

EDWARD HYLSON

St. Asude

St. Asude

Manuscript

(1)

Arithmetic

BY

Edward Clayton,

Horton School.

1862.

What will be the expense of glazing a hall-
window, containing 60 squares, each 1 ft. 3 in.
long and $11\frac{1}{4}$ in. wide at 5s. 4d. per sq. ft.?

ft. in.
 $1.3 = 1\frac{3}{4}$ ft. 5s. 4d. = $5\frac{1}{3}$

in
 $11\frac{1}{4} = 1\frac{15}{16}$ ft.

ft. $1\frac{1}{4} \times \frac{15}{16} \times \frac{60}{1} = 5\frac{1}{3}$

$\frac{5}{1} \times \frac{15}{16} \times \frac{60}{1} \times \frac{16}{3} = 375$ L. S. Ans.

By selling an article for 10s, the seller loses 5

percent.; what will be the loss or gain when sold for
12s. 6d., and what was its prime cost? —

$$\frac{100}{5} = 20$$

As 95 : 100 :: 10 or 12 L.

$\frac{100}{95} = \frac{10}{9.5}$ L. S. D. prime cost.

$\frac{12s. 6d.}{10} = 1.26$ L.
 $\frac{1.26}{1.1179} = 1.127$

As $\frac{10}{19} : \frac{15}{152} :: 100$ L.

5

~~10~~

$$\frac{15}{100} \times \frac{100}{1} \times \frac{19}{100} = \frac{75}{4} = 18\frac{3}{4} \text{ per cent Ans.}$$

~~15~~
~~100~~
~~19~~
~~100~~
 4

At what rate per cent. of simple interest will £1 become a guinea in 5 years?

£
 1
 5
 100/5 (0 " 1.
 20
 100/100 (10

£
 21 or 1 guinea
 21
 1

£ £ £ £
 As 100 $\frac{1}{20}$: 100 $\frac{1}{20}$:: 1 £ :

Odd

$$\frac{1}{20} \times \frac{1}{1} \times \frac{20}{1} = \underline{\underline{1 \text{ £ per cent Ans}}}$$

How much will a broker who charges 5 per cent.

discount give for a bill for £60 due at 2 months

$$\frac{2}{12} \times \frac{5}{100} = \frac{10}{1200} = \frac{5}{600}$$

As £ $\frac{5}{600}$: £600 :: £100 :

$$\frac{600 \times 100 \times 6}{121} = \frac{72000}{121} = \underline{\underline{595.0.9 \text{ 121}}}$$

£ . s . D 111
 Ans: 595. 0. 9 121

Find the present worth and discount on
 £226. 1s. 11d. due 7 months at $4\frac{3}{4}$ percent.

$$\frac{7}{12} \times \frac{19}{4} = \frac{133}{48} \text{ £}$$

$$\text{As } 100 \frac{133}{48} : 100 :: 226 \frac{23}{40}$$

$$\frac{100 \times 54263 \times 48}{1 \times 240 \times 4933} = 220 \text{ present worth}$$

£.	s.	d.
226.	1.	11
220.	0.	0
<hr/>		
6.	1.	11 discount

Ans: 220 Present worth £. s. d.
6. 1. 11 discount

By selling tea at 5s. 4d. a pound, a grocer clears
 $\frac{1}{8}$ of his outlay; he then raises the price to
 6s.: what does he clear percent. upon
 his outlay at the latter price?

$$5s. 4d. = \frac{9}{8} \text{ s}$$

$$\text{As } \frac{9}{8} : \frac{8}{8} :: 5\frac{1}{3}$$

$$\frac{8}{8} \times \frac{16}{3} + \frac{128}{9} = \frac{128}{27} = 4.8\frac{8}{9} = 135$$

s.	d.
6.	0
4.	8 $\frac{8}{9}$
<hr/>	
1.	3 $\frac{1}{9} = 2\frac{1}{10}$

$$\text{As } \frac{32}{135} : \frac{17}{270} :: 100 \text{ £.}$$

$$\frac{100}{100} \times \frac{100}{1} \times \frac{135}{32} = \frac{425}{16} = 26 \frac{9}{16} \text{ ans.}$$

How must wine, which cost 15s, in gal. be sold so as to gain 21/4 percent, and how so as to lose the same?

L L L
 As 100 : 121 1/4 :: 3 or 15s :

$$\frac{3}{4} \times \frac{485}{4} \times \frac{1}{100} = \frac{201}{320} = 18 \frac{21}{4} \text{ S. D.}$$

L L L
 As 121 1/4 : 100 :: 3/4 or 15s

$$\frac{100 + 3 + 4}{1 \ 4 \ 485} = \frac{107}{11} = 11 \frac{93}{4} \text{ S. D.}$$

S. D. S. D.
 Ans: 18 21/4 11 93/4

If an oz. of silver cost 5s, what is the price of a cup weighing 1 lb. 10 oz. 12 dwts. 6 grs.?

1 lb. 10 oz. 12 dwts. 6 grs. = 22 12 6

10 dwts = 1/2 of 1 oz

2 dwts = 1/5 of 1 oz
 6 grs = 1/8 of 1 oz

5s
22
110
2 1/2
0 1/2
0 3/4
20 11 3 0 3/4
5 13 0 3/4 Ans:

Find the commission on £126 at $\frac{5}{8}$ per cent, and reduce the answer to the decimal of £1.11s.6d. —

As £100: $\frac{5}{8}$:: £126

$$\frac{5}{8} \times \frac{126}{100} = \frac{63}{80} \text{ £ } = 15.9 \text{ s. } 9 \text{ d.}$$

£ 9 d.
15.9 = 189.
L. S. D. D.
1.11.6 = 378

$$\frac{189}{378} = .5$$

∴ 15.9 to the decimal of £. S. D. = .5 Ans.

£1000 is to be divided among A, B and C, so that for every £3 given to A, B is to receive £5 and C £8; what sum had they each? —

£

A gets 3
B gets 5
C gets 8

16

A gets $\frac{3}{16}$ of £1000 = 187.10.

$$B \text{ gets } \frac{5}{16} \text{ of } £1000 = £ 312.10$$

$$C \text{ gets } \frac{8}{16} \text{ of } £1000 = £ 500.0$$

$$\text{Ans. As } \frac{L.S.}{184.10}, \frac{L.S.}{B \text{ is } 312.10}, \frac{L.S.}{C \text{ is } 500.0}.$$

A father left to the elder of two sons $\frac{13}{25}$ of his estate, and $\frac{13}{25}$ of the remainder to the younger, and the residue to his wife; find their respective legacies it being found that the elder son

received £169 more than the younger

$$1 - \frac{13}{25} = \frac{12}{25}$$

$$\frac{13}{25} \text{ of } \frac{12}{25} = \frac{156}{625} \text{ sons share}$$

$$\frac{13}{25} = \frac{156}{625} = £ 1690$$

$$\frac{325}{625} - \frac{156}{625} = \frac{169}{625} = £$$

$$\frac{12}{25} - \frac{156}{625} = \frac{300}{625} - \frac{156}{625} = \frac{144}{625} \text{ wife's share}$$

$$\text{As } \frac{169}{625} : \frac{13}{25} :: £ 1690$$

$$\frac{13}{25} \times \frac{1690}{1} \times \frac{25}{169} = \underline{\underline{3250}} \text{ £}$$

$$\text{As } \frac{169}{625} : \frac{156}{625} :: £ 1690$$

$$\begin{array}{r} 10 \\ 156 \times \frac{1690}{625} + \frac{169}{1} = \underline{1360} \end{array}$$

As $\frac{169}{625} : \frac{144}{625} :: 1690$

$$\begin{array}{r} 10 \\ 144 \times \frac{1690}{625} + \frac{169}{1} = 1140 \end{array}$$

Ans 3250 elder sons share: 1560 younger sons
and 1440 wives share.

If the Russian werst be one-half the
Scotch mile, and 4 Scotch miles are equal
to 5 English, how many wersts are there
in 560 English miles?

Scotch mile Russian wersts
 $\frac{1}{2} = 1$ Scotch miles 4 = 5 English

4 = 8
wersts
 $\therefore 8 = 5$ English miles

miles: wersts
As 5 : 560 :: 8
 $5 \overline{) 4480}$
Ans: 896 Russian wersts

$$\begin{array}{l} 5 : 3 \\ \text{Ans } 7 : 1\frac{2}{3} :: 5 \text{ days} \\ 8 : 9 \end{array}$$

$$\frac{3}{5} \times \frac{3}{2} \times \frac{3}{4} \times \frac{9}{8} = \frac{135}{16} = 8\frac{1}{16} \text{ days}$$

Ans: $8\frac{1}{16}$ days.

Add together $3\frac{2}{15}$, $2\frac{5}{12}$, $\frac{1}{9}$, $\frac{1}{45}$

$$3\frac{2}{15} + 2\frac{5}{12} + \frac{1}{9} + \frac{1}{45}$$

$$\frac{4}{15} + \frac{29}{12} + \frac{1}{9} + \frac{1}{45}$$

$$\frac{564 + 435 + 20 + 16}{180} = \frac{1035}{180} = 5\frac{3}{4}$$

Ans $5\frac{3}{4}$

Find the value of

$$\frac{1}{7}(4x-21) = \frac{5}{6} + \frac{1}{3}(x-4) = x + 3\frac{3}{4} - \frac{1}{8}(9-\frac{2}{3}x) + \frac{1}{12}$$

$$-1x - 21 - \frac{329}{6} + \frac{1}{3}(x-4) = x + \frac{105}{4} - \frac{1}{8}(9-\frac{2}{3}x) + \frac{1}{12}$$

$$-18x - 252 - 658 + 196x - 784 = 84x + 315 - \frac{21}{2}(9-\frac{2}{3}x) + \frac{1}{12}$$

$$96x - 504 + 1316 + 392x - 1568 = 168x + 630 - 189$$

$$+ 147x + 11$$

$$173x = 1211$$

$$x \therefore = \frac{1211}{173} = \underline{\underline{7}} \text{ Ans.}$$

A person has £3500 to lay out, the 3 per cents are at $8\frac{1}{2}$, and the $3\frac{1}{2}$ at $9\frac{1}{2}$, what would be his income from each?

$$\frac{3500}{8\frac{1}{2}} \times 3 = \frac{400}{1} \times \frac{3}{1} + \frac{2}{1} = \frac{1400}{11}$$

L. S. D.
127.5.57

$$\frac{3500}{96} \times 3\frac{1}{2} = \frac{3500 \times \frac{7}{2} \times 1}{12 \times \frac{96}{24}} = \frac{6125}{48} = \underline{\underline{127.12.1}} \text{ L. S. D.}$$

L. S. D. L. S. D.
Ans: 127.5.57; 127.12.1

What number is that which exceeds its sixth part by 10?

Let x = the number req^d

$$\text{Then } x - \frac{1}{6}x = 10$$

$$6x - x = 60$$

$$\therefore x = \underline{\underline{12}} \text{ Ans.}$$

A merchant employs £700 in trade

and at the end of 3 years takes another

into partnership, who advances £1900.

At the end of 4 years from this time they
have gained £500; how ought this to
be divided between them?

$\frac{3}{4}$
7 mths.

$$\begin{array}{r} 700 \times 3 = 2100 \\ 1900 \times 4 = 7600 \\ \hline 9700 \end{array}$$

$$\frac{4900}{12500} \text{ of } 500 \text{ £} = \frac{49}{125} \text{ of } 500 \text{ £} = 196 \text{ £}$$

$$\frac{7600}{12500} \text{ of } 500 \text{ £} = \frac{76}{125} \text{ of } 500 \text{ £} = 304 \text{ £}$$

Ans: £196; £304

At an election where 97 votes were given
the successful candidate had a majority
of 47; what were the numbers for each?

Let x = the number required

$$\text{Then } 97 - x = x - 47$$

$$-2x = -1026$$

$$\therefore x = \frac{1026}{2} = 513$$

$$\begin{array}{r} 979 \\ 513 \\ \hline 466 \end{array}$$

Ans: 513; 466.

What is the discount on £ 25⁷/₃ " 8s. 8¹/₄d.
paid 210 days before due at 4¹/₂ per cent?

$$\frac{210}{365} \times 4\frac{1}{2} = \frac{210}{365} \times \frac{9}{2} = \frac{189}{73} = 2\frac{43}{73}$$

$$As \quad L \frac{43}{73} \quad L \frac{139}{320} \quad \therefore 100 L$$

$$\frac{82349}{3201} \times \frac{100}{1} \times \frac{73}{7489} = \frac{4015}{16} = 250.18.9$$

L. S. D.

257. 8. 8¹/₄

250. 18. 9

Ans: L. 6. 9s. 11¹/₄d.

There is a number such that if 8 be added

to its double, the sum will be five times its

half. Find it.

Let $x =$ the number required

$$\text{Then } (x \times 2) + 8 = \left(\frac{1}{2}x \times 5\right)$$

$$4x - 16 = 5x$$

$$4x - 5x = -16$$

$$x \therefore = \underline{\underline{16 \text{ Ans:}}}$$

The rent of a man's house is £120
 per annum. It is assessed to the rate
 at $\frac{2}{3}$ of this; the poor's rate is $\frac{1}{2}$ s. 6d
 in the pound, the paving rate is 1s. 9d

and the church rate 4d: how much does he
 pay altogether for his residence?

$$\frac{2}{3} \text{ of } £120 = £80$$

bd. = $\frac{1}{2}$ s / 80 at $\frac{1}{2}$ s bd = $\frac{1}{2}$ s 80 at 1s. 9d

$$\begin{array}{r} 20 \overline{) 600} \\ \underline{40} \\ 200 \\ \underline{200} \\ 0 \end{array} \text{ s.}$$

$$\begin{array}{r} 20 \overline{) 600} \\ \underline{40} \\ 200 \\ \underline{200} \\ 0 \end{array} \text{ s.}$$

$$\begin{array}{r} 20 \overline{) 600} \\ \underline{40} \\ 200 \\ \underline{200} \\ 0 \end{array} \text{ s.}$$

$$\begin{array}{r} 3d = \frac{1}{2} \text{ s} / 80 \\ \underline{40} \\ 20 \\ 20 \overline{) 140} \\ \underline{140} \\ 0 \end{array} \text{ s.}$$

	80		£	s.	d.
	<u>4</u>				
	12320	d			
	<u>20</u>	268			
	<u>£</u>	1.6s.8d.			

	£	s.	d.
	30	0	0
	<u>4</u>	0	0
	<u>£</u>	11	6.8
	<u>£</u>	38	6.8

	£	s.	d.
	120	0	0
	<u>38</u>	6	8
Ans	<u>£</u>	158	6.8

A and B can do a piece of work alone in 12 and 16 days respectively; they work together at it for 3 days, when A leaves it, but B continues, and after 2 days is joined by C, and they finish it together in 3 days; in what time would C do it alone?

A can do $\frac{1}{12}$ of the work in 1 day
 B " $\frac{1}{16}$ " " "

\therefore A does $\frac{3}{12}$ or $\frac{1}{4}$ in 3 days
 and B " $\frac{5}{16}$ in 5 days

$1 - \left(\frac{3}{12} + \frac{2}{16}\right)$ work to be done when A starts

$$1 - \left(\frac{12}{48} + \frac{15}{48}\right) = \frac{48 - 27}{48} = \frac{21}{48} = \frac{7}{16}$$

Now $\frac{7}{16} - \frac{3}{16} = \frac{4}{16} = \frac{1}{4}$ the quantity done by C in 3 days

$$\therefore 3 \times 4 = 12 \text{ days. Ans.}$$

What is the present worth of £2035.15s. due in 2 yrs. 5 $\frac{1}{2}$ mths. at 4 $\frac{1}{2}$ per cent.?

$$\text{p.w. } 2. 5\frac{1}{2} = 2 \frac{5\frac{1}{2}}{12} = 2 \frac{11}{24}$$

$$4^2 \times 2^{\frac{11}{24}} = \frac{3}{2} \times \frac{50}{24} = \frac{150}{48} = 11 \frac{1}{4}$$

As $L_1 \quad L \quad L \quad L \quad 3$
 As $111 \frac{1}{16} : 100 :: 2035 \frac{3}{4} :$

$$\begin{array}{r} 20353 \times 100 \\ \hline 111 \frac{1}{16} \end{array}$$

$$\begin{array}{r} 8143 \times 100 \times 16 \\ \hline 4 \quad 1 \quad 1777 \\ \hline 325200 \\ \hline 1777 \\ \hline \end{array}$$

Ans: $L. \quad s. \quad d. \quad 522$
 $1832 \quad 19 \quad 6$

Find a number such that, if 10 be taken from
 its double, and 20 from the double of the remain-
 der, there may be 40 left.

Let x = the no. req^d

$$2(2x - 10) - 20 = 40$$

$$4x - 20 - 20 = 40$$

$$4x - 40 = 40$$

$$4x = 40 + 40$$

$$4x = 80$$

$$\therefore x = \frac{80}{4} = 20 \text{ Ans:}$$

If I lay out £3000 in the 3 per cent. when they are at 84 $\frac{3}{8}$, what income should I hence derive?

$$\frac{3000 \times 3}{84\frac{3}{8}} = \frac{3000 \times 3 \times 8}{1075} = \frac{320}{3} = 106\frac{2}{3}$$

Ans: L. S. D.
106. 13. 4.

A and B play together for a stake of 5s; if A win, he will have thrice as much as B, but if he lose, he will have only

twice as much. What has each at first?

Let x = A's money in shillings, at first

Then $\frac{x-5}{3}$ = B's when he loses

$\frac{x-5}{2}$ = B's when he wins

$$\frac{x-5}{3} = \frac{x-5}{2} = 10$$

$$2x + 10 = 3x - 15 = 60$$

$$-x = -85$$

$\therefore x = 85$ s. = A's money

Let x = B's money in shillings, at first

Then $3(x-5)$ A's when he wins

$2(x+5)$ " " loses

$$3(x-5) = 2(x+5) + 10$$

$$3x - 15 = 2x + 10 + 10$$

$$3x - 15 = 2x + 20$$

$$\therefore x = 35 \text{ s. Rs money}$$

Ans: Rs 85 s. Bs 35 s.

What income should I get by laying
out £1188 in the purchase of 3 per cent stock
at 81?

$$\frac{1188 \times 3}{81} = \frac{1188 \times 3}{81} = 44 \text{ } \left\{ \begin{array}{l} \text{Ans:} \\ 44 \end{array} \right.$$

A father's age is 40 and his son's 8, in how

many years will the father's age be triple

of his son's?

Let x = the no. of years in which the father's

age will be triple of his son's.

Then $x + 40$ = father's age

$\frac{x + 40}{3}$ son's age

$$\frac{x + 40}{3} = x + 8$$

$$x + 40 = 3x + 24$$

$$2x = 16$$

$$\therefore x = \frac{16}{2} = 8 \text{ years. Ans:}$$

If I lay out £1000 in the 3½ per cents at 96, what should I have by selling out at 95?

As 96: 95 :: 1000:

$$\frac{95 \times 1000}{96} = \frac{11875}{121} = 989.11.8 \text{ L. S. D.}$$

$$\begin{array}{r} \text{L. S. D.} \\ 1000.0.0 \\ 989.11.8 \\ \hline 111.8.4 \text{ Ans:} \end{array}$$

Write down the expansion of

$$(4a - 3b)^3$$

$$(4a - 3b)^3 = (16a^2 - 24ab + 9b^2)(4a - 3b) =$$
$$(64a^3 - 144a^2b + 108ab^2 - 27b^3) \text{ Ans:}$$

If a person lays out £4560 in the 3½ per cents at 93, what will be his loss of property by the stocks falling ¼ per cent?

$$\frac{50}{92} \times 100 = 5000 \text{ L}$$

$$50 \text{ at } 92\frac{1}{2} = \frac{25}{1} \times \frac{185}{2} = 4625 \text{ L}$$

L
 4650
 4625
 Ans. 25 L

Write down the expansion of

$$(1+x+x^2)^4$$

$$(1+x+x^2)^4 = (1+2x+3x^2+2x^3+x^4)(1+2x+3x^2+2x^3+x^4)$$

$$1+4x+10x^2+16x^3+19x^4+16x^5+10x^6+4x^7+x^8 \text{ Ans.}$$

What would be the difference in annual income from investing £3450 in the 4 per cents. at 92, and 3 1/3 per cents. at 69?

$$\frac{3450}{92} \times 4 = \frac{3450}{92} \times \frac{150}{1} = 150 \text{ L}$$

$$\frac{3450}{69} \times 3\frac{1}{3} = \frac{3450}{69} \times \frac{10}{3} = 166.13.4$$

L. S. D.
 166.13.4
 150.0.0
 L. 16.13.4 Ans.

Write down the expansion of

$$(1 - 2x + x^2)^3$$

$$(1 - 2x + x^2)^3 = 1 - 6x + 15x^2 - 20x^3 + 11x^4 - 6x^5 + x^6$$

$$= 1 - 6x + 15x^2 - 20x^3 + 11x^4 - 6x^5 + x^6 \text{ Ans}$$

A person has £1000 in the $3\frac{1}{2}$ per cent

how much must he have also in the

3 per cent. that his whole income may

be £200, and what sum would he

realize by selling out at $83\frac{3}{8}$ and $77\frac{1}{8}$ respectively

- by ?

$$\frac{1000}{100} \times 3\frac{1}{2} = \frac{1000}{100} \times \frac{7}{2} = 35 \text{ £}$$

$$\frac{1000}{100} \times 3 = \frac{1000}{100} \times 3 = 30 \text{ £}$$

$$\frac{200}{35} = 165$$

$$\text{As } 30 : 165 :: 1000 \text{ £}$$

$$\frac{35}{30} \times 1000 = 5500 \text{ £}$$

$$£1000 \text{ or } 10 \text{ ct.} \times 83\frac{3}{8} = \frac{107669}{8}$$

$$\frac{6690}{8} = \text{L. S. } 836.5$$

$$£5500 \text{ or } 55 \text{ ct.} \times 19\frac{1}{8} = 55 \times \frac{161}{8} =$$

$$\frac{33935}{8} = \text{L. S. D. } 4241.17.6$$

Ans: L. S. L. S. D.

$$5500; 836.5; 4241.17.6$$

Find the expansion of

$$(3ax + 2by + cz)^2$$

$$(3ax + 2by + cz)^2$$

$$9a^2x^2 + 6ax(2by + cz) + (2by + cz)^2$$

$$9a^2x^2 + 12abxy + 6acxz + 4b^2y^2 + 4bcyz + c^2z^2$$

Ans: $9a^2x^2 + 4b^2y^2 + c^2z^2 + 12abxy + 6acxz + 4bcyz$

A sum of 3750 £ was sold out of the 3 per cents at 95, and put at compound interest

for 2 years at 4 per cent.; the amount being laid out in the $3\frac{1}{2}$ per cents at 104, find the alteration in income.

Ans: $3\frac{7}{8} \times 0.5 = \frac{25}{8} \times \frac{1}{2} = 3.562\frac{1}{2}$ L

$\frac{3.562\frac{1}{2} \times 3 = 10.687\frac{1}{2}}{95} = 112.10$ L S

L. S.
 $\frac{3562.10}{4}$
 14250
 20
 10.00

L. S. D.
 $\frac{3705}{4}$
 14820
 20
 400

L. S. D.
 $\frac{3705.0.0}{4}$
 $148.4.0$
 $3853.4.0$

$38.53\frac{1}{2} \times 3\frac{1}{2} = 192.64 \times \frac{7}{2} \times 1 = 129.13.6$ L. S. D.

$\frac{19264}{5} = 38528$

L. S. D.
 $129.13.6$
 $112.10.0$
 $17.3.6$

L. S. D.
Ans: 17.3.6

Find the expansions of

$(1+x)^6$

$(1+x)^6 = (1+3x+3x^2+x^3)^2$

$1+6x+6x^2+2x^3$
 $9x^2+18x^3+6x^4$
 $9x^4+6x^5+x^6$

Ans: $1+6x+15x^2+20x^3+15x^4+6x^5+x^6$