\
\hline
2025 \\
1600 \\
\hline
1,64025 \\
4 \\
\hline
2,56100 \\
40 \\
\hline
22,44000 \\
5\ 1\text{-}2 \\
\hline
220000 \\
22000 \\
\hline
2,42000
\end{array}
$$

Ans. 1a. 2r. 22p. 2yds.

Prob. 2.—To find the content of a rectangle, or long square.————Multiply the length by the breadth ; the product is the content.

Example. There is a field 16 chains 24 links in length, and 7 chains 44 links in breadth—What is the area ?

Ans. 12a. 1r. 20¾p. \.

Prob. 3.—To find the content of a triangular piece of ground.....Chain along the base : Find by the cross-staff, where the perpendicular falls, and measure its length : Then multiply half the base into the perpendicular, for the content or the whole base into the perpendicular, and half the product is the answer.

Example. There is a triangular piece of land, whose base is 14 chains, and the perpendicular 7 chains 28 links. Required the area. Ans. 5a. 3r. 15p. 36.

The area of a triangle may be found without the help of a perpendicular. Add the sides of the triangle into one sum—from the half of this sum subtract each side respectively : Multiply these three differences and the half sum into one another :—The square root of the product is the area.

PROBLEM 4.
TO MEASURE OFFSETS.

Let the following figure represent the side of a large Field being a right lined offset. Required the content ?

In order to measure these offsets—place yourself at A and fix upon a mark in the opposite hedge at K—then measure the perpendicular A B—enter A in your field book, return to the point A and as you are chaining the base line A K, take up the several perpendiculars, R C, Q D, P E, O F, N G, M H, L I.—To find the true area of all the offsets thus taken up, observe the following RULE.—Multiply the sum of every two adjacent perpendiculars, by the intermediate distance upon the base line—and half the product is the content.

To find the intermediate distance—Subtract the forego-
ing length or distance from the following—for instance
the intermediate distance between the fifth and sixth per-
pendiculars is found by subtracting 19 40 (that is to say
19 chains, 40 links counting from A) from 20 chains 80
links, the remainder 1 chain 40 links is the intermediate
distance—in like manner may the rest be found.

	Chains.	Links.	Dimensions.	Chains.	Links.
No. 1		0	————————	2	40
No. 2	3	12	————————	0	20
No. 3	10	20	————————	2	52
No. 4	14	00	————————	0	70
No. 5	19	40	————————	0	70
No. 6	20	80	————————	2	60
No. 7	24	44	————————	1	06
No. 8	28	28	————————	1	28
No. 9	29	36	————————	0	

（Distance on the base line.）

2,40 1st Perpendicular.	0,20 2d Perpendicular.
0,20 2d do.	2,52 3d do.
2,60 Sum.	2,72 Sum.
3,12 Intermediate distance.	7,08 intermediate distance.
520	2176
260	19040
780	
	19,2576
8,1120	

In the same manner may the other areas be
found, and the several products will be as follows :

```
            8,1120
            19,2576
            12,5560
             7,5500
             4,6260
            13,5224
             8,7920
             1,4336
          2)75,3336
            3,76668
                 4
            3,76672
                40
            9,66880       Ans. 3a. 3r. 8p,      9
```

PROB. 6.—To measure an irregular field.—Required the content of the following field, in acres, roods, & poles

You are supposed to enter the field at C, and as you chain from C to E take up the South off-setts to the left hand—Next chain the second station from E to F, an take up the West off-setts—Chain from F to G, takin up the North off-set—and then chain from G to C, tak ing up the last off-set—Lastly, measure the Trapezium C E F G, by chaining the base line C F, & take the right hand off-sett X G, and the left Y E.

DIMENSIONS.

South off-setts left hand. 1st Station.		West off-setts left hand 2d Station.		North off-setts left hand 3d Station.		East off-setts left hand 4th Station.		Trapezium.	
0	0	0	0	0	0	0	0	0	0
0.90	1.66	1.66	1.20	1.24	1.44	2.72	1.86	8.80	10.26
2.83	1.32	4.72	0.00	5.54	0.—	4.00	1.10	15.30	12.70 L
4.46	0.60	9.60	1.60	10.80	3.32	5.70	2.00	24.86	0.
6.80	1.80	11.96	1.14	15.30	3.54	8.20	2.00	Content 456.	
8.30	1.60	14.94	1.90	18.40	3.66	11.32	0.70	Perches.	
10.50	0.20	15.90	0.00	19.90	0.—	13.40	0.		
12.30	1.66	Content		Content		Content			
16.90	2.34	245 3-4 perch.		655½ perches.		282 Perches.			
16.70	2.20								
17.80	0.00								
19.60	0.94								
19.96	0.00								
Content 403 3-4 perches									

THE PRODUCTS COLLECTED.

```
        4,566¼
          403¾
          245¼
          655½
          282
        ───────
  160)6153(38a. 1r. 33p. Ans.
      480
      ───────
      1353
      1280
      ───────
      40)73(1
         40
         33
```

Sometimes such a figure as that above is computed by finding a mean breadth and mean length. But however expeditious this method may appear, it is always false ; though the error diminishes according to the number of breadths and lengths from which the measures are taken. In this field the mean of four lengths was formed 21,74 and the mean of 6 breadths 18,33. These two numbers multiplied into each other, give an area of 39a. 3r. 17p. which is more than the truth by 1a. 1r. 24p.

The general flatness of this country and the continued woods, render the more elegant and scientific methods of surveying in some degree useless. The townships are commonly laid out in right lines, and if attention be paid to the compass the business of the surveyor is rather a labor of body than of mind. Great care, however, should be taken of the variation of the compass and of the back sight. When any minerals appear to disturb the magnet, stakes should be used. In fine the surveyor who is ambitious of correctness, must never spare labor — He must not go round large trees or other impediments which he finds in his way, if it be possible to remove them.

A GENERAL EXERCISE.

1. REQUIRED the age of the world at the time of the Flood from the 5th Chapter of Genesis and the 6th verse of the 7th Chapter—also the length of time from the Flood to the call of Abraham, from the 10th and following verses of the 11th Chapter and 1st verses of the 17th Chapter ? Ans. 2047 years.

2. From the Creation to the Flood were 1656 years—to the call of Abraham 426 years—to the departure of the Israelites 430 years—to the siege of Troy 307 years—to the building of Solomon's Temple 180—to Homer's time 97—to the establishment of the Spartan government by Lycurgus 23—to the first Olympiad 108—to the building of Rome 23—to the Jewish captivity 147—to the return of the Jews 70—to the expulsion of the Kings from Rome 27—to the beginning of the Peloponnesian war 78—to the burning of Rome by the Gauls 41—to the conquest of Persia by Alexander 57—to the first Punic war 69—to the destruction of Carthage 118—to the death of Julius Casar 102—to the Christian Ara 44—and from the Christian Ara to the present time 1808 years. Required the time from the Creation to the present ? Ans 5812 years.

2. The Marriners compass was invented in 1302 ; Printing in 1440—and America was discovered in 1492. How many years were there between each of these discoveries ? Ans. 128, 52, 190.

4. Gunpowder was invented in 1344 - Gunpowor plot was discovered in 1605. How many years between, and how many years are there since each of these events ? Ans. 261, 464, 203.

5. If the human heart beat 70 times in a minute, and each pulsation transmit 4oz. Avoirdupoise of blood and the whole blood be $\frac{1}{25}$ part of the weight of the body. In what time will the blood of a man whose weight is 140 lbs. circulate through the heart ? Ans. 24 seconds.

6. A General commanding an army of 12000 men, which he increased $\frac{1}{4}$ by recruiting, afterwards he lost $\frac{1}{4}$

by disease and ¼ of the remainder fell in battle. How many were left? Ans. 10,500 men.

7. In the army, the parade step is 70 paces each 2 feet 6 inches per minute. Required the movement per hour?
Ans. 1m 7f. 36p. 2yds.

8. The Quick time marching is 2 paces per second — required how many miles that is per hour?
Ans. 3m. 3f. 10p. 5yds.

9. A circle round the earth measures 24952 miles — how long would a ship take to sail round it at the rate of 6 miles an hour: if it met with no interruption?
Ans. 173d. 5h. 20m.

10. A Gun being fired at 13 miles distance, the report is heard a minute after the fire is seen. Required how far sound moves in a second? Ans. 1144 feet.

11. A Baker purchases 17 qrs. of Wheat at 55¼ shillings which he grinds into 40cwt. of flour, paying to the Millar ¹⁄₁₁ of the whole — expence of carying it £1 12s. 8d. — he bakes it into quartem loaves of 1¾lbs. each, which he sells at 11½d. the expence of baking cost him 5s. 4d. per cwt. I demand how much he looses or gains percwt. Ans. 0s. 3d. per cwt. lost.

12. A Gentleman ships to Jamaica, goods to the amount of £1768 12s. 8d. which he covers by insuring at 4½ Guineas — freight £347 19s. — his agent sells the Goods at 156 per cent currency advance in the invoice — Exchange £40 per cent and retaining 5 per cent commission — he purchases rum at 2s. 3d. per gallon Jamaica currency — the freight cost him 1½d. per gallon, Sterling — he sells it in London for 3s. 6d. per gallon. What was the state of the adventure?
Ans. Clear gain £4046 3s. 8½d.

13. A Merchant purchased an Estate worth £2915 per annum at 24 years purchase, there was a marsh in the grounds which he got drained at £17 10s. per acre, consisting of 89½ acres — rents it at £1 11s. 8d. per acre, he builds farm houses and fences to the value of £5785 18s. and he then raises his rents ⅓, soon after, he sold the whole for 25 years purchase. Required his profit and what interest he had for his money, after finishing all his improvements, which he retained the Estate?
Ans. Gained £22850 12s. 2½d — Interest £3 6 6½.

Q 2

14. A Gentleman purchases 27689 acres of Land for $\frac{3}{4}$ dollar per acres, and kept it 17 years—he then sells 7 frams, containing 208 acres each, at 2 dollars per acre—two years after he sold the rest at $2\frac{1}{2}$ dollars. He might have laid out his money at 8 per cent. Required which would have produced the more profit?

Lost if laid out at interest £4871 5s. 7d.
Gained by selling Land £41931 18s. 9d.

15. A country Merchant goes to Montreal on the 3d of June, 1799, and purchases £1000 worth of goods, at 12 months credit—on the 3d July, he remits £156 in good bills—on the 2d of April he sends $5\frac{1}{4}$ tons Potash worth £55 per ton—on the 24th June he sends 94 barrels of flour at 10 dollars per barrel and orders Goods to the amount of £986—on September 18th, he remits £268 in money and furs to the amount of £185—on April 7th, 1801, he sends 217 barrels flour worth 8 dollars per barrel and in July he orders a fresh assortment of Goods to the amount of £1765 which were sent him July 17th,—on 13th October, he sends 12 tons Potash worth £48 per ton—on April 9th, 1802, the Montreal Merchant makes up his account. Required how it stood, giving the country Merchant Credit for his remittances at 5 per cent, charging him 5 per cent upon the balance against him?

Ans. Due his Creditor £1573. 18s. 4½d.

16. A Merchant purchases £3768 worth of wheat at 4s. 9d. per Canadian minot and Manufactures it into flour at the rate of 5 Winchester bushels for every barrel of flour, containing 1cwt. 3qrs.—price of barrel and packing 2s. 3d.—the flour remaing 9 months on hand upon inspection $\frac{1}{20}$ was sour and sold for $3\frac{3}{4}$ dollars per barrel, at Quebec—the remainder was exchanged for Spirits at 4s. per gallon, 11 gallons for 1 barrel of flour—the spirits remained on hand one year and then sold at 5s. 6d. I demand what the Merchant gained by the transaction?   Ans. £5089 11s. 11¼d. gain.

17. A Merchant purchased 81 tons of Potash at £2 11s. 6d. with the view of shipping it to London, but finding the Market low, he kept it in his ware-house 18 months—at length he sent it to London and directed his correspondent to sell it to the Manufactures for Goods

as the Market price was still low—It was sold for Irish Linen at 3s. 9d.—Check 2s. 7d. and broad Cloth 15s. 7d. of each, ½ the Potash being valued at £3 1s. 8d. per cwt. The expence of sending the ashes to London was £12 10s. per ton and 2½ per cent is paid for commission—the goods arrived in Montreal 6 months after the shipment of the Potash and it was 10 months before the Linen, check, and broad Cloth were sold, the prices being for the linen 5s. 2d. check 4s. 3d. and broad cloth 18s. 4d.—the expence of fright out from London and attendance was 5 per cent. What was the loss or gain in the whole?   Ans. gain £482 11s. 2¼d.

18. A Gentleman requires his agent in London to purchase him goods for a bill of £4768 due 73 days discounting it at 5 per cent and deducting commission at 2½ per cent and 5 guineas per cent were paid for insurance. The Goods arrived at Quebec 7 months after the bill was sent home and 9 months after they were sold at an advance of 33½ per cent. Required his loss or gain and a copy of the bill sent home?   Ans. gained £706 7s. 0¼d.

. . . .

BILL SENT HOME.

<div align="right">Cornwall, 1st January, 1809.</div>

Exchange for £4768, Sterling.

Sir,

AT Seventy three days sight of this my first of Exchange (second, third and fourth of the same tenor and date unpaid) Please to pay to Jas. Brown, or Order, the sum of four thousand, seven hundred, and sixty eight pounds Sterling, value received ; and place it to my accompt without further advice from,

<div align="center">Sir, your obedient Servant,
ADAM SMITH.</div>

Messrs. Frasers & Co. London.

. . . .

19. A Nobleman purchases a tract of land in Canada of 80,000 acres, at 1 dollar per acre, and brings out a colony of 57 families ; each family averaging 5 persons, at the expense of £9 12 6 each person—He engages to give each of the heads of the family 50 acres uncleared land at the end of 5 years, and during that time each

family costs him £37 12 9 per annum. They keep a flock of sheep, consisting of 1000, which one with another gave a fleece weighing 4½ lbs. a year, worth 1s. 3d. per pound. For a ency he pays £437 per annum. We suppose the quantity of wool to increase ⅕ every year during the 5 years, and as many sheep to be sold as made up their original cost and £75 per annum more. Required a statement of the Nobleman's loss or gain, when the indentures of his colonists were given up—estimating the land ⅓ better. Ans. £15842 10 7½ lost.

20. A London Alderman left a legacy of £100,000 to be divided among his three sons, in the proportion of ½ to A. ¼ to B. and ⅕ to C.—but C. having died, it is required to divide his portion between A. and B. and what each of their shares were.

Ans. A.'s share £57112 17 1½,
And B.'s £42857 2 10½ $\frac{7}{2.9}$.

21. A gentleman wishing to make a fish-pond exactly 36 perches in diameter and 9½ feet deep. Required the number of cubical feet of earth thrown out, and what quantity of ground it took up.

Ans. 263160.2468 cubical feet, & nearly 6a. 1r. 7p.

22. The river Ganges discharges into the Sea 400,000 cubical feet of water per second, in the rainy season, which continues during ⅔ of the year, and 80,000 feet per second during the remainder of the year. Required the cubical miles of water discharged by the river in a year.

Ans. 40 miles.

23. The roan of a cod-fish weighed 2lb. 10 oz. 18dwt. Troy, and each grain contained 320 seeds. The length of the fish was 2ft. 9in.— its breadth 7in. and its weight 15lb. suppose in each seed of the roan to produce a fish of the same size and weight, required the number of fish, their weight, the number of ships of 100 tuns burden to carry them, their value at one penny each; also, how many acres English they would cover, and how many miles they would measure, if placed in a line.

Ans. 525.5840 fish 79257.000 lbs.—3550+ ships—
£2.246 162+ acres—2751 miles.

24. Let 36000 soldiers be so placed that the number in file may be to those in rank as 5 to 9. Ans. in rank 80; file 44.

25. Let 3600 soldiers be drawn up in the form of a square, so that the distance in file may be 7 feet and in rank 3 feet. Required how many men form the side of the square. Ans. 92+ in rank & 39+ in file.

26. Let 8450 men be drawn in an oblong square, the one side of which shall be double the other.
Ans. 130 in rank and 65 in file.

27. Laid out on muslin £500; but finding ⅓ damaged, I was obliged to sell it at 5s. per yard, and by so doing lost £50 — At what rate per ell must I sell the undamaged part to clear £50 on the whole? Ans. 11s. 7¾d.

28. The amount of a sum of money which had been put out to interest is £100, and the principal is just 7 times as much as the interest. What is the principal?
Ans. £87 10s.

29. A person dying worth £5460, left his wife with child, to whom he bequeathed, if she had a son, ⅔ of his estate, and the rest to his son —but if she had a daughter ⅔ to herself and ⅓ to his daughter—Now it so opened that she had both a son and a daughter. How must the estate be divided to answer the father's intention?
Ans. The daughter's £780 — the son £3120 }
The mother £1560. }

30. A general drawing up his army in square battle, finds he has 284 soldiers over; but increasing each side by one soldier, he wants 25 to fill up the square. Required the number of soldiers in the army. Ans. 24000.

31. Suppose the sea allowance for the common men to be 5lb. of beef and 3lb. of biscuit a day for a mess of 4 people, and that the price of the beef is 2½d. per pound and of bread 1½d.—now if the ship's company be such that the meat they eat cost 12 guineas per day, what must they pay for their bread per week? Ans. £25 4.

32. A person paved a court-yard 42ft. 9in. in front and 68 feet 6 inches in depth, and in this he laid a foot-path the depth of the court 5ft. 6in. in breadth—the foot-path was laid of fine stone at 3s. 6d. per yard, and the rest with pebbles at 3s. per yard What will the whole come to? Ans. £19 17 ½ ¾ 1.

33. Divide £13 12 9 among 7 men, 9 women, and ¿

boys, and give a woman $\frac{3}{4}$ of a man's share, and a boy $\frac{2}{3}$ of a woman's.

Ans. A boy's share £1 12 2$\frac{1}{4}$d. $\frac{24}{121}$; £1 17 6$\frac{3}{4}$d.$\frac{89}{121}$ } a woman's ; £3 2 7 0$\frac{67}{121}$ a man's. }

34. The swiftest velocity of a cannon ball is about 2000 feet in a second of time. In what time, at that rate, would such a ball move from the earth to the sun, supposing the distance to be 95 millions of miles.

Ans. 7 years, $\frac{309944}{31536}$.

35. What is the ratio of the velocity of light to that of a cannon ball, which issues with the velocity of 1500 feet per second—light passing from the sun to the earth in 7$\frac{1}{2}$ minutes ? Ans. 78 2222$\frac{2}{9}$ to 1.

36. In the latitude of London, the distance round the earth measured on the parallel of latitude is about 15550 miles—now as the earth turns round in 23 hours 56 minutes, at what rate per hour is the city of London carried by this motion from west to east ? Ans. 649$\frac{212}{718}$.

37. The degrees of light, heat, and attraction are reciprocally proportional to the squares of their distances from the centre whence they are propagated.

Supposing the distance of the sun from the earth 95 millions of miles—I would know at what distance from him another body must be placed so as to receive light and heat quadruple to that of the earth.

Ans. 47$\frac{1}{2}$ millions of miles.

38. If the mean distance of the sun from us be 106 of its diameters ; how much hotter is it at the surface of the sun than under our equator ? Ans. 11236 times hotter.

39. Suppose the planet Mercury to be 37 millions of miles distant from the sun—Venus 68 millions—the Earth 95 millions—Mars 144 millions—Jupiter 490 millions— Saturn 900 millions—Georgium Sidus 1800 millions.— Required the Sun's heat, light, and attraction on each of these bodies—admitting the earth to have 100 parts—thus

Mercury	668	Jupiter	3,7
Venus	191	Saturn	1,1
Mars	43	Geo. Sidus	0,276

40. There are 2 columns in the ruins of Persepolis left standing upright, the one is 64 feet above the plain and the other 50—In a right line between these stands an

cient small statue, the head of which is 97 feet from the summit of the higher and 86 from the top of the lower column, the base of which measures just 76 feet to the centre of the figure's base. Required the distance between the tops of the two columns. Ans. 157 nearly.

41. In the midst of a field of luxuriant grass,
I rented an acre to tether my ass ;
Pray what length of tether that feeding around,
The Donkey may graze just his acre of ground ?
Ans. 39,25073 yds.

42. A farmer borrowed of his neighbor part of a hay-rick that measured 6 feet every way, and paid him back again by 2 equal cubical pieces, each of whose sides were 3 feet. Was the lender fully paid ?
Ans. He was paid ¼ part only.

43. A gentleman has a bowling green 300 feet long and 200 broad, which he would raise one foot higher by means of a ditch that goes round it ; to what depth must the ditch be dug, supposing its breadth to be every where 8 feet ? Ans. 7½ feet.

44. If the diameter of the earth be 7930 miles and that of the moon 2160. Required the proportion of their surfaces and also of their solidities, supposing them both Globular as they are very nearly.

Ans. { The Surfaces are as 13½ to 1 nearly.
{ The Solidities as 49½ to 1 nearly.

45. The battering ram of Vespasian weighed 100,000 pounds ; and was moved with such velosity as to pass through 20 feet in a second of time, which was found suf ficient to demolish the walls of Jerusaem. Require what velocity given to a cannon ball of 32lbs. would pre duce an equal effect ? Ans. 62500 feet

46. What weight will a man be able to raise who pre ses with the force of an hundred and a half on the end of an equipoised handspike 100 inches long, meeting with convenient prop 7½ inches from the lower end of the Ma chine ? Ans. 2072lbs.

47. A weight of 1½lb. laid on the shoulders of a m: is no greater burden to him than its absolute weight of 24 ounces, what difference will he feel between the sa weight applied near his elbow at 12 inches from the shou

der, and the palm of his hand 28 inches from the same,
and how much more must his muscles then draw to sup-
port it at right angles, that is having his arm stretched
right out ?   Ans. 24lbs. Avoirdupoise.

48. Two Porters carrying a burthen of 200lbs. hung
upon a pole 4 feet long, the ends of which rest on their
shoulders—one of them being a cunning rogue, pushed
the weight 6 inches nearer his companion than himself.
How much less the weight did he carry ? Ans. 50lb. less.

49. Being ordered one day to observe how far a batte-
ry of cannon was from me, 1 counted by my watch 17
seconds between the time of seeing the flash and hearing
the report. What was the distance supposing sound to
move 1142 feet in a second of time ? Ans. 3 miles, $\frac{1187}{2746}$.

50. A body weighing 20lb. is impelled by such a force
as to send it through 100 feet in a second. With what
velocity then would a body of 8lb. weight move if it
were impelled by the same force ?   Ans. 250 lb.

51. A general has an army of 36000 men, which he
wishes to form into an equilateral triangle. Required the
number of men forming the side of the triangle and the
number forming the perpendicular. Ans. Side 288,337. }
                         Perpen. 249,7075. }

52. What is the circumference of Saturn, supposing his
diameter 79042 miles ?——Here we multiply the diame-
ter by 3,1416 and the product is the circumference.
                         Ans. 248318,3472.

53. What is the superficial content in square miles, on
the surface of Saturn ?——Here we multiply the circum-
ference by the diameter or the square of the diameter
by 3,1416.   Ans. 19627488589,3724 miles.

54. What is the solid content of Saturn in miles ?—
Multiply the superficial content by ⅙ of the diameter, or
the square of the diameter by ⅞ of the circumference or
the cube of the diameter by ,5236— the product is the
solidity.   Ans. 253552007187792,6252 miles.

TABLES OF ANNUITIES.

T A B L E III.

THE AMOUNT OF £1 ANNUITY COMPOUND INTEREST.

yrs.	3 per cent.	4 per cent.	5 per cent.	6 per cent.	7 per cent.	8 per cent
1	1,000000	1,000000	1,000000	1,000000	1,00000	1,0000
2	2,030000	2,040000	2,050000	2,060000	2,07000	2,08000
3	3,090900	3,121600	3,152500	3,183600	3,21490	3,21640
4	4,183627	4,246464	4,310125	4,374616	4,43994	4,50611
5	5,309135	5,416322	5,525631	5,637092	5,75073	5,86660
6	6,468109	6,632975	6,801912	6,975318	7,15329	7,33592
7	7,662162	7,898294	8,142008	8,393827	8,65402	8,92280
8	8,892336	9,214226	9,549108	9,397167	10,2518	10,6366
9	10,159106	10,582795	11,026564	11,491315	11,9779	12,4875
10	11,163879	12,006107	12,577892	13,180794	13,8164	14,4865
11	12,807795	13,486351	14,206787	14,791642	15,7836	16,6454
12	14,192029	15,025805	15,917126	16,869941	17,8884	18,9771
13	15,617790	16,626837	17,712982	18,882157	20,1406	21,4952
14	17,086324	18,291911	19,598631	21,015065	22,5504	24,2149
15	18,598913	20,023587	21,578563	23,275969	25,1290	27,1521
16	20,156881	21,824531	23,657491	25,672528	27,8880	30,3242
17	21,761587	23,697512	25,840366	28,212879	30,8402	33,7502
18	23,414435	25,645412	28,132384	30,905652	33,9990	37,4502
19	25,116868	27,671229	30,539005	33,759990	37,3789	41,4462
20	26,870374	29,778078	33,065953	36,785591	40,9954	45,7619
21	28,676485	31,969202	35,719251	39,992720	44,8651	50,4229
22	30,536780	34,247969	38,505214	43,392290	49,0057	55,4567
23	32,452885	36,617888	41,430475	46,995827	53,4361	60,8932
24	34,426470	39,082604	44,501998	50,815577	58,1766	66,7647
25	36,459064	41,645908	47,727098	54,864512	63,2490	73,1059
26	38,553042	44,311745	51,113454	59,156389	68,6764	79,9544
27	40,709635	47,084214	54,669126	63,705763	74,4838	87,3507
28	42,930922	49,967583	58,402582	68,528115	80,6976	95,3388
29	45,218850	52,966288	62,322711	73,639798	87,3465	103,965
30	47,575415	56,084937	66,438847	79,058186	94,4607	113,283

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TABLES.

TABLES OF ANNUITIES.

TABLE IV.

PRESENT-VALUE OF £1 ANNUITY COMPOUND INTEREST.

yrs.	3 per cent.	4 per cent.	5 per cent.	6 per cent.	7 per cent.	8 per cent.
1	0,970874	0,961539	0,952381	0,943396	0,9345	0,926
2	1,913470	1,886095	1,859410	1,833393	1,8080	1 783
3	2,828611	2,775091	2,723248	2,673012	2,6243	2,5770
4	3,717098	3,629895	3,545951	3,465106	3,3872	3,3121
5	4,579707	4,451822	4,329477	4,212364	4,1001	3,9927
6	5,417191	5,212137	5,075692	4,917324	4,7665	4,6228
7	6,230283	6,002055	5,786373	5,582382	5,3892	5,206
8	7,019692	6,732745	6,463213	6,209791	5,9712	5,7466
9	7,786109	7,435331	7,107822	6,801692	6,5152	6,2468
10	8,530203	8,110896	7,721785	7,360087	7,0235	6,7100
11	9,252024	8,760476	8,306414	7,886875	7,4986	7,1389
12	9,954004	9,385073	8,863252	8,383844	7,9426	7,5360
13	10,634955	9,985647	9,393573	8,852083	8,3576	7,9037
14	11,296073	10,563122	9,898641	9,291984	8,7454	8,244
15	11,937935	11,118387	10,379658	9,712249	9,1079	8,550
16	12,561102	11,652295	10,837770	10,105895	9,4466	8,853
17	13,166110	12,165668	11,274066	10,477260	9,7632	9,1216
18	13,753513	12,659296	11,689587	10,827604	10,059	9,3718
19	14,323799	13,133939	12,085311	11,158117	10,335	9,603
20	14,877475	13,590325	12,462210	11,469921	10,594	9,818
21	15,415021	14,029159	12,821153	11,764077	10,585	10,016
22	15,936917	14,451114	13,163009	12,041582	11,061	10,200
23	16,443608	14,856841	13,488574	12,303379	11,272	10,374
24	16,935542	15,246962	13,798642	12,550358	11,469	10,528
25	17,413118	15,622079	14,093945	12,783356	11,653	10,674
26	17,876842	15,982768	14,375185	13,003166	11,825	10,809
27	18,327032	16,329584	14,643034	13,210531	11,986	10,935
28	18,764108	16,663062	14,898127	13,406164	12,137	11,015
29	19,188455	16,983713	15,141074	13,590721	12,277	11,158
30	19,600441	17,292032	15,372451	13,764831	12,409	11,257

TABLE V.

PROBABILITIES OF LIFE AT LONDON.

age.	living.	die.	age.	living.	die.	age.	living.	die.	age.	living.	die.
0	1009	320	21	355	5	42	214	8	63	87	5
1	689	153	22	350	5	43	206	7	64	82	5
2	547	51	23	345	6	44	199	7	65	77	5
3	496	27	24	339	6	45	192	7	66	72	5
4	469	17	25	333	6	46	185	7	67	67	5
5	452	12	26	327	6	47	178	7	68	62	4
6	440	10	27	321	6	48	171	6	69	58	4
7	430	8	28	315	7	49	165	6	70	54	4
8	422	7	29	308	7	50	159	6	71	50	4
9	415	5	30	301	7	51	153	6	72	46	4
10	410	5	31	294	7	52	147	6	73	42	3
11	405	5	32	287	7	53	141	6	74	39	3
12	400	5	33	280	7	54	135	6	75	36	3
13	395	5	34	273	7	55	129	6	76	33	3
14	390	5	35	266	7	56	123	6	77	30	3
15	385	5	36	259	7	57	117	5	78	27	2
16	380	5	37	252	7	58	112	5	79	25	2
17	375	5	38	245	8	59	107	5	80	23	2
18	370	5	39	237	8	60	102	5			
19	365	5	40	229	7	61	97	5			
20	360	5	41	222	8	62	92	5			

TABLE VI.

PROBABILITIES OF LIFE AT NORTHAMPTON.

age.	living.	die.	age.	living.	die.	age.	living.	die.	age.	living.	die.
0	11650	1894	24	4835	75	49	2936	79	74	912	80
½	9756	1106	25	4760	75	50	2857	81	75	832	80
1	8650	1367	26	4685	75	51	2776	82	76	732	77
2	7283	502	27	4610	75	52	2694	82	77	675	73
3	6781	635	28	4535	75	53	2612	82	78	602	68
4	6146	197	29	4460	75	54	2530	82	79	534	65
5	6249	184	30	4385	75	55	2448	82	80	469	63
6	6065	140	31	4310	75	56	2366	82	81	406	60
7	5925	110	32	4235	75	57	2284	82	82	348	57
8	5815	80	33	4160	75	58	2202	82	83	289	55
9	5735	60	34	4065	75	59	2120	82	84	204	48
10	5675	52	35	4010	75	60	2038	82	85	186	41
11	5623	50	36	3935	75	61	1956	82	86	145	34
12	5573	50	37	3860	75	62	1874	81	87	111	28
13	5523	50	38	3785	75	63	1793	81	88	83	21
14	5473	50	39	3710	76	64	1712	80	89	62	16
15	5423	50	40	3635	77	65	1632	80	90	46	12
16	5373	53	41	3559	78	66	1552	80	91	34	10
17	5320	58	42	3482	78	67	1472	80	92	24	8
18	5262	63	43	3404	78	68	1392	80	93	16	7
19	5199	67	44	3326	78	69	1312	80	94	9	5
20	5132	72	45	3248	78	70	1232	80	95	4	3
21	5060	75	46	3170	78	71	1152	80	96	1	1
22	4985	75	47	3092	78	72	1072	80			
23	4910	75	48	3014	78	73	992	80			

TABLE VII.

VALUE OF AN ANNUITY OF £1 ON A SINGLE LIFE.

Age	year's purchase at 3 per cent. London.	Northampt.	year's purchase at 4 per cent. London.	Northampt.	year's purchase at 5per cent London	North	Age	year's purchase at 3per cent. London.	North ampt.	year's purchase at 4 per cent London.	North ampt.	year's purchase at 5 per cent. London.	North ampt.
6	18.8	20.73	16 2	17.48	4.11	5,04	41	12,0	14,62	11,4	13.02	10.2	11.70
7	18,9	20.85	16 3	17.51	14.2	15.7	42	11.8	4 39	11.2	12,84	10.1	11.5
8	19,0	20.89	16 4	17.66	14.3	15 23	43	2,6	14,6	11,1	12,66	10.0	11 4
9	19,0	20.8	16 4	.63	4 3	15,2	44	2,5	1.9	11.0	2.47	9.9	11,2
10	19,0	20 66	16.4	17 52	14.3	15 14	45	2.3	3.69	10,8	2,23	9,8	11,1
11	19,0	20,48	16.4	7.39	14.2	15 04	46	1.1	13 4	10.7	12.0	9,7	10.9
12	18 9	20,8	16 3	7 51	14.2	14 91	47	1.9	13.40	10.5	11.89	9.6	10.8
13	18.7	20.08	16,2	7.10	14,1	14.8	48	1,8	13,95	10.4	11.68	9 4	10.6
14	18.5	19 87	16.0	6 95	4.0	14.7	49	1.6	13 69	10,2	11.47	9,3	10,4
15	18 3	19.66	15 8	6.9	13,9	14.59	50	11.4	13 44	10.1	11,26	9,2	10,2
16	18 1	19.44	5 6	16.6	13.7	14 46	51	11.2	12. 8	9.9	11,06	9,0	10.0
17	17.9	19.2	15.4	16.36	13.5	14.35	52	11.0	11.98	9,8	10,85	8.9	9.9
18	17.6	19 0	15.2	16 31	13.4	14.2	53	1.7	11,67	9.6	10.64	8,8	9,7
19	17.4	18 82	15.0	16 17	13 2	14 1	54	10.5	11.41	9.4	10,43	8.6	9.5
20	17.2	18 64	14.8	6.03	13.0	14.01	55	10,3	11,15	9 3	10 20	8.5	9.3
21	17.0	8 47	14 7	15 9	12.9	13 92	56	10 1	10.83	9,1	9,98	8,4	9.1
22	16 8	18.31	14.5	5 85	2 7	13 83	57	9.9	10,61	8.9	9.75	8.2	9.0
23	16 5	18.15	14.	15.68	12.0	13.75	58	9.0	10.34	8.7	9.54	8.1	8.8
24	16.3	7 98	14.1	5.56	12.4	13 66	59	9,41	10.60	8.6	9 28	8,0	8.6
25	16.1	7 8	13 9	5.44	12.2	13.57	60	9 2	9,78	8.4	9.04	7,9	8.4
26	15.9	7 64	13 8	15 31	2.1	47	61	8 9	9.46	8,2	8 8	7.7	8.1
27	15.6	7 47	13 6	5 18	12.0	13.38	62	8.7	9,21	8 1	8 55	7.6	7.97
28	15.4	7.29	13.4	5 05	11.8	28	63	8.5	8 91	7.9	8.89	7,4	7.7
29	15.1	17 1	13.	14 9	11,7	13 18	64	8.3	8.61	7.7	8 63	7.3	7.6
30	15.0	10.92	1.1	4 78	11.6	13.07	65	8.0	8.3	7 5	7.76	7.1	7.8
31	14 8	16.7	12 9	14,64	11,4	2.97	66	7.8	7.91	7 3	7,49	6,9	7.0
32	14 6	10 54	12.7	14,50	3	2.85	67	7.6	7.68	7,1	7.21	6,7	6 7
33	14 4	16 34	12 6	14.35	2	74	68	7.4	7.37	6 9	6.93	6.6	6 5
34	14.2	6. 4	2.4	42	11 0	2 62	69	7.1	7.08	6 7	6.65	6,4	6 2
35	14 1	5.9	12.3	4 04	10.0	2.50	70	6 9	6.73	6,5	6,36	6,2	6.0
36	13.9	15.73	1	3 88	0,8	12,33	71	6.7	6.41	6.3	6.08	6,0	5.7
37	13.7	15 52	11.9	3 72	10.6	12,25	72	6 5	6.10	6.	5.7	5.6	5.5
38	13.5	15.3	11 8	3.55	10 5	12.1	73	6 2	5.79	5.9	5,15	5,6	5.
39	13.3	15 8	11 1	3.38	10.4	11,93	74	5.9	5.49	5,6	5,23	5 4	4
40	13 2	14.85	11.5	3 20	10,3	11,8	75	5,6	5,20	5,4	4,96	5,2	4.7

TABLES OF LIFE ANNUITIES.

TABLE VIII.

VALUE OF AN ANNUITY OF £1 ON TWO JOINT LIVES.

Ages.	Value at 3 per cent.		Value at 4 per cent.		Value at 5 per cent.	
	Lon-don.	North-mpt.	Lon-don.	North- am pt.	Lon-don.	North-ampton
10	14,7	16,34	13,0	14,28	11,6	12,77
15	14,3	15,76	12,7	13,84	11,	3 12,69
20	13,8	15,15	12,2	13,35	10,8	11,91
25	13,1	14,68	11,6	12,90	10,2	11,63
30	12,3	14,15	10,9	12,59	9,7	11,30
35	11,5	13,53	10,2	12,10	9,1	10,92
40	10,7	12,79	9,6	11,56	8,6	10,44
10 45	10,0	11,98	9,0	10,85	8,1	9,90
50	9,8	11,04	8,1	10,08	7,6	9,26
55	8,6	10,05	7,8	9,26	7,1	8,56
60	7,8	8,95	7,2	8,31	6,6	7,75
65	6,9	7,72	6,5	7,24	6,1	6,80
70	6,1	6,35	5,8	6,01	5,5	5,70
75	5,3	4,96	5,1	4,72	4,9	4,52
15	13,9	15,23	12,3	13,41	11,1	11,96
20	13,3	14,66	11,8	12,96	10,5	11,58
25	12,6	14,23	11,2	12,63	10,1	11,32
30	11,9	13,73	10,6	12,25	9,5	11,02
35	11,2	13,15	10,0	11,79	9,0	10,66
40	10,4	12,46	9,4	11,23	8,5	10,21
15 45	9,6	11,69	8,8	10,61	8,0	9,69
50	8,9	10,80	8,2	9,87	7,5	9,08
55	8,2	9,85	7,6	9,08	7,0	8,40
60	7,5	8,79	7,0	8,17	6,5	7,52
65	6,8	7,50	6,4	7,13	6,0	6,71
70	6,0	6,25	5,7	5,93	5,4	5,68
75	5,2	4,91	5,0	4,70	4,8	4,50
20	12,8	14,13	11,3	12,54	10,1	11,23
25	12,2	13,74	10,8	12,23	9,7	10,99
30	11,6	13,29	10,3	11,87	9,2	10,71
35	10,9	12,74	9,8	11,15	8,8	10,36
40	10,2	12,10	9,2	10,92	8,4	9,94
20 45	9,5	11,37	8,6	10,38	7,9	9,45
50	8,8	10,52	8,0	9,63	7,4	8,86
55	8,1	9,62	7,5	8,87	6,9	8,22
60	7,1	8,60	6,9	8,00	6,4	7,46

TABLE VIII. CONTINUED.

VALUE OF AN ANNUITY OF £1 ON TWO JOINT LIVES.

Ages.		Value at 3 per cent.		Value at 4 per cent.		Value at 5 per cent.	
		Lon-don.	North-ampt.	Lon-don.	North-ampt.	Lon-don.	North-ampt.
	65	6,7	7,44	6,3	6,99	5, 9	6,98
20	70	6,0	6,15	5,7	5,83	5, 4	5,53
	75	5,2	4,83	5,0	4,62	4, 8	4,12
	25	11,8	13,38	10,5	11,94	9, 4	10,76
	30	11,3	12,97	10,1	11,??	9, 0	10,50
	35	10,7	12,46	9,6	11,22	8, 6	10,18
	40	10,0	11,85	9,1	10,73	8, 2	9,77
	45	9,4	11,16	8,5	10,16	7, 8	9,30
25	50	8,7	10,36	7,9	9,49	7, 3	8,74
	55	8,0	9,48	7,4	8,77	6, 8	8,12
	60	7,3	8,50	6,8	7,91	6, 3	7,38
	65	6,6	7,37	6,2	6,92	5, 8	6,52
	70	5,9	6,10	5,6	5,78	5, 3	5,19
	75	5,1	4,80	4,9	4,59	4, 7	4,10
	30	10,8	12,59	9,6	10,31	8, 6	10,26
	35	10,3	12,13	9,2	10,95	8, 3	9,95
	40	9,7	11,57	8,8	10,49	8, 0	9,58
	45	9,1	10,92	8,3	9,96	7, 6	9,14
	50	8,5	10,16	7,8	9,32	7, 2	8,60
30	55	7,9	9,33	7,3	8,62	6, 7	3,00
	60	7,2	8,38	6,7	7,80	6, 2	7,29
	65	6.5	7,29	6.1	6,84	5, 7	6,15
	70	5,8	6,04	5,5	5,73	5, 2	5,14
	75	5,1	4,76	4,9	4,56	4, 7	4,37
	35	9,9	11,72	8,8	10,61	8, 0	9,68
	40	9,4	11,21	8,5	10,20	7, 7	9,33
	45	8,9	10,62	8,1	9,71	7, 4	8,92
	50	8,3	9,91	7,6	9,11	7, 0	8,42
35	55	7,7	9,13	7,1	8,45	6, 6	7,85
	60	7,1	8,23	6,5	7,70	6, 1	7,17
	65	6,4	7,18	6,0	6,75	5, 6	6,36
	70	5,7	5,97	5,4	5,66	5, 1	5,38
	75	5,0	4,72	4,8	4,52	4, 6	4,33

TABLE VIII. CONCLUDED.

VALUE OF AN ANNUITY OF £1 ON TWO JOINT LIVES.

		Value at 3 per cent.		Value at 4 per cent.		Value at 5 per cent.	
		Long-: North		Lon-: N.		Long-: North	
Ages.		lon. : unmpt		lon. : amp		lon. : unpt	
	49,1	0,71	8,19	8,27	3	1,02	
	45	8,7	10,41	7,89	9,55	7,1	8,79
	50	8,2	9,59	7,18	8,83	6,8	8,18
40	55	7,6	8,87	6,98	8,82	6,47	7,65
	60	7,0	8,03	6,17	7,49	6,0	7,02
	65	6,1	7,03	5,95	6,61	5,56	6,24
	70	5,7	5,87	5,45	5,77	5,1	5,30
	75	5,0	4,66	1,84	4,16	1,6	4,27
	45	8,3	9,78	4,89	6,78	8,31	
	50	7,9	9,20	7,18	8,56	6,5	7,89
	55	7,4	8,56	6,77	7,95	6,2	7,41
45	60	6,8	7,78	6,37	7,27	5,8	6,82
	65	6,3	6,85	5,86	6,45	5,	6,09
	70	5,6	5,75	5,35	5,46	5,	5,20
	75	4,9	4,58	1,71	4,39	4,	4,21
	50	7,0	8,71	6,88	8,08	6,27	5,52
	55	7,2	8,15	6,57	7,59	6,07	7,10
	60	6,7	7,46	6,16	6,99	5,76	6,57
50	65	6,2	6,61	5,76	6,24	5,35	6,90
	70	5,5	5,58	5,25	5,3	4,93	5,05
	75	4,8	4,17	4,6	4,28	1,1	4,11
	55	6,9	7,68	6,27	7,18	5,7	6,74
	60	6,5	7,09	5,96	6,65	5,5	6,27
55	65	6,0	6,33	5,65	5,99	5,2	5,67
	70	5,4	5,39	5,1	5,13	4,8	4,89
	75	4,7	4,35	4,5	4,17	1,3	4,01
	60	6,1	6,61	5,66	6,23	5,2	5,80
	65	5,7	5,97	5,35	5,66	4,9	5,37
60	70	5,2	5,14	4,91	4,90	4,6	4,68
	75	4,6	4,19	4,14	4,02	1,2	3,84
	65	6,4	5,47	5,0	5,20	4,7	4,96
65	70	4,9	4,78	4,6	4,57	4,4	4,38
	75	4,4	3,96	4,2	3,81	4,0	3,67
	70	4,6	4,26	4,1	4,09	1,9	3,95
70	75	4,2	3,60	4,0	3,17	3,9	3,35
75	75	3,8	3,11	3,7	3,02	3,6	2,92

ERRATA.

AS the DISTANCE of the AUTHOR rendered it impossi‑
ble for him to correct the Press, the number of Errata
have been much increased : But he hopes the following
list contains the most material.

APPENDIX.

PROBLEMS IN CHRONOLOGY.

POPE Gregory in the year 1582 reformed the Julian Calendar or Old Style, which had, before that time, been used over all Europe—According to Julias Cæsar, the year consisted of 365 days 6 hours, or 365 days and a quarter, that is, three years of 365 days each, and the fourth year of 366 days,—But as the mean tropical year consists only of 365 days, 5 hours, 48 minutes and 57 seconds ; an error of 11 minutes 3 seconds was produced every year—This amounted to ten days form the time of the general council of Nice holden in the year 325 of the Christian Æra, to the year 1582. Pope Gregory added these ten days, and brought the account of time back to its proper day again—At the same time he appointed that every century after a day more should be added, making the years of the complete centuries 1600, 1700, 1800, 1900 common yea·s of 365 days each, instead of leap years of 366 days, which makes the mean Gregorian year 365 days, 5 hours, 45 minutes, 36 seconds.

This new account or new style termed after its reformer, the Gregorian Calander, was not adopted in Great Britain till the year 1752 when the Julian account had lost 11 days, and therefore the 3d of September was in that year, by act of Parliament, reckoned the 14th.

PROBLEM 1.—To find when Leap Year happens.

RULE.—Divide the given year by 4, if nothing remain, it is leap year.

PROB. 2.—To find the Golden number.

RULE.—Add 1 to the given year and divide by 19, the remainder is the Golden number, if nothing remain, then 19 is the Golden number.

What is the Golden number for 1809

$$
\begin{array}{r}
1 \\
19)\overline{1810}(95 \\
171 \\
\overline{100} \\
95 \\
\overline{5} \text{ Ans.}
\end{array}
$$

Note.—The Golden number or Lunar Cycle is a period of 19 years, after which the changes of the moon return to the same days as in the former 19 years, though not exactly to the same hour.

<div style="text-align:center">Prob. 3.—To find the Epact.</div>

RULE.—Take 1 from the Golden number, multiply the remainder by 11 and divide the product by 30, the remainder is the Epact.

The Golden number for 1809 is $5 - 1 = 4 \times 11 = 44 \div 30$ the remainder is 14 the Epact.

Note.—An Epact is the excess of the solar year or months above the Lunar year or month—The annual Epact or difference between the solar and Lunar year is about 11 days, for 2 years, 22 day.—for 3 years, 33 days, or 3 days rejecting the 30, for 4 years 14 days, &c.

The excess of the Solar above the Lunar month, will, in common years, be nearly as follows

Jan. Feb. March. April. May. June. July. Aug. Sept. Oct. Nov. Dec.
0. 2. 0. 2. 2. 4. 4. 6. 7. 8. 10. 10.

<div style="text-align:center">IN LEAP YEARS.</div>

Jan. Feb. March. April. May. June. July. Aug. Sept. Oct. Nov. Dec.
0. 2. 1. 3. 3. 5. 5. 7. 8. 9. 10. 11.

<div style="text-align:center">Prob. 4.—To find the Moon's Age nearly.</div>

RULE.—Add together the Epact of the year—the Epact of the month, and the day of the month—the sum, rejecting 30 if above it, is the Moon's age nearly.

To find the Moon's age on the 12th February, 1809.

<div style="text-align:center">

14 Epact for the year.

2 Number of the month.

12 Day of the month.

——

28 Moon's age, nearly.

</div>

Note.—The day of the mean new moon being known, add 7½ days to it for the mean time of the first quarter, 15 days for the mean time of full moon and 22½ days for the 3d quarter.

Prob. 5.—To find the Moon's southing nearly, or her coming to the Meridian.

RULE.—Take ⅘ of her age for her Southing, nearly—if less than 12 it is afternoon—if greater, the excess above 12 is the time after last midnight.

FOR EXAMPLE.

12th February, 1809. The Moon's age is $23 \times 4 = 112$ $\div 5 = 22$h. 21m. $-12 = 10$h. 14m. morning.

PROB. 6—To find the Cycle of the Sun.

RULE.—Add 9 to the given year ; divide the sum by 28 and the remainder is the Cycle required—if nothing remain the Cycle is 28.

What is the Solar Cycle for the present year 1809.

```
        To 1809
        Add    9
              ——
        28)1818(64
            168
            ———
            138
            112
            ———
```

26 Cycle of the Sun.

The use of this Cycle is to find the Sunday or Dominical Letter.

PROB. 7—To find the year of indiction.

RULE.—Add 3 to the given year ; divide the sum by 15 and the remainder will be the indiction—if nothing remain, it will be 15.

```
        To 1809
        Add    3
              ——
        15)1812(12
            15
            ——
            31
            30
            ——
```

12 Indiction.

The Indiction or Roman Indiction is a period of 15 years used only by the Romans pointing out the periods of certain taxes paid by the people.

PROB. 8.—To find the Julian Period.

RULE.—Add 4713 to the given year and the sum will be the Julian Period.

What year of the Julian Period answers to the present year.

To 1809

Add 4713

———

6522

NOTE.—The Julian Period is a Revolution of 7980 years and is produced by the continual multiplication of the three Cycles ; viz. that of the Sun 28 years—that of the Moon 19 years and that of the indiction 15 years.

PORL. 9.—To find the Dominical or Sunday Letter.

RULE.—Divide the centuries by 4—subtract double the remainder from 6, and then add the odd number and it's fourth—divide this by 7 —subtract the remainder from 7 and the number left points out the Letter.

     THUS FOR THE PRESENT YEAR 1809.

Divide 18 the centuries by 4 and 2 is left—the double of which 4 taken from 6 leaves 2 to which add the odd years 9=11 and their 4th part 2=13 divided by 7 leaves 6 which subtracted from 7 leaves 1=A the Dominical Letter. - A 1, B 2, C 3, D 4, E 5, F 6, G 7.

The Dominical Letter goeth backward in a common year one letter ; but in leap year two.

TABLE I.

Of the Golden numbers, Epacts and Dominical Letters for the 19th Century.

Years.	G	E	D. L.	Years.	G	E	D. L.
1801	16	15	D.	1815	11	20	A.
2	17	26	C.	16	12	1	G. F.
3	18	7	B.	17	13	12	E.
4	19	18	A. G.	18	14	23	D.
5	1	0	F.	19	15	4	C.
6	2	11	E.	20	16	15	B. A.
7	3	22	D.	21	17	26	G.
8	4	3	C. B.	22	18	7	F.
9	5	14	A.	23	19	18	E.
10	6	25	G.	24	1	0	D. C.
11	7	6	F.	25	2	11	B.
12	8	17	E. D.	26	3	22	A.
13	9	28	C.	27	4	3	G.
14	10	9	B.	28	5	14	F. E.

TABLE II.

A PERPETUAL ALMANAC,

CONTAINING THE DOMINICAL LETTERS AND THE SUNDAY FIGURES.

January October	A	B	C	D	E	F	G
May	B	C	D	E	F	G	A
August	C	D	E	F	G	A	B
February March Nov.	D	E	F	G	A	B	C
June	E	F	G	A	B	C	D
September December	F	G	A	B	C	D	E
April July	G	A	B	C	D	E	F
	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31				

EXAMPLES.

On what day of the week will the 27th June happen in the present year, 1809 ?---I find by Table I. that the Dominical Letter is A. Entering Table II. for June in the line to the right you will find A, under which you will see among the figures 25 for the fourth Sunday of June, consequently Tuesday is the 27th.

On what day of the month does the 3d Wednesday of November fall, 1802 ?---I find the 3d Sunday to be the 15th, then the 3d Wednesday is the 18th.

To FIND EASTER.—Easter Sunday is the first after he full moon which happens upon or next after the 21st March, and if the full moon happen to be upon Sunday, Easter day is the Sunday after.

RULE.

Find the age of the moon on the 21st March in the given year, if it be 14 then find the day of the week an-

swering to it, and the Sunday following is Easter day. But if the Moon's age on the 21st of March be not 14, then reckon forward to the day on which her age will be 14, and find the day of the week answering to that day. The Sunday following will be the day required.

When does Easter happen in the year 1816?

   21 March.
    1 Epact.
    1 N. month.

   23 Moon's age.
add 21 Number of days to the moon's being 14 days old.

   44
Take 31 Days in March.

13th April, the day of the full Moon, which by Table 2d gives the 15th for Easter Sunday

As Easter cannot happen sooner than the 22d of March nor later than the 25th of April, in all 35 days, this number has been called the number of direction for finding Easter for any year. Thus Easter day falling as in the first line below the number of direction will be as in the lower line.

Easter day, March 22, 23, 24, 25, 26, &c. April 1, 2, 3, &c.
  No. of direction, 1,   2,   3,   4,   5, &c.   11, 12, 13 &c.
and so on till the number of direction on the lower line be 35, which will answer to April 25th, being the latest that Easter can happen. Therefore add 21 to the number of direction and the sum will be so many days in March for Easter day : If the sum exceed 31, the excess will be the day of April.

To find the number of direction.—Enter the following table with the Dominical letter on the left hand, and the Golden number at the top ; then where the columns meet you have the number of direction.

Gold. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Dom. Let.																			
A	29	19	5	26	12	33	19	12	26	19	5	26	12	5	26	12	33	19	12
B	27	13	6	27	13	34	20	13	27	20	6	27	13	6	20	13	34	20	6
C	8	14	7	12	14	35	21	7	28	21	7	28	14	7	21	14	28	21	7
D	19	15	8	22	15	29	22	8	29	15	8	29	15	1	22	15	29	22	8
E	30	16	2	23	16	30	23	9	30	16	9	23	16	2	23	9	30	23	9
F	24	17	3	24	10	31	24	10	31	17	10	24	17	3	24	10	31	17	10
G	25	18	4	25	11	32	18	11	32	18	4	25	18	4	25	11	32	18	11

Thus for the year 1810 the Dominical letter is G, and the golden number 6 on the line G, and below 6 is 32 the number of direction. To this add 21, the sum is 53, from the 1st of March, which deducting the 31 days of March leaves 22 for the day of April for Easter day that year.

A LETTER OF CREDIT.

Montreal, January 2d, 1809.

SIR—Please furnish the bearer, Mr. John Peterson, with two hundred and fifty pounds sterling, in such sums as he shall have occasion for and require of you, for which take his receipt, and draw upon me as per advice.

I am, Sir, Your most obt. servt. A. B.

Mr. Samuel Beattie, Mercht. London.

A BILL OF LADING.

Shipped, by the grace of God, in good order and well conditioned, by Alexander Brown, merchant, London, in and upon the ship called the Brilliant, whereof Peter Dawson is master, now riding in the Thames near London bridge, and bound for Montreal; five bales of superfine broad cloth, and six

1v boxes of sugar, marked and numbered as per mar-
no. 1 gin, and are to be delivered in the like good order
to 11. at the aforesaid port of Montreal, (the danger of
the seas only excepted) unto Mr. James Anderson,
Merchant there, or to his assigns, he or they pay-
ing freight for the said goods ...... per cwt. with
primage and average accustomed.

In witness whereof the master or purser of the said
ship hath affirmed to three bills of ladency, all of this
tenor and date : one of which bills being accomplished,
the other two to stand void—and so God send the ship to
her desired port in safety—Amen.

Dated London, March 20, 1808.

There should be always three of these bills made out,
one of which must be sent by the post to the person to
whom the goods are consigned, the master of the ship
must have another, and the merchant or exporter the third.

————

POLICY OF INSURANCE.

KNOW all men by these presents, that A. B. of Lon-
don, merchant, as well in his own name as for and in the
name and names of all and every other preson or persons
whom the same may or shall concern, doth make assur-
ance, and hereby cause himself and them and every of
them to be assured, lost or not lost, at and from the Port
of London to the Port of Quebec in the Province of Low-
er Canada, upon the body, tackle, apparel, Ordnance,
Munition, Artillery, Boat and other Furniture of and in
the good Ship, called the Brilliant, burthen 360 Tons or
thereabouts, whereof A. B. is Master ; beginning the
adventure upon the said Ship from and immediately fol-
lowing the date hereof, and to continue and endure until
the said Ship and all her Tackle, Apparel, &c. shall be
arrived at the aforesaid Port of Quebec, and hath there
moored at Anchor 24 hours, and it shall be lawful for
the ship in this voyage to proceed and sail to, and touch

and stay at any parts and places whatsoever ; without prejudice to this Assurance. The said Ship the Brilliant for so much as concerns the assureds is and shall be rated and valued at —— Sterling without further account to be given by the Assureds for the same—And touching the Adventures and Perils in this Voyage, they are of the seas, Men of War, Fire, Enemies, Pirates, Rovers, Thieves, Jetsons, Letters of mark and counter mark, Surprisals and taking at sea—Arrests, Restraints and detainments of all Kings, Princes, and people, of what nation, condition, or quality soever ; Barratry of the Master or Marrines and all other Perils, losses and misfortunes, that have or shall come to the hurt, detriment or damage of the said Ship Brilliant or any part thereof— And in case of any misfortune it shall be lawful for the assureds, their Factors, servants and assigns to sue, labour and travel, for, in and about the defence, safeguard and recovery of the said ship, or any part thereof without prejudice to this Assurance ; to the charges whereof, we the Assurers will contribute, each of us according to the rate and quantity of his sum herein assured—And so we the assures are contented and do hereby promise and bind ourselves (each for his own part) our Heirs, Executors, Goods and Chattels, to the Assureds, their executors, administrators and assigns for the true performance of the premises ; confessing ourselves paid the consideration due to us for this Assurance by A. B. of London, Merchant, at and after the rate of — per cent, and in case of less, the assureds to abate — per cent.—In witness whereof, we the assurers have subscribed our names and sums assured.

I, DAVID RIED, am content with this assurance for four Hundred Pounds.—Witness, my hand,

                          D. R.

£400.

FORM OF AN INVOICE.

London, 20th March, 1809.

Invoice of five bales of superfine broad cloth and six boxes of sugar, shipped on board the Brilliant, Peter Dawson, master, for accompt and risk of Mr. James Anderson, merchant, Montreal, being marked and numbered as per margin, viz.

		£. S. d.
IV	BROAD CLOTH, 5 BALES.	
	No. 1. 118 yards.	
No. 1	No. 2. 84	
	No. 3. 102	
to 11.	No. 4. 108	
	No. 5. 99	
	511 yds. at 16s. 6d. per yd.	421 11 6

SUGAR, 6 BOXES.   *tare.*

cwt. qrs. lbs.   cwt. qrs. lbs.

	cwt qrs lbs	cwt qrs lbs
No. 6.	14 3 25	1 1 17
No. 7.	13 2 8	1 2 7
No. 8.	15 1 0	1 3 18
No. 9.	17 3 24	2 0 16
No. 10.	14 1 12	1 2 15
No. 11.	15 2 0	1 1 19
Gross	91 3 13	10 0 6
Tare	10 0 6	

81 2 7 neat at 28s. per cwt.

£ 55 1 9

Cost of wrapper and boxes,   8 3 3

— — — 63 5 0

CHARGES.

Entry, agency & shipping charges £3 12 6

River freight and cartage .. 4 11 0

— — — 8 3 6

Commission on £593 at 5 per cent, £29 0 0

Insurance on £635 at 3 per cent,   19 1 0

Policy 5s. 6d. per cent,   1 13 0

— — — 49 14 0

London, 20th March, 1809.

Errors excepted,   642 4 0

ALEXR. BROWN.

AN ACCOUNT OF SALES.

MONTREAL, 12th Oct. 1809.

AN account of sale of five bales superfine broad cloth received per the Stork, John Freeman, master, for account of Joseph Webster, merchant, London——DR.

	£.	S.	D.
BALES.			
No. 1. containing 108 yards.			
No. 2. — 118 —			
No. 3. — 81 —			
No. 4. — 99 —			
No. 5. — 102 —			
511 yards at 16s. 6d.	421	1	6
CHARGES.			
To freight and average - £11 3 9			
To landing charges 3s.6d. per bale 17 6			
To ware-house rent and deliv-			
ery, 6s. 3d. per bale - 1 11 3			
To commission at 5 per cent, 21 13 2½	35	5	8½
To the nett proceeds carried to the cred-			
it of your accompt -	450	17	2½

	PER CONTRA.	CR.			
	Sold for ready money,				
Oct. 1.	No. 1. 108 yards.				
	No. 2. 118 —				
	216 at 17s. 10d.		192	7	6
	Sold James Duncan, at one month,				
	No. 3. 81 yards.				
	No. 4. 99 —				
	183 at 18s. 6d.		169	5	6
	Kept No. 5. 102 yds. at 18s. 8d. Of. 2/102		95	4	2½
	at 2 months - - -				
	MONTREAL, 12th Oct. 1809.		456	17	2½
	Errors excepted,				
	PETER WILSON.				

T

FORM OF A BOND.

KNOW all men by these presents, that I, A. B. of the city of Montreal, Merchant, am held and firmly bound to C. E. of the same city, Gentleman, in the sum of one thousand pounds of good and lawful money of the Province of Lower Canada, to be paid to the said C. E. or to his certain Attorney, Executors, Administrators, or Assigns; for the true payment whereof, I bind myself, my Heirs, Executors and Administrators firmly by these presents, sealed with my seal—dated this —- day of ——in the forty eighth year of the reign of our Sovereign Lord George the Third, King of the British Isles; and in the year of our Lord one thousand eight hundred and eight.

The condition of this obligation is such that if the above bounden A. B. his Heirs, Executors, or Administrators, do well and truly pay or cause to be paid to the above named C. F. his Heirs, Executors, Administrators, or Assigns, five hundred pounds of good and lawful money of the Province of Lower Canada, on the —- day of —— next ensuing the date hereof with lawful interest for the same, then this obligation to be void or else to remain in full force.   A. B.

LETTER OF ATTORNEY.

KNOW all men, by these presents, that I Samuel Arne, of London, Merchant, for divers good causes and considerations, have named, constituted and appointed, and by these presents, do name, constitute and appoint my Friend Allen Jamieson, Esqr. of the city of Montreal, in Lower Canada, my true and lawful Attorney, for me, in my name, and to my use, to ask, demand, recover and receive of A. B. of the said city of Montreal Merchant, the sum of ——— to me due and owing by and from the said A. B. giving and hereby granting to my said Attorney, my full power and authority to take, pursue, and follow such legal courses for the recovery and obtaining of the said debt, as I myself might or could do, were I personally present, and acquittance or other suf-

ficient discharge in my name, to make and give, ratifying, confirming and allowing all and whatsoever my Attorney shall lawfully do or cause to be done, in and about the premises by virtue of these presents.--In witness whereof I have hereunto set my hand and seal the —— day of —— in the forty eighth year of the reign of our Sovereign Lord George the Third, By the Grace of God King of the British Isles and in the year of our Lord one thousand eight hundred and eight.

ARBITRATION BOND.

[It is a common and laudable practice among Merchants and others in Business that they do not upon every small difference go to law, but refer the matter in dispute to two Judicious men ; and in case these cannot agree, they sometimes chuse a third called an umpire. The contending parties oblige themselves to stand to their determination by signing and delivering to each other mutual bonds —The final decision must be delivered in writing.—The bond of Arbitration in Eng'and is of the following form.]

KNOW all men by these presents that I A. B. am he'd and firmly obliged to A. Z. in—pounds of good and lawful money of the province of Lower Canada, to be paid to the said A. Z. his Attorney, Executors, or Administrators. To which every payment well and faithfully to be made I oblige my Heirs, Executors and Administrators, firmly by these presents sealed with my seal, dated at ——— on the —— day of —— in the year of our Lord —— and in the forty eighth year of the reign of our Sovereign Lord King George.

The condition of this bond is such that if the above bounden A. B. his heirs, Executors and Aministrators do in all things well and truly stand to, obey, abide by, perform, fulfil and keep the Award, order, Arbitrament and determination of X. Y. and B. C. Arbitrators indifferently named and elected as well on the part and behalf of the above bounden A. B. as of the above named A. Z. to Arbitrate, award, order, Judge, and determine of and concerning all and all manner of action and actions,

cause and causes of actions, suits, bills, bonds, specialities, Judgments, Executions, Extents, quarrels, controversies, trespasses, damages and demands whatsoever, at any time or times heretofore had made, moved, brought, commenced, sued, prosecuted, suffered, committed or depending by and betwacn the said parties, so as the said award be made and given up in writing under their hands and seals to the said parties, on or before the —— next ensuing the date above mentioned—then this obligation to be void or else to remain in full force. **A. B.**

   Signed and Sealed in the persence of,

               G. D.

               E. F.

FORM OF AN ARBITRATION BOND OR SUB-MISSION USED IN SCOTLAND.

WE A. and B. by these presents, submit and refer to C. D. all controvercies, claims, and competition of right between us of and concerning —— and oblige us and our successors to abide by their decree to Arbitrate to be therein promounced betwixt and the day of — next to come under the penalty of —— besides performance.

FORM OF AN UMPIRAGE OF AWARD.

TO all people to whom this present writing shall come, we X. Y. and B. C Arbitrators indifferently chosen between A. B. and A. Z. of ·····, send greeting. Now know ye that we the said X. Y. and B. C. having deliberately heard, considered, and understood the griefs, allegations, and proofs, of both the said parties ; and being willing, as much as in us lyeth, to set the said parties at unity and good accord—do, by these presents, arbitrate, award, deem, decree and judge, that the said A. B. his executors, administrators, and assigns, do and shall well and truly pay, or cause to be paid unto the said A. Z. his executors, administrators and assigns, the full sum of ······, of lawful money of the Province of Lower Canada, on

the •••• day of •••• next ensuing the date of these pres-
ents ; and that upon payment thereof, the said A. B.
and A. Z. shall, at their own proper cost and charges,
seal, subscribe, and as their several acts and deeds deliver
each to the other a general release in writing, of all mat-
ters, actions, suits, causes of actions, bonds, bills, cove-
nants, controversies and demands whatever, which either
of them hath, may or might have of and against each
other by reason aforesaid, or means of any matter, cause,
or thing whatever, from the beginning of the world to
the •••• day of •••••• last past, and in the forty-eighth
year of the reign of our Sovreign Lord King George, &c.

In witness whereof, we have hereunto set our hands
and seals, this •••••• in the year of our Lord, one thou-
sand eight hundred and eight.   X. Y.
   Sealed and Delivered in the   B. C.
      presence of   L. S.
                         G. F.

GENERAL RELEASE.

KNOW all men by these presents, that I, A. B. have
remised, released, and forever quitted claim, and by these
presents do for me, my heirs, executors, and administra-
tors, remise, release, and forever quit claim unto A. Z.
his heirs, executors, and administrators, all and all man-
ner of actions, cause and causes of actions, suits, bills,
bonds, writings, obligations, debts, dues, duties, ac-
compts, judgments, executions, extents, quarrels, con-
troversies, trespasses, damages and demands whatsoever,
both in law and equity, or otherwise however, which
against the said A. Z. I ever had, now have, and which
I, my heirs, executors, and administrators shall or may
have, claim, challenge or demand, for as by reason, or
by means of any matter, cause or thing, from the begin-
ning of the world to the day of the date of these presents.

In witness whereof, I have hereunto set my hand and
seal, the •••• day of ••••••, &c.   A. B.
   Sealed and delivered in ⎱
      the presence of   ⎰

FORM OF A PROTEST, WITH AN ACCEPTED BILL OF EXCHANGE ANNEXED.

MONTREAL, 17th Nov. 1807.

Exchange for £250 Sterling.

AT thirty days sight, pay this my only bill of exchange to Daniel Thompson, Esq. or order, the sum of two hundred and fifty pounds Sterling, value received, and place it to account as per advice from, JAMES STEVEN.

To Mr. PETER CRAIG. Merchant in London.

Accepted—PETER CRAIG.

ON this day the the twenty-fourth of April, one thousand eight hundred and eight, at the request of Daniel Thomson, of London, merchant, bearer of the bill of exchange, whereof a true copy is above written : I, James Turner, of London, Notary Public, by royal authority, duly admitted and sworn, went to exhibit the said bill of exchange unto Mr. Peter Craig, of London, merchant, upon whom the same is drawn, whereunto I was answered by Mr. A. B. his clerk, that he was in the country and would return to-morrow, when the said bill would be certainly paid ; which answer not being satisfactory, therefore I the said notary, at the request aforesaid, have protested, and by these presents do solemnly protest, as well against the drawer and acceptor of the said bill of Exchange, as against all others whom it may concern, for exchange, re-exchange, and all costs, charges, damages, and interest suffered, for want of payment of the the said bill of exchange.

Done and protested in London, in the presence of David Milo and John Davis, of London, aforesaid, witnesses. In testimonium veritatis,

JAMES TURNER, Notary Public.

NOTE.—Where no Notary resides—any substantial person of the place, in the presence of two credible witnesses may act as such.

FINIS.