

The sum of £100 was laid out in the

3 per cents. at 89 $\frac{3}{8}$, and a whole year's

dividend having been received upon it,

it was sold out; the whole increase of capital

being 7 $\frac{1}{2}$ guineas. find at what price

it was sold out.

$$\frac{\text{£}1001 \times 3}{89\frac{3}{8}} = \frac{3003 \times 8}{715} = \frac{24024}{715} = 33\frac{3}{5}$$

$$\begin{array}{r} \text{£} \\ 1001 \\ \frac{7\frac{1}{2} \times 3}{42} \\ \hline 1043 \end{array}$$

$$\begin{array}{r} \text{£} \\ 1001 \\ \frac{42}{42} \\ \hline 1043 \end{array}$$

$$\text{As } \text{£}1001 : \text{£}1043 :: 89\frac{3}{8}$$

$$\frac{1043 \times 715}{1001 \times 8} = 93\frac{1}{8} \text{ £}$$

$$\underline{\text{Ans } 93\frac{1}{8}}$$

Find the G.C.M. of $x^2 - 7x + 10$ and

$$4x^3 - 25x^2 + 20x + 25$$

$$x^2 - 7x + 10 \quad 4x^3 - 25x^2 + 20x + 25 \quad (4x + 3)$$

$$4x^3 - 28x^2 + 40x$$

$$3x^2 - 20x + 25$$

$$3x^2 - 21x + 30$$

$$x - 5 \overline{) x^2 - 7x + 10} \quad (x - 2)$$

$$x^2 - 5x$$

$$-2x + 10$$

$$-2x + 10$$

Ans: $x - 5$

A person invests £18150 in the 3 per cents. at

90 $\frac{3}{4}$ and, on the 1st of Jan. transfers it to

the 3 $\frac{1}{2}$ per cents. at 97 $\frac{1}{4}$: what increase does

he make thereby in his annual income?

150	£
1650	
<u>18150 x 3</u>	= 18150 x 3 $\frac{1}{2}$ = 600 int. in the 3 per cents.
90 $\frac{3}{4}$	363
	121
	14
	1
	<u>at 90$\frac{3}{4}$</u>

$$\frac{18150 \times 91}{90\frac{3}{4}} =$$

50
 $\frac{18150 \times 91}{90\frac{3}{4}} = 18200$ Money transferred to 3rd at $9\frac{1}{4}\%$
 363

$$\frac{18200 \times 3\frac{1}{2}}{97\frac{1}{2}} = \frac{18200 \times 7 \times 7}{195 \cdot 7}$$

$$\frac{18200 \times 3\frac{1}{2}}{97\frac{1}{2}} = 280$$

1960
 3 — L. S. D.
 653. 6. 8 And in the 3rd in cents.

L. S. D.
 653. 6. 8
 600. 0. 0
 53. 6. 8

L. S. D.
 Ans: 53. 6. 8

Find the G.C.M. of $2a^4 + a^3b - 1a^2b^2 - 3ab^3$ and

$$1a^4 + a^3b - 2a^2b^2 + ab^3$$

$$2a^3a^3b - 1a^2b^2 - 3ab^3 \quad | \quad 1a^4 + a^3b - 2a^2b^2 + ab^3$$

$$2a^3a^3b - 1a^2b^2 - 3ab^3 \quad | \quad 1a^3 + a^2b - 2ab^2 + b^3 \quad (2$$

$$4a^3 + 2a^2b - 8ab^2 - 6b^3$$

$$6a^2b + 6ab^2 + 6b^3$$

$$a^2 - 6ab + b^2$$

$$\begin{array}{r} a^2 - 6ab + 7b^2 \overline{) 2a^3 + a^2 - 11ab^2 - 3b^3} \quad (2a + 13b \\ \underline{2a^3 - 12a^2b + 14ab^2} \end{array}$$

$$13a^2b + 10ab^2 = 3b^3$$

$$13a^2b - 78ab^2 - 91b^3$$

$$88b^2 \overline{) 88ab^2 + 88b^3}$$

$$\underline{a + b}$$

$$\begin{array}{r} a + b \overline{) a^2 - 6ab + 7b^2} \quad (a - 7b \\ \underline{a^2 + ab} \end{array}$$

$$= 7ab - 7b^2$$

$$\underline{-7ab + 7b^2}$$

$$\text{Ans: } a(a + b)$$

Divide 100 guineas into an equal num

ber of guineas, half-guineas, crowns, half-

crowns, shillings, and sixpences, and

reduce the remainder to a fraction of a

pound.

1 quinea	42	sixpences
1/2 "	21	"
1 crown	10	"
1/2 "	5	"
1 shilling	2	"
1/2 "	1	"
	<u>81</u>	"

quineas
 100
 42

$$81 = \left\{ \begin{array}{l} 9 \times 1200 \\ 9 \times 166 + 6 \\ 51 \times 1 \end{array} \right\} = 69 \text{ sixpences}$$

sixp. 69 is a fraction of £1

$$\frac{69}{40} = \frac{129}{80}$$

$$\text{Ans: } 51 + \frac{129}{80}$$

Find the G.C.M. of $3x^3 - 22x - 15$ and

$$5x^4 - 54x^2 + 18x$$

$$\begin{array}{r}
 3x^3 - 22x - 15 \quad | \quad 5x^4 - 54x^2 + 18x \\
 | \quad 5x^3 + x^2 - 54x + 18 \\
 | \quad 3 \\
 | \quad 15x^3 + 3x^2 - 162x + 54 \quad (5) \\
 | \quad 15x^3 - 110x - 75 \\
 | \quad 3x^2 - 52x + 129 \\
 | \quad x - 3
 \end{array}$$

$$x-3 \overline{) 3x^3 - 22x - 15} \quad (3x^2 + 9x$$

$$\underline{3x^3 - 9x^2}$$

$$9x^2 - 22x - 15$$

$$\underline{9x^2 - 27x}$$

$$5x - 15$$

$$\underline{5x - 15}$$

Ans: $x = 3$

A plate of gold, 3 in. square and $\frac{1}{8}$ in. thick,
is extended by hammering so as to cover
a surface of $\frac{1}{4}$ sq. yds.; find its present
thickness.

$$\frac{1}{4} \text{ sq. yds.} = \frac{90^{\text{in}} \times 2}{3} \text{ sq. in. } Q = \text{area of the plate.}$$

$$\text{As } 90^{\text{in}} \times 2 : Q :: \frac{1}{8}^{\text{in}}$$

$$\frac{9 \times 1}{90 \times 2 \times 8} = \frac{1}{8064}$$

Ans. $\frac{1}{8064}$ in present thickness.

Reduce $\frac{x^2 + x - 12}{x^3 - 5x^2 + 7x - 3}$ to its lowest terms.

$$\frac{x^2 + x - 12}{x^3 - 5x^2 + 7x - 3} = \frac{(x-3)(x+4)}{(x^2 - 2x + 1)(x-3)} = \frac{x+4}{x^2 - 2x + 1}$$

Ans: $\frac{x+4}{x^2 - 2x + 1}$

A person spending annually £240.
saves £2.15s of it quarterly by ready

payment, what is the rate of discount?

and if he by this means make an in-
crease of 20% percent upon his annual
savings, what was his annual income?

$$4) \frac{240}{100} = \frac{L.S.}{L} = 2.15 \times 4 = 11$$

$$\frac{L.S.}{L} = 10 : 100 :: 2 \frac{3}{4}$$

$$\frac{3}{100 \times 11} = \frac{55}{12} = \frac{11}{12} \text{ rate of discount}$$

L S S
 As $20\frac{3}{4} : 11 :: 100$

		20		
11 x 100	=	1100	x 8	
20 $\frac{3}{4}$	=	1	=	100 x 8
				13
				3

160 L 53. 6s. 8d
 3 240. 0. 0
 L 293. 6s. 8d. annual income

L L S S
 Ans $4\frac{7}{12}$; 293. 6. 8

Reduce to a mixed fraction

$$\frac{3x^2 + 6x + 5}{x + 4}$$

$$\frac{3x^2 + 6x + 5}{x + 4}$$

$$\begin{array}{r} x+4 \overline{) 3x^2 + 6x + 5} \quad (3x - 6 + \frac{29}{x+4} \\ \underline{3x^2 + 12x} \\ -6x + 5 \\ \underline{-6x + 24} \\ 19 \\ \underline{x + 4} \end{array}$$

Ans: $3x - 6 + \frac{19}{x+4}$

In the centigrade thermometer the freezing point is zero, and the boiling point is 100° ; in Fahrenheit's the freezing point is 32° , and the boiling point is 212° ; what degree C. corresponds to 68° F.?

$$\begin{array}{r} 212 \\ 32 \\ \hline 180 \end{array} \quad \begin{array}{r} 68 \\ 32 \\ \hline 36 \end{array}$$

$$\text{As } 180 : 100 :: 36$$

$$\frac{100 \times 36}{180} = 20$$

Ans. 20° C.

Reduce to a common denominator

$$\text{for } \frac{a+x}{a-x} \quad \frac{a-x}{a+x}$$

$$\frac{a+x}{a-x} \quad \frac{a-x}{a+x}$$

$$\frac{a^2 + 2ax + x^2}{a^2 - x^2} \quad \frac{a^2 + 2ax + x^2}{a^2 - x^2}$$

$$\frac{a^2 + 2ax + x^2}{a^2 - x^2} \quad \frac{a^2 - 2ax + x^2}{a^2 - x^2} \quad \text{Ans:}$$

Divide $3\frac{1}{2}$ guineas among 6 persons, so

that their shares may be in the proportion

of the reciprocals of the first 6 units.

$$\frac{1}{1} \quad \frac{1}{2} \quad \frac{1}{3} \quad \frac{1}{4} \quad \frac{1}{5} \quad \frac{1}{6}$$

$$\frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6}$$

$$\frac{60 + 30 + 20 + 15 + 12 + 10}{60} = \frac{147}{60}$$

$$\begin{array}{r} 10 \\ \text{guineas } 30 \\ \hline 60 \text{ of } 3\frac{1}{2} = \frac{60 \times 7}{14} = \frac{10}{2} = 30 \\ \hline 147 \\ 21 \\ \hline 7 \end{array} \quad \text{S.}$$

$$\begin{array}{r} 5 \\ 10 \\ \hline 30 \text{ of } 3\frac{1}{2} = \frac{30 \times 7}{14} = \frac{5}{2} = 15 \\ \hline 147 \\ 21 \\ \hline 7 \end{array} \quad \text{S.}$$

$$\begin{array}{r} 10 \\ \hline 20 \text{ of } 3\frac{1}{2} = \frac{20 \times 7}{14} = \frac{10}{2} = 10 \\ \hline 147 \\ 21 \\ \hline 7 \end{array} \quad \text{S.}$$

$$\begin{array}{r} 5 \\ \hline 15 \text{ of } 3\frac{1}{2} = \frac{15 \times 7}{14} = \frac{5}{2} = 7.5 \\ \hline 147 \\ 21 \\ \hline 7 \end{array} \quad \text{S. D.}$$

$$\frac{12}{14} \text{ of } 3\frac{1}{2} = \frac{12}{14} \times \frac{7}{2} = \frac{2}{1} = 6$$

$$\frac{10}{14} \text{ of } 3\frac{1}{2} = \frac{10}{14} \times \frac{7}{2} = \frac{5}{2} = 2\frac{1}{2}$$

S S S S D S S
Ans 30, 15, 10, 7, 6, 6, 5.

Find the value of,

$$\frac{a}{2b} \frac{(a-b)}{2(a+b)}$$

$$\frac{a}{2b} = \frac{(a-b)}{2(a+b)} = \frac{a(a+b) - (b(a-b))}{2b(a+b)}$$

$$\frac{a^2 + ab - ab + b^2}{2b(a+b)} = \frac{a^2 + b^2}{2b(a+b)}$$

Ans. $\frac{a^2 + b^2}{2b(a+b)}$

A farm lets for £92 per annum. The tenant pays for 2 years occupation, with interest accumulating at 5 per cent; the

landlord pays $\frac{1}{4}$ the amount for repairs of

house, $\frac{1}{3}$ of this for repairs of barn, and

£2. 3s. 4d for other expences: find the balance.

£		92
92		3
2		4.60
184 s		20
4.12		12.00
4 188.12		
47.3	D.	
15.14.4		
2.3.4		
£ 65.0.8		

L. S. D.

188. 12. 0

65. 0. 8

£ 123. 11. 4 Ans.

Find the value of,

$$\frac{x^2 + y^2}{x^2 - y^2} - \frac{y}{x - y} + \frac{x}{x + y}$$

$$\frac{x^2 + y^2}{x^2 - y^2} - \frac{y}{x - y} + \frac{x}{x + y}$$

$$\frac{x^2 + y^2 - (x - y)y + (x - y)x}{x^2 - y^2}$$

$$\frac{x^2 + y^2 - xy - y^2 + x^2 - xy}{x^2 - y^2}$$

$$\frac{2x^2 - xy}{x^2 - y^2} = \frac{2x(x - y)}{(x + y)(x - y)} = \frac{2x}{x + y} \text{ Ans.}$$

If a person's estate produce £100 a

year, and the land-tax be assessed at

2s. 9d. in the pound, what is his net

annual income.

1d profit	100		
		2	
		800	
3d profit	200		
		100	
		20110.0	
		£55.0	£
		£	£
		100.0.0	£
		55.0.0	£
		345.0.0	£

L

Ans: 345

Find the value of,

$$\frac{3}{8(1-x)} + \frac{1}{8(1-x)} + \frac{1-x}{4(1+x^2)}$$

$$\frac{3(1+x+x^2+x^3) + (1-x+x^2-x^3) - (1-x-x^2+x^3)2}{8(1-x^4)}$$

$$\frac{3+3x+3x^2+3x^3+1-x+x^2-x^3-2+2x+2x^2-2x^3}{8(1-x^4)}$$

$$\frac{2+4x+6x^2}{8(1-x^4)} = \frac{1+2x+3x^2}{4(1-x^4)} \text{ Ans.}$$

What would be the purchase-money for an estate producing a rental of £3228.3s.4d.

at the rate of $8\frac{3}{4}$ percent?

L L L
As $8\frac{3}{4} : 100 :: 3228k$

$$\frac{100 \times 3228k}{8\frac{3}{4}}$$

$$\begin{array}{r} 20 \times 2767 \times 2 \\ 400 \quad 49369 \quad 14 \\ \quad \quad 6 \quad 35 \\ \quad \quad 3 \quad 5 \end{array}$$

$$\frac{110680}{3} = \text{L. S. D. } 36893. 6. 8$$

$$\text{Ans } 36893. 6. 8.$$

Simplify $\frac{\frac{1}{1+x} + \frac{x}{1-x}}{\frac{1}{1-x} - \frac{x}{1+x}}$

$$\frac{\frac{1}{1+x} + \frac{x}{1-x}}{\frac{1}{1-x} - \frac{x}{1+x}} = \left(\frac{1}{1+x} + \frac{x}{1-x} \right) \times \left(\frac{1-x}{1-x} - \frac{1+x}{1-x} \right) = 1 \text{ Ans.}$$

Steward receives for his landlord £1987 of
rent, and disburses one-fifth; he pays his land-
lord £105. 12s. and the remainder is
invested in an estate at 30 years purchase:
find the rent of the estate.

Required the weight of a beam of fir 20 ft
 long, 9 in deep, and 3 in thick.

$$\begin{array}{r} \text{ft} \quad \text{in.} \\ 20 = 240 \end{array}$$

$$\begin{array}{r} 240 \\ \times 9 \\ \hline 2160 \end{array}$$

$$\begin{array}{r} 1728 \quad 6480 \quad 3\frac{3}{4} \text{ ft.} \\ \times 3 \\ \hline 5184 \\ \times 3 \\ \hline 1296 \quad 3 \\ \hline 1728 \quad 4 \end{array}$$

$$3\frac{3}{4} \times 553 = \frac{15 \cdot 553}{4} = 15 \cdot 553$$

$$\frac{8295}{4} = 2073\frac{3}{4} = 129 \cdot 6 \text{ lbs.}$$

Ans: 129.6 lbs.

$$\begin{aligned} x &= a(ac+bc) \\ (bc+ax) &= a(bc+ac) \\ -bcx - ax^2 &= -abc - a^2c \\ ac - bcx - ax^2 &= ac \end{aligned}$$

$$\begin{aligned} \frac{bc}{ac} - \frac{ax^2}{ac} &= \frac{ac - bcx - ax^2}{ac} \\ \frac{bc}{ac} - \frac{ax^2}{ac} &= 1 \end{aligned}$$

Find the value of

$$\begin{array}{r} 30 \quad 1784 \quad 0 \cdot 0 \\ \times 19 \quad 9 \cdot 11 \text{ Ans:} \\ \hline 0 \cdot 0 \quad 1784 \quad 0 \cdot 0 \\ 0 \cdot 0 \quad 0 \cdot 0 \\ 1984 \cdot 0 \cdot 0 \\ \hline 593 \cdot 0 \cdot 0 \\ \hline 0 \cdot 805 \text{ F} \\ 21 \cdot 991 \\ \hline 39 \cdot 8 \\ \hline 1984 \cdot 8 \\ \hline 1984 \cdot 8 \end{array}$$

Memorandum

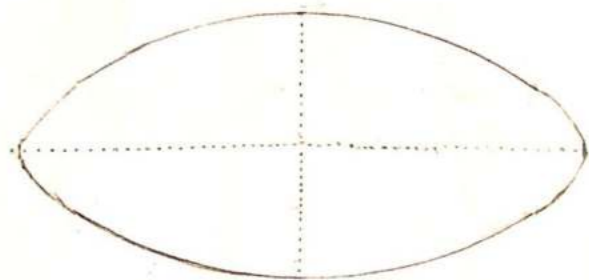
by

Edward Lytton

Horton G. School
Quincy 1862

The diameters of an ellipse are 18 and 8 ft.;
required the area.

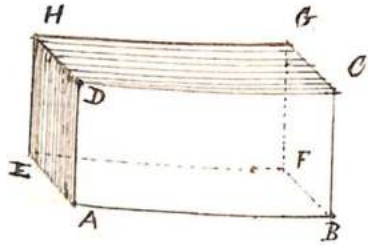
$$\begin{array}{r} 18 \\ 8 \\ \hline 144 \\ \cdot 7854 \\ \hline 1152 \\ 1008 \\ \hline 113.0976 \end{array}$$



Ans: 113.0976 sq. ft.

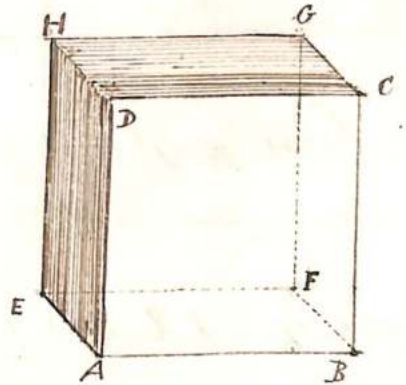
Find the number of cubic ft. in a rectangular solid A B C E, whose length A B is 1 yd. 3 ins breadth A E 4 ft. 6 ins, and depth or altitude A D 3 ft. 1 in.

ft. in.
 1 yd. 3' = 36 + 3 = 39
 4 ft. 6 in. = 48 + 6 = 54
 3 ft. 1 in. = 36 + 1 = 37
 250
 39
 2816
 39
 8448
 2816
 Ans 8448 yd. 37 in.



In the cube A B C E, the side A B or A D or A E is 1.75 ft.; required its solidity.

1.75 ft.
 1.75
 8.75
 1225
 1.75
 30125
 1.75
 153125
 214375
 30625
 5.359375 Ans: cu. ft.



What is the solidity of a cylinder whose height is 2 ft. 6 in and the diameter 4 ft.?

$$\text{Area base} = 4^2 \times .7854 = 12.5664$$

$$\therefore \text{Solidity } 12.5664 \times 2.5 = 31.416$$

$$\begin{array}{r} 2.5 \\ \hline 628320 \\ 251328 \\ \hline 31.41600 \end{array}$$

Ans: 31.416 cub. ft.

What is the convex surface of an upright cylinder the diameter of whose base is 15 in., and the length 5 ft.?

$$\text{Circum. base } 15 \times 3.1416 = 47.124$$

$$\therefore \text{Convex surface } 47.124 \times 60 \text{ in.} = 2827.44 \text{ sq. in.}$$

Ans: 2827.44 sq. in.

Required the solidity of a pyramid, with
 a square base, the side of which is 9 ft.,
 and the perpendicular height of the
 pyramid 15.3 ft.

$$\text{Area base} = 9 \times 9 = 81$$

$$\therefore \text{Solidity} = 81 \times 15.3 \times \frac{1}{3} = 81 \times 5.1$$

$$\begin{array}{r} 81 \\ 3 \overline{) 1239.3} \\ \underline{60} \\ 243 \\ \underline{243} \\ 000 \\ \underline{000} \\ 000 \end{array}$$

Ans. 413.1 c. ft.

What is the solidity of the frustum
 of a cone, the diameter of the great-
 er end being 5 ft., that of the less end
 3 ft., and the perpendicular height

4.5 ft. ?

$$\text{Area base} = 5^2 \times .7854 = 19.635$$

$$\text{Area top} = 3^2 \times .7854 = 7.0686$$

$$\text{Area middle section} = 4^2 \times .7854 = 12.5664$$

$$\text{Solidity} = \frac{1}{6} \times \left(19.635 + 7.0686 + 12.5664 \times 4 \right)$$

$$4.5 = \frac{1}{6} \times (26.7036 + 50.2656) \times 4.5 =$$

$$\frac{1}{6} \times 346.3614 = 57.7269 \text{ c. ft.}$$

$$\text{Ans: } 57.7269 \text{ c. ft.}$$

If the mean diameter of the earth be

7912 miles, what will be its surface?

$$\text{Area surface} = 7912^2 \times 3.1416 = 7912$$

$$7912$$

$$15824$$

$$7912$$

$$791208$$

$$55384$$

$$162599.44$$

$$3.1416$$

375598464

62599744

250398976

62599744

187799232

196663355 7504 miles Ans.

How many cart-loads of clay will there
be in a drain 90ft long, 3ft broad,
and 2ft deep, allowing 1 1/4 tons for
each load

Weight of 1 cub. ft. of clay 2160 oz

ft

90

3

270

2

540

2160

32400

540

1080

166400

291600

15 = 172900

18225

14 2603 + 4 = 16 lbs

20 650 . 3 qrs . 16 lbs

Ans. 32 . 10 cwt . 3 qrs . 16 lbs 32 1/2

$$\begin{array}{r}
 \text{tons} \quad \text{tons} \quad 729 \\
 32 \overline{) 112} \div 14 = 3645 \times \frac{4}{5} = 26.03 \\
 \quad \quad \quad 112 \quad 5 \\
 \quad \quad \quad 28
 \end{array}$$

Ans: 26.03 cart-loads.

Required the number of cubic feet in

1 ton of iron

$$\text{1 cub. ft. of iron} = 14700 \text{ cu.}$$

$$\begin{array}{l}
 1 \text{ ton} = 1 \\
 \quad 20 \\
 \quad 20 \\
 \quad 11
 \end{array}$$

$$\begin{array}{r}
 80 \\
 28 \\
 \hline
 640 \\
 160 \\
 \hline
 2240 \\
 16
 \end{array}$$

$$\begin{array}{r}
 13440 \\
 2240
 \end{array}$$

$$14700 \times 35840 = 4.65 \text{ No.}$$

$$30800$$

$$50400$$

$$46200$$

$$42000$$

$$38300$$

$$3500$$

ton cub. ft.

$$1 = 4.65 \text{ No. Ans.}$$