

Grammar School,  
PONTARDAWE.

Name MYRON WYN EVANS

Form

V L

Subject

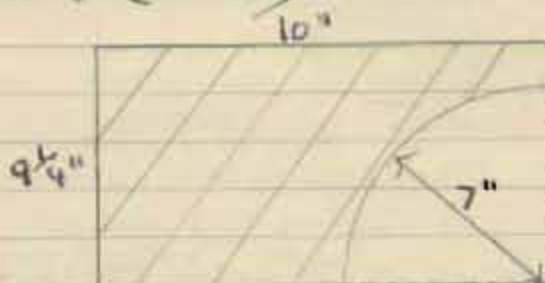
ARITHMETIC HOMEWORK

S.S. - LONDON.

Problems with  $\pi$

20-10-64

1. The shaded part of the figure represents a steel bracket made by removing a quadrant of a circle radius 7" and centre C from the rectangle ABCD. Find in cu. ins. the volume of steel. If 1 cu. ins. weighs 0.29 lbs. calculate the weight of the bracket in lbs. to 2 sig. figs. The thickness of the bracket is  $\frac{1}{8}$ " ( $\pi = 3\frac{1}{2}$ )



$$\begin{aligned}
 \text{(i) Volume of steel} &= 9\frac{1}{4} \times 10 \times \frac{1}{8} - \left( 3\frac{1}{2} \times 7 \times 7 \times \frac{1}{8} \times \frac{1}{4} \right) \\
 &= \frac{37}{4} \times \frac{10}{1} \times \frac{1}{8} - \left( \frac{22}{1} \times \frac{7}{1} \times \frac{7}{1} \times \frac{1}{8} \times \frac{1}{4} \right) \\
 &= \frac{375}{16} - \frac{77}{16} \\
 &= \frac{108}{16} = 6\frac{3}{4} \text{ cu. ins. ans (i)}
 \end{aligned}$$

(ii) Weight of bracket =  $6\frac{3}{4} \times 0.29$  lbs

No.	Ans.
6.75	0.8293
0.29	7.4624
	0.2917

ans (i) = 19.57    ans. = 1.957 lbs. ans (ii)

ans (i)  $6\frac{3}{4}$  cu. ins. (ii) 1.957 lbs. = 2 lbs.

2. A hot water tank consists of a closed copper cylinder of height 30", having plane circular ends, diameter 14". Taking  $\pi = 3\frac{1}{2}$  calculate the area in sq. ft. of the external surface. Area =  $2\pi R(r+h)$

$$\begin{aligned}
 \text{area of tank} &= 2\pi R(r+h) \\
 &= 2 \times \frac{22}{7} \times \frac{7}{1} \times (30+7) \times \frac{1}{144}
 \end{aligned}$$



$$= \frac{2 \times 2 \times 7 \times 5 \times 1}{7 \times 1 \times 1 \times 1 \times 1} \text{ sq. ft.}$$

$$= \frac{140}{36} = 3.89 \text{ sq. ft.} \text{ and } \text{ans} = 17.31 \text{ sq. ft.}$$

### Problem

3-11-64

10. A brass tube 9 ft. long has an outside diameter of 3" and inside diameter 2.8". What is the volume of the brass in cu. in.

$$\begin{aligned} \text{Volume of brass} &= \pi(R+r)(R-r)h. \\ &= 3.142(3+2.8)(3-2.8)108 \text{ cu. in.} \\ &= 3.142 \times 5.8 \times 0.2 \times 108 \text{ cu. in.} \\ &= 3.142 \times 1.16 \times 108 \text{ cu. in.} \\ &= 393.6 \text{ cu. in.} \end{aligned}$$

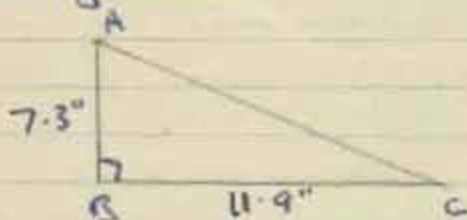
No.	log
3.142	0.4971
1.16	0.0645
108	2.0334
<u>x</u>	<u>2.5950</u>
antilog	3936

$$\begin{aligned} \text{ans} &= 196.8 \text{ cu. in.} \\ \text{ans} &= 393.6 \text{ cu. in.} \end{aligned}$$

### Problems on Squares

17-11-64

1. The sides of a right angle are 7.3" and 11.9". Find the diagonal to the nearest 10th of an inch.



By Pythagorean theorem  $AB^2 + BC^2 = AC^2$

$$\therefore 7.3^2 + 11.9^2 = AC^2$$

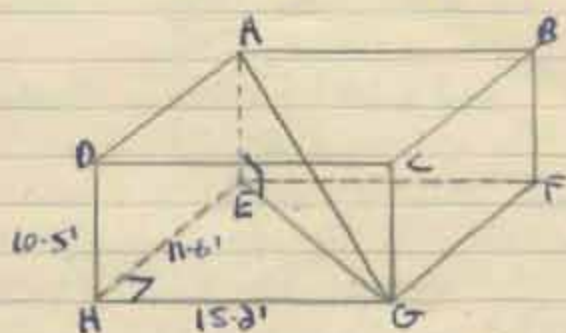
$$53.29 + 141.6 = AC^2$$

$$\therefore AC^2 = 194.89$$

$$\text{and } \sqrt{194.89} = 13.9$$

$$\therefore AC = 13.957 \text{ in.} = 14.0$$

2. Given the length, breadth and height of a room to be  $15.2'$ ,  $11.6'$ ,  $10.5'$  respectively. Find the length of the diagonal of the room.



By Pythagorean theorem  $11.6^2 + 15.2^2 = EG^2$  ( $EH^2 + HG^2 = EG^2$ )

$$134.6 + 231.0 = EG^2$$

$$\therefore EG^2 = 365.6$$

$$AE^2 + EG^2 = AG^2$$

$$\therefore 10.5^2 + 365.6 = AG^2$$

$$\therefore 110.3 + 365.6 = AG^2$$

$$\therefore AG^2 = 475.9$$

$$\therefore AG = 21.815 = 21.8'$$

ans to nearest 10th of a foot =  $21.8'$

10.  $\sqrt{2184}$  Use of Tables  $\approx 46.73$  ans. =  $46.73$   $24-11-64$

2  $\frac{1}{(0.7891)^2} = \frac{1}{0.6227} = 1.606$  ans =  $1.606$   
 $= 1.61$

3 From the formula  $T = 2\pi \sqrt{\frac{h^2 + k^2}{gh}}$  calculate  $T$  when  $g = 32$ ,  $h = 8$ ,  $k = 6$ ,  $\pi = 3.14$ . ans correct to 2 sig. figs.

$$T = 2\pi \sqrt{\frac{h^2 + k^2}{gh}} = 6.28 \sqrt{\frac{64 + 36}{32 \times 8}}$$



$$= 6.28 \sqrt{\frac{100}{2.56}}$$

$$= 6.28 \sqrt{\frac{1.00}{2.56}}$$

$$= 6.28 \times \sqrt{0.3906}$$

$$= 6.28 \times 0.19763$$

$$T = 1.2$$

$$\text{ans} = 1.2 (T = 1.2)$$

No.	Log.
6.28	0.7980
0.1976	T.2958
	10.0938

$$\text{antilog} = 12.41$$

$$\text{ans} = 1.241$$

$$4 \quad (27.32)^2 = 746.4 \text{ ans.}$$

$$5 \quad \frac{10}{1.769} = \frac{1.0}{0.1769} = 5.654 \text{ ans.}$$

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### Problems.

18-1-65

- 10) A vessel in the shape of a circular cylinder whose axis is vertical contains water. The radius of the cylinder is 2". A sphere, radius 1" is lowered into the water until entirely immersed. Find how much the water level rises (V. of sphere =  $\frac{4}{3}\pi r^3$ ) (Take  $\pi = 3.142$ )

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3}\pi 1^3$$

$$= \frac{4}{3}\pi$$

$$\text{Area of base of cyl} = \pi r^2$$

$$\therefore \text{Rise in level of water} = \frac{\text{Volume of sphere}}{\text{Area of base}}$$

$$= \frac{\frac{4}{3}\pi}{\pi r^2}$$

$$= \frac{\frac{4}{3}\pi}{\pi \times 2^2}$$

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

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

$$= \frac{1}{3}''$$

$$\text{ans.} = \frac{1}{3}''$$

- (ii) Another measuring cylinder contains 250 c.c. of water, and when 10 equal spherical marbles are immersed in the water, the level of the water rises to the 335 c.c. mark. Use logs to calculate the radius of one of these marbles.

$$\text{Rise in water level} = 335 - 250 = 85 \text{ c.c.}$$

$$\text{Increase in volume of water} = 85 \text{ c.c.}$$

$$\text{Volume of 10 marbles} = 10 \times \frac{4}{3} \pi r^3$$

$$\text{Volume of 10 marbles} = \text{Weight of water displaced} = \text{Weight of 10 marbles}$$

$$\text{Let weight of water displaced} = 85 \text{ gms}$$

$$\therefore \text{Volume of 10 marbles} = 85 \text{ c.c.}$$

$$\therefore 85 \text{ c.c.} = 10 \times \frac{4}{3} \pi r^3$$

$$\therefore \frac{85}{10 \times \frac{4}{3} \pi} = r^3$$

$$= \frac{85}{10 \times 4.1888}$$

$$= \frac{85}{41.888}$$

$$= 2.029$$

$$= 1.27 \text{ cm}$$

$$\therefore \text{Volume of 1 marble} = 8.5 \text{ c.c.}$$

$$\therefore 8.5 \text{ c.c.} = \frac{4}{3} \pi r^3$$

$$\therefore r^3 = \frac{8.5}{\frac{4}{3} \pi}$$

$$= \frac{8.5}{4.1888}$$

$$= 2.029$$

$$= 1.27 \text{ cm}$$

$$\therefore r = \sqrt[3]{\frac{8.5}{4.1888}} = \sqrt[3]{\frac{2.029}{4.1888}} \text{ cm}$$

$$\log 8.5 = 0.9294$$

$$\log 4.1888 = 0.6221$$

$$\log 2 = 0.3073$$

$$\log \sqrt[3]{2} = 0.1024$$

$$\text{antilog} = 1.266$$

$$\text{radius} = 1.266$$

Answer.

$$\text{radius of 1 marble} = 1.27 \text{ cm}$$

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### Problem on Shares

26-1-65

1. What is the income from investing £250 in 500 shares at £0.50 each, if they declare a dividend of 12%.

$$\text{No. of shares} = \frac{£250 \times 20}{100} \div \frac{1}{4}$$



$$= \frac{10}{1} \times \frac{20}{1} \times \frac{4}{25} = 800 \text{ shares}$$

$$\begin{aligned} \text{Nominal value} &= (800 \times 5) \text{ p.} \\ &= \frac{800}{4} \\ &= \text{£} 200 \end{aligned}$$

$$\therefore \text{Dividend} = 12\% \text{ of } \text{£} 200$$

$$\begin{aligned} &= \frac{12}{100} \times \frac{200}{1} \\ &= \text{£} 24 \\ \text{ano. income} &= \text{£} 24. \end{aligned}$$

2. How much cash must I invest in a 6½% preference share of nominal value £1 standing at 18/6 to produce an income of £39

$$\text{Dividend on } \text{£} 100 \text{ @ } 6\frac{1}{2}\% = \text{£} 6.10 \text{ d.}$$

$$\therefore \text{£} 39 = 6\frac{1}{2}\% \text{ dividend on } \text{£} 39 \div 6\frac{1}{2}\% \times \text{£} 100$$

$$\begin{aligned} &= \frac{39}{1} \times \frac{2}{18\frac{1}{2}} \times 100 \\ &= \text{£} 600 \end{aligned}$$

$$\therefore \text{Nominal value of shares} = \text{£} 600$$

$$\therefore \text{Cost value of shares}$$

$$\text{No. of shares} = \frac{\text{£} 600}{1}$$

$$\text{Cost value of shares} = 600 \times 18/6$$

$$\begin{aligned} &= \frac{365}{2} \times \frac{37}{2} \\ &= \text{£} 555 \end{aligned}$$

3. A  $4\frac{1}{2}\%$  preference share of nominal value £1 is quoted at  $18\frac{1}{2}$ . What dividend do I receive from an investment of £365. each.

$$\text{No of shares} = \frac{£365}{18\frac{1}{2}}$$

$$= \frac{£365}{18\frac{1}{2}} = \frac{£365}{\frac{37}{2}} = \frac{£365 \times 2}{37}$$

$$= 20 \times 20 = 400$$

$$\text{Nominal value} = £400$$

$$\text{Dividend} = 4\frac{1}{2}\% \text{ of } 400$$

$$= \frac{9}{200} \times 400 = £18$$

$$\text{Ans, Dividend} = £18.$$

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### Stock and Shares

5-2-65

A man invests £1000 in 3% stock at 75 and another £1000 in 4% stock at 80. What is the average yield on the 2 holdings (Yield means the amount of interest given by investing £100 each.)

① £75 gives £3 dividend  
 $\therefore$  £100 gives  $\frac{3}{75} \times 100 = £4$  dividend

$$\therefore £1000 \text{ gives } £40 \text{ dividend}$$

② £80 gives £4 dividend  
 $\therefore$  £100 gives  $\frac{4}{80} \times 100 = £5$  dividend

$$\therefore £1000 \text{ gives } £50 \text{ dividend}$$

$$\therefore \text{Average yield} = \frac{£50 + £40}{2} = 4\frac{1}{2}\%$$



2. A holder of 250 £1 shares in the Imperial Tobacco Company receives a dividend of  $8\frac{1}{2}\%$  together with a bonus of  $\frac{1}{3}$  per share. Tax is deducted on the dividend and the bonus at  $9/-$  in the £. What does he receive?

$$\text{Cost} = £250$$

$$\begin{aligned} \text{Dividend} &= 8\frac{1}{2}\% \text{ of } £250 \\ &= £ \frac{250}{1} \times \frac{17}{200} = \frac{85}{4} = £21.50 \end{aligned}$$

$$\text{Bonus} = £ \frac{250}{1} \times \frac{1}{16} = £15.625$$

$$\therefore \text{Gross income} = £36.175$$

$$\text{Nett. income} = \frac{11}{20} \text{ of } £36.175$$

$$= £ \frac{11}{20} \times \frac{59}{8} = £20.578125 \text{ i.e. } £20.58$$

(10)

### Problems on Stocks and Shares

12-2-65

1. A man sells 2000 £1 shares at 24s each. He re-invests  $\frac{5}{8}$  of the proceeds in some £10 shares at par which pay a dividend of 6 and  $\frac{3}{8}$  in a  $4\frac{1}{2}\%$  stock at £90. Find his annual income from the new investments.
2. If £3000 is invested in £1 shares at 75s and the annual dividend is 27.5%, but income tax is deducted at  $7/4$  in the £. Find the annual income from the shares.

1. A man sells <sup>2000</sup> £1 shares at 24s each  
 Number of shares =  $\frac{£2000}{£10} = 200$   
 He sells them for 24/- each  $\therefore$

$$\begin{aligned}\therefore \text{proceeds} &= (2000 \times 24) \text{ s.} \\ &= \frac{2000}{1} \times \frac{24}{1} \times \frac{1}{20} \\ &= \pounds 2400 \quad \checkmark\end{aligned}$$

He re-invests  $\frac{5}{8}$  of  $\pounds 2400$  in  $\pounds 10$  shares at par.

$$\frac{5}{8} \text{ of } 2400 = \frac{5}{8} \times \frac{2400}{1} = \pounds 1500$$

$$\begin{aligned}\text{No. of shares} &= \frac{\pounds 1500}{\pounds 10} \\ &= 150\end{aligned}$$

Nominal value of shares =  $\pounds 1500$  ✓

$$\begin{aligned}\text{Dividend} &= 6\% \text{ of } \pounds 1500 \\ &= \frac{6}{100} \times 1500 \\ &= \pounds 90\end{aligned}$$

He invests  $\frac{3}{8}$  of  $\pounds 2400$  in  $4\frac{1}{2}\%$  stock at 90

$$\frac{3}{8} \text{ of } \pounds 2400 = \frac{3}{8} \times \frac{2400}{1} = \pounds 900$$

$\pounds 90$  purchases  $\pounds 100$  stock.

$$\therefore \pounds 900 = \frac{\pounds 900}{90} \times 100$$

$$= \pounds 1000 \text{ stock.}$$

Interest on  $\pounds 1000$  stock =  $\pounds 4.10 \text{ s.}$

Interest on  $\pounds 1000$  stock =  $\pounds 45.40 \text{ s.}$

$\therefore$  Total income =  $\pounds 45.40 \text{ s.} + \pounds 90.$

$$\begin{aligned}\therefore \text{ans.} &= \pounds 2040 \text{ s. } 135 \\ &= \pounds 135.\end{aligned}$$



$$2. \text{No of shares} = \frac{3000 \times 20^4}{25 \times 15} = 800$$

$$\therefore \text{Nominal value of shares} = \text{£}800$$

$$\text{Resident} = 27\frac{1}{2}\% \text{ of } 800$$

$$= \frac{155}{200} \times \frac{800}{1}$$

$$\text{Gross value} = \text{£}220$$

$$\text{Nett value} = \frac{149}{80} \times 220$$

$$= \text{£}53.9$$

$$= \text{£}134.15s.$$

$$\text{Ans.} = \text{£}134.15s. \quad \checkmark$$

(10)

### Problems on Stocks and Shares.

26-2-65

1. A man sells £3,150 of 7% stock at 112 and invests the proceeds in 3% stock at 72. Find the change in income.
2. A man sells ~~360~~ 360 10/- grocery shares paying 12% at 21/- and invests the proceeds in 5/- tin shares paying 4 1/4% at 3/6. Find the change in income.
3. A man sells 720 £1 Ordnance 5/- shares at 6/3 and invests the proceeds in Odham's Press (4/-) at 11/3. How many Odham's shares does he buy?

$$1. \text{£}100 \text{ of stock will sell for } \text{£}112$$

$$\therefore \text{£}3,150 \text{ " " " " " } \text{£} \frac{3150}{100} \times 112$$

$$= \frac{352800}{100} = \text{£}3528$$

He invests £3528 in 3% stock at 72.

£100 will buy £700

$$\therefore \text{£3528 will buy } \frac{3528 \times 100}{72}$$

£3528 will buy

$$\therefore \text{£3528 will buy } \frac{3528 \times 100}{72}$$

$$= \text{£4900}$$

Income from £3,150 of 7% stock.

Income from £100 stock = £7

$$\therefore \text{ " " £3,150 " } = \frac{\text{£3,150} \times 7}{100}$$

$$= \text{£220.100}$$

Income from £4900 of 3% stock

Income from £100 stock = £3

$$\therefore \text{ " " £4900 " } = \frac{\text{£4900} \times 3}{100}$$

$$= \text{£147}$$

$$\therefore \text{Change in income} = \text{£220.100} - \text{£147} = \text{£73 10s av.}$$

$$2 \text{ 360 grocery shares at } 21/- \text{ each} = \frac{\text{£360} \times 21}{20}$$

$$= \text{£378}$$

Income from 360 grocery shares at 10/- paying 12%

$$= \frac{\text{£360} \times 12}{100} = \frac{\text{£432}}{5}$$

$$= \text{£86.400}$$

He invests £378 in tin shares at 3/6 each.

$$= \frac{\text{£378} \times 7}{40}$$



$$\text{Number of shares} = \frac{54}{378 \times 20 \times \frac{2}{7}}$$

$$\text{Nominal Value} = \frac{2160}{\cancel{20} \times \frac{8}{20} \times \frac{17}{100}}$$

$$= \text{£}540$$

$$\therefore \text{Dividend} = \text{£}540 \times \frac{17}{100}$$

$$= \text{£}22.190$$

$$\text{Change in income} = \text{£}22.190 - \text{£}21.120$$

$$= \text{£}1.70$$

$$\text{Ans.} = \text{£}1.70$$

3. A man needs 720,000 (5/-) @ 6/3

$$\text{Proceeds} = \frac{720000}{20} \times \frac{25}{100}$$

$$\text{Proceeds} = \frac{720000}{20} \times \frac{25}{100}$$

$$= \text{£}225$$

He invests £225 in ~~and~~ Odhams Press (4/-) @ 1/3

$$\therefore \text{Number of shares} = \frac{225}{4 \times \frac{1}{3}}$$

$$= 400 \text{ shares}$$

$$\text{Answer} = 400 \text{ shares.}$$

(10)

Miscellaneous Questions

12-3-65

Q) Find the ratio of 2' 8" to 4' to 12' in its simplest form.

$$\begin{aligned} 2' 8'' : 4' : 12' \\ = 32 : 48 : 144 \\ 4 : 6 : 18 \\ 2 : 3 : 9 \end{aligned}$$

ans 2:3:9. ✓

Q) Cooper hit 9 lbs. 6 oz as an exact decimal of 2 st 11 lbs. 1 oz.

$$\begin{array}{r} \text{1st 9 lbs. 6 oz.} \\ \cancel{14} \quad \cancel{14} \quad \cancel{368} \\ \cancel{14} \quad \cancel{23} \quad \cancel{3} \quad \cancel{4} \quad \cancel{oz} \\ \quad \quad \quad \underline{16} \\ \quad \quad \quad 230 \\ \quad \quad \quad \underline{138} \\ \quad \quad \quad 368 \end{array}$$

$$\begin{array}{r} \text{2st 11 lbs. 1 oz.} \\ \cancel{14} \quad \cancel{28} \quad \cancel{624} \\ \cancel{28} \quad \cancel{39} \quad \cancel{62} \quad \cancel{4} \\ \quad \quad \quad \underline{16} \\ \quad \quad \quad 340 \\ \quad \quad \quad \underline{234} \\ \quad \quad \quad 624 \end{array}$$

$$= \frac{368}{624}$$

$$= 1$$

$$\text{1st 9 lbs. 6 oz} = 374 \text{ oz.}$$

$$\text{2st 11 lbs. 1 oz} = 625 \text{ oz.}$$

$$\therefore \frac{\text{1st 9 lbs. 6 oz}}{\text{2st 11 lbs. 1 oz}} = \frac{374}{625}$$

$$= 0.5984 \quad \checkmark$$



(iii)  $18.147 \div 0.023$

$= 18147 \div 23$

$$\begin{array}{r} 789 \\ 23 \overline{) 18147} \\ \underline{161} \phantom{00} \\ 204 \phantom{00} \\ \underline{184} \phantom{00} \\ 207 \phantom{00} \\ \underline{207} \phantom{00} \\ 0 \end{array}$$

ans.  $= 789$

(iv)  $6\frac{1}{4}\% \text{ of } 1.6084$

$= 6\frac{1}{4} \times \frac{1}{100} \times 1.6084$

$= \frac{25}{4} \times \frac{1}{100} \times 1.6084$

$= \frac{25}{4} \times \frac{1}{100} \times \frac{16084}{10000}$

$= 1.6084$

2(i) A man cycles 36 Kms. in 50 mins. Find his speed in m-per

In 50 mins a man cycles 36 Kms

$\therefore$  in 60 mins a man cycles  $\frac{60}{50} \times 36$  Kms.

$= 43.2$  Kms.

in 3600 seconds a man cycles

in 3600 seconds a man cycles 36000 m.

$\therefore$  in 1 second it makes  $\frac{56000}{3600}$  rev.  $\therefore$  1 rev.  $\therefore$  1 m.

$\therefore$  It speeds to 1 m. per sec. ans. ✓

(ii) The circumference of a circular lawn is 88' find the area in sq. ft.

$$\text{Circumference of circle} = \pi D$$

$$\therefore \text{Diameter} = \frac{\text{Circumference}}{\pi}$$

$$= \frac{88}{1} \times \frac{7}{22}$$

$$= 28'$$

$$\text{Area of circle} = \pi R^2$$

$$= \frac{22}{7} \times \frac{28}{2} \times \frac{28}{2}$$

$$= 28 \times 28$$

$$= 616 \text{ sq. ft.}$$

10

### Miscellaneous Problems

21-3-65

(iii) Find to the nearest penny the C.I. on £120 for 2 years at 5½% per annum

$$C.I. = \frac{P \times R \times T}{100}$$

$$= \frac{120 \times 5.5 \times 2}{100}$$

$$= 13.20$$

$$= £13 \text{ 11s } 3d.$$

$\frac{5.5}{100}$	£120.0000
$\frac{1}{100}$	6.0000
	0.6000
	126.6000
$\frac{5.5}{100}$	6.3300
$\frac{1}{100}$	0.6330
	133.5630
	120.0000
	13.5630

P. for 1st year.

I for " "

P. for 2nd year.

I " " "

Amount

Interest



3a. 630 litres of water are drawn from a rectangular tank 1.75m long by 1.2m wide. By how many cms. does the water level fall?

$$\text{Area of bottom of tank} = 1.75 \times 1.2 \text{ sq. m.}$$

$$= 2.1 \text{ sq. m.}$$

$$= 21000 \text{ sq. cm.}$$

$$1 \text{ litre} = 1000 \text{ c. cm.}$$

$$\therefore 630 \text{ litres} = 630000 \text{ c. cm.}$$

$$\therefore \text{the water level falls by } \frac{630000}{21000} \text{ cms}$$

$$\text{ans.} = 30 \text{ cms.}$$

3b. When the annual rate is  $9\frac{1}{2}\%$  the  $\frac{1}{2}$  of a householder pays  $\pounds 21$  10 8d each half year in rates. Find the rateable value of his house.

$$\text{a man pays } \pounds 21.108d \times 2 \text{ for annual rates.}$$

$$= \pounds 42.304d$$

$$\text{annual rate is } 9\frac{1}{2}\% \text{ of the } \pounds$$

$$9\frac{1}{2}\% \text{ of the } \pounds = \frac{118}{240} \text{ of a } \pounds$$

$$\therefore \frac{11}{24} \text{ of the rateable value of house} = \pounds 42.304d$$

$$= \frac{11}{24} \text{ of } \pounds 253$$

$$\therefore \text{rateable value of house} = \pounds 253 \times \frac{24}{11}$$

$$\text{ans.} = \pounds 92$$

3c. In a given year a man spends  $\pounds 169$  8s more than he receives. He saves 16% of his income, how much did he earn in a year?

He has paid £1669 80 more than 16% of his income.

∴ £1669 80 = 84% of his income

∴ ~~his income~~

$$\therefore 100\% \text{ of his income} = \frac{100}{84} \times \frac{8347}{8}$$

$$= £1987 70 \frac{7}{8}$$

$$£2455$$

$$68\% = £1669 \frac{3}{4}$$

$$100\% = ?$$

Summer 1964

26-3-65

Two bottles are exactly similar in shape but not a 6" high and the other 7½" high. Find the ratio of the volume. The smaller bottle holds 15, and the larger 10. Express the price per unit volume in the larger bottle as a % of the price of the same volume in the smaller bottle.

a man sells 2000 £1 shares at 24/- each. He reinvests 5% of the proceeds in more £10 shares at par which pay a dividend of 6%, and the remainder in a certain 4½% stock at 90. Find his annual income derived from his new investments.

1. The ratio of their volumes: if they are exactly similar in shape

$$= \frac{7\frac{1}{2}}{6}$$

$$= \frac{15}{12}$$

$$= \frac{5}{4}$$

$$= 5:4$$

$$\frac{\text{Price of large bottle}}{\text{Price of small bottle}} = \frac{5 \times 12 \text{ p}}{4 \times 10 \text{ p}}$$

$$= \frac{10 \text{ p}}{48 \text{ p}}$$



$$\frac{\text{Price per unit volume of larger bottle}}{\text{" " " " " smaller "}} = \frac{100 \div 5}{48 \div 4}$$

$$= \frac{20}{12}$$

$\therefore \%$

$$= \frac{12}{20} \times \frac{5}{1} \times 100$$

$$= 60\%$$

$$\text{ans.} = 60\%$$

2. A man sells 2000  $\text{\pounds}1$  shares @ 24/- each

$$\therefore \text{proceeds} = \text{\pounds} \frac{2000}{1} \times \frac{24}{1}$$

$$= \text{\pounds} 2400$$

$$\text{He invests } \frac{5}{8} \text{ of } \text{\pounds} 2400$$

$$= \frac{5}{8} \times \text{\pounds} 2400$$

$$= \text{\pounds} 1500 \text{ in } \text{\pounds} 10 \text{ shares at par.}$$

$$\text{No. of shares} = \frac{1500}{10}$$

$$= 150 \text{ shares}$$

$$\therefore \text{Dividend} = \frac{6}{100} \times 1500$$

$$= \text{\pounds} 90$$

He invests  $\text{\pounds} 900$  in  $4\frac{1}{2}\%$  stock @ 90

$\text{\pounds} 90$  will buy  $\text{\pounds} 100$  stock

$$\therefore \text{\pounds} 900 \text{ will buy } \frac{900}{90} \times 100 = \text{\pounds} 1000$$

$$\text{Income} = \frac{4\frac{1}{2}}{100} \times 1000 = \text{\pounds} 45$$

$$\therefore \text{Total income} = \text{\pounds} 45 + \text{\pounds} 90 = \text{\pounds} 135$$

$$1 \text{ Ratio of radii} = \frac{7\frac{1}{2}}{6}$$

$$\therefore \text{Ratio of volumes} = \frac{\left(\frac{7\frac{1}{2}}{6}\right)^3}{1}$$

$$= \frac{225}{36 \times 4} = \frac{25}{16}$$

Smaller can is 1/- and larger can is 1/8  
 $= 12d$   $= 20$

$$\therefore \text{Let volume of smaller} = V_{\text{smaller}}$$

$$\therefore \text{ " " larger} = \frac{25}{16} \times V$$

$\therefore$  Price per unit volume of each

$$= \frac{12}{V} \text{ price and } 20 \div \frac{25}{16} V$$

$$= \frac{20 \times 16}{25 \times V}$$

$$= \frac{64}{5V}$$

$$\therefore \% = \frac{64/50}{12/V} \times 100$$

$$= \frac{64}{5} \times \frac{100}{12}$$

$$= \frac{320}{3}$$

$$= 106\frac{2}{3}\%$$

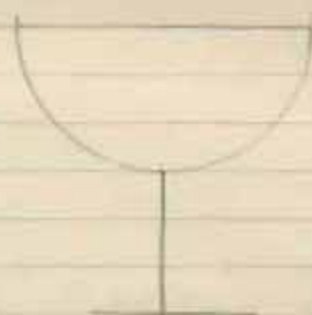


Summer term 1465

4-5-65

The bowl of a wine glass is conical in shape with the depth of the bowl equal to the diameter of the rim. The wine glass can just be filled 9 times from a bottle of wine which holds 1 pint. What is the depth of the bowl of the wine glass? To the nearest inch of each.

If another wine glass has a hemispherical bowl and the rim of the two glasses are of exactly the same size how many times can the second glass be filled from a pint bottle of wine (1 cu. ft. = 6.23 gallons,  $\log \pi = 0.4971$ , volume of sphere =  $\frac{4}{3}\pi r^3$ , volume of cone =  $\frac{1}{3} \times \text{area of base} \times \text{perpendicular height}$ ).



$$\begin{aligned}\text{Volume of wine glass (conical)} &= \frac{1}{9} \text{ of a pint} \\ &= \frac{1}{9} \times \frac{1}{8} \text{ of a gallon} \\ &= \frac{1}{72} \text{ of a gallon}\end{aligned}$$

$$\begin{aligned}1 \text{ cu. ft.} &= 6.23 \text{ galls} \\ \therefore 1 \text{ gall} &= \frac{1}{6.23} \text{ cu. ft.} \\ &= 0.1605 \text{ cu. ft.}\end{aligned}$$

$$\therefore \text{Volume of wine glass} = \frac{1}{72} \times 0.1605 \times 1728 \text{ cu. in.}$$

$$\begin{aligned}\text{Vol. of cone} &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \pi r^2 (2r) \\ &= \frac{2}{3} \pi r^3\end{aligned}$$

$$\therefore 9 \times \frac{2}{3} \pi r^3 = 1 \text{ pt.}$$

$$\# 1 \text{ cu. ft.} = 6.23 \times 8 \text{ pints}$$

$$\therefore 1 \text{ pt.} = \frac{1}{6.23 \times 8} \text{ cu. ft.}$$

$$\therefore 9 \times \frac{2}{3} \pi r^3 = \frac{1}{6.23 \times 8}$$

$$\therefore r^3 = \frac{1 \times 1728 \text{ cu. ins.}}{6.23 \times 8 \times 6 \pi}$$

$$\begin{aligned}\therefore r &= \sqrt[3]{\frac{1 \times 1728 \text{ cu. ins.}}{6.23 \times 8 \times 6 \pi}} \\ &= 1.226''\end{aligned}$$

$$\therefore \text{depth of bowl of wine glass} = 2.46''$$

$$\text{Vol of hemisphere} = \frac{4}{3} \pi r^3$$

$$\text{Vol of 1 pint} = \frac{1728 \text{ cu. ins.}}{6.23 \times 8}$$

$$\text{but } r = 1.226''$$

$$\therefore \text{Vol of hemisphere} = \frac{4}{3} \pi 1.226^3$$

$$\therefore \text{No. of times glass can be filled} = \frac{1728 \times 27}{6.23 \times 8 \times \frac{4}{3} \pi 1.226^3}$$

$$\begin{aligned}&= 8.982 \\ &= 8 \text{ times.}\end{aligned}$$

Answer  
8 times.

No.	Log.
1728	3.2375
6.23	0.7945
8	0.9031
6	0.7782
$\pi$	0.4971
	2.9750
$\sqrt{x}$	0.2045
$\sqrt{x}$	0.0882

No.	Log.
432	2.6355
6.23	0.7945
$\frac{4}{3} \pi$	0.6221
1.226 <sup>3</sup>	0.2655
	1.6821
	0.9534



A home has a 3 Kw. electric fire with <sup>average</sup> 2 Kw. fixed in the living room and a 750w. heater in the 2 bedrooms and bathroom. The lounge heater is not used on for an average of 1 hr per day, the living room heater for 2 hrs per day, the bedroom heater for 1 hr per day, and the bathroom heater for 1 hr 2 mins per day. An average of 3 100 watt electric light bulbs are lit for 8 hours each day. The stove consumes at a rate of 3 Kw for 1 hr and 1 Kw for 6 hrs every day. In addition a 100 watt electric iron is used for 4 hrs per week and a 550 watt electric washing machine for 2 hrs per week. A unit of electricity is consumed when 1 Kw is used for 1 hr. How many units are consumed in this house in a quarter (13 weeks)?

The charges for the electricity are at the rate of 6.5 pence per unit for each of the first 20 used and 1.26 pence per unit for the remaining units. Calculate the amount payable for the quarterly electricity bill for the above household.

$$\text{Total number of kilowatts} = 3 + 2 + (0.75 + 0.3 + 3 + 1 + 0.4 + 0.55)$$

$$= 10.5$$

$$\text{No of hours of electricity used per day} = 4 + 2 + 1 + 1\frac{1}{3} + 8 + 1 + 6 + 1\frac{1}{2} + 21$$

$$= 23\frac{1}{2} + \frac{168}{42} + \frac{168}{84} + \frac{21}{84} + \frac{4}{3} + \frac{3}{84}$$

$$= 22\frac{1}{2} + 1\frac{1}{3} + \frac{3}{84}$$

$$\frac{42 + 28 + 1}{84} = 22\frac{70}{84}$$

$$= 22\frac{35}{42}$$

$$= 22\frac{5}{6} \text{ per day.}$$

$$\text{no. of units used per day} = 12\frac{1}{2} \div 22\frac{5}{6}$$

$$= \frac{25}{2} \times \frac{6}{149} = \frac{75}{149} \text{ units.}$$

$$\text{no. of units used in 13 weeks} = \frac{75}{149} \times 13 \times 7$$

$$= \frac{25}{2} \times \frac{143}{6}$$

$$= \frac{25}{2} \times \frac{143}{6}$$

$$= \frac{75}{143}$$

$$\text{no. of units used in 13 weeks}$$

$$= \frac{75}{143} \times 2 \times \frac{1}{1}$$

$$= \frac{525}{11}$$

$$= 47\frac{8}{11} \text{ units.}$$

$$\text{charges} = 47\frac{8}{11} \times 6\frac{1}{2} \text{ d.}$$

$$= \frac{525}{11} \times \frac{13}{2}$$

$$= 310\frac{5}{11} \text{ d.}$$

$$= 2\frac{1}{2} \text{ 25 sld. d.}$$

as

$$= \text{£} 1. 60 \text{ 10d.}$$





$$= \frac{24963}{4} d$$

$$= 6243 \frac{1}{4} d.$$

$$= \frac{13885}{4}$$

$$= 3471 \frac{1}{4} d.$$

$$\therefore \text{total cost} = 6243 \frac{1}{4} \text{ total cost} = 3471 \frac{1}{4}$$

$$\begin{array}{r} 455 \\ 12 \overline{) 6705 \frac{1}{4}} \\ 20 \overline{) 558} \quad 9 \frac{1}{4} \end{array}$$

$$\begin{array}{r} 455 \\ 12 \overline{) 3926 \frac{1}{4}} \\ 20 \overline{) 327} \quad 2 \frac{1}{4} \\ 16 \quad 7 \quad 2 \frac{1}{4} \end{array}$$

$$= \text{£} 16. 7s. 2d. \text{ and}$$

Summer 1963 Set A, 10

10

(i) Express  $17 \frac{1}{2}$  as an exact decimal of £1.

(ii) Find the cost of 129 shirts at £1 8s 4d each.

(iii) Verify  $(2 \frac{1}{4} + 12 \frac{1}{2}) \div (23 \frac{1}{8} - 1 \frac{1}{5})$ .

(iv) What is the smallest whole number which will give a remainder of 5 when divided by 24 or by 30 or by 36.

20) Solving 1 km. = 5/8 mls represents the need of 40 Kp.h. in ft. per sec.

10

$$\begin{array}{r} 12 \overline{) 7.50} \\ 20 \overline{) 17.025} \\ 0.88225 \end{array}$$

$$\text{ans} = 0.88225$$

10

	£	12s		2s	16s. 6d		4s.
1/5				25	16s. 6d		4s.
1/5				25	16s.		4s.
24				1	1	6d	4d.
				52	13	6d	
				12.9			
				£181	13	6d	

2 £1.

4s.

4d.

2

2

2

2

2

2

2



$$\frac{2\frac{1}{4} + 1\frac{2}{3}}{3 + 8} = \frac{3\frac{11}{12}}{11} = 3\frac{11}{12}$$

$$\frac{2\frac{3}{8} - 1\frac{1}{5}}{15 - 8} = \frac{1\frac{7}{40}}{7} = \frac{1}{4}$$

$$\begin{aligned} 3\frac{11}{12} \div 1\frac{2}{3} &= \frac{47}{12} \times \frac{3}{4} = \frac{47}{4} = 11\frac{3}{4} \\ &= 11\frac{3}{4} \times \frac{4}{3} = 15\frac{1}{3} \end{aligned}$$

Q10 L.C.M. of 24, 30, 36

$$24 = 6 \cdot 4$$

$$30 = 6 \cdot 5$$

$$36 = 6 \cdot 6$$

$$\therefore \text{L.C.M.} = 360$$

$$\therefore \text{number} = 360 + 5 = 365 \text{ ans.}$$

Q11 1 Km = 5/8 ml.

$$4 \text{ km} = 4 \times \frac{5}{8} = 2.5 \text{ ml.}$$

$$\therefore \text{speed} = 2.5 \text{ ml. per hour.}$$

$$= 5880 \times 2.5 \text{ ft per 3600 sec.}$$

$$\therefore \text{On 3600 sec speed} = 24550 \text{ ft.}$$

$$\therefore \text{in 1 sec.} = \frac{24550}{3600} \text{ ft.}$$

$$\begin{array}{r} 6 \\ 36 \overline{) 2455} \\ \underline{216} \\ 295 \end{array}$$

$$\begin{array}{r} 5820 \\ 26 \\ 116400 \\ 129100 \\ \hline 245500 \\ 11 \\ 3600 \overline{) 245500} \\ \underline{3600} \\ 3600 \end{array}$$

$$3600 \overline{) 245500} = 36\frac{2}{3} \text{ ft per sec.}$$

$$\text{ans} = 36\frac{2}{3} \text{ ft per sec.}$$

7

- 2(ii) after paying  $\frac{5}{8}$  of his income and paying  $16\frac{2}{3}\%$  of  $31.50$  income in tax a man has  $\pounds 37.5$  left. What is his income?
- (iii) A picture is mounted in a rectangular frame of overall length  $2'$  and width  $1\frac{1}{2}'$ . If the area of the picture is  $2\frac{3}{16}$  sq ft and the bars of the frame is  $\frac{1}{2}$  inch wide find in cubic feet the volume of wood in the frame.
- 3(i) What sum of money invested for four years at  $5\frac{1}{8}\%$  per annum will be  $\pounds 1$ . Total  $\pounds 1.50$ .

2. (i)  $\frac{\pounds}{\pounds} 16\frac{2}{3}\% = \frac{16\frac{2}{3}}{100} = \frac{1}{6}$

$\therefore$  total amount of income spent  $= \left(\frac{5}{8} + \frac{1}{6}\right)$  of income.

$= \frac{15}{24} + \frac{4}{24}$

$= \frac{19}{24}$

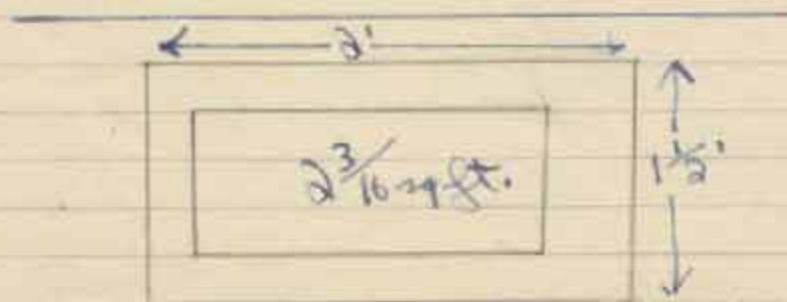
$= \frac{19}{24}$  of income.

$\therefore \pounds 37.5$

$\therefore$  total income  $= \pounds 37.5 \times \frac{24}{19} = \pounds 1800$

$= 75$   
 $\frac{24}{19}$   
 $1500$   
 $300$   
 $1800$

3(iii)





$$\begin{aligned}\text{area of picture} &= 2^3 \text{ sq. ft.} \\ \text{area of frame + picture} &= 2 \times 1\frac{1}{2} = 3 \text{ sq. ft.} \\ \therefore \text{area of frame} &= 3 - 2\frac{3}{16} = \frac{13}{16} \text{ sq. ft.}\end{aligned}$$

$$\begin{aligned}\therefore \text{Volume of frame} &= \frac{13}{16} \times \frac{1}{36} \times \frac{1}{48} \text{ cu. ft.} \\ &= \frac{13}{16} \times \frac{1}{48} \times \frac{1}{3} \text{ cu. in.} \\ &= 39 \text{ cu. in. and}\end{aligned}$$

$$3(i) \quad I = \frac{PRT}{100}$$

$$\begin{aligned}\therefore P &= \frac{100I}{R.T.} = \frac{100 \times 1350}{4 \times 5\frac{1}{8}} \\ &= \frac{100 \times 1350}{4 \times 5\frac{1}{8}} \\ &= 1350 \text{ and}\end{aligned}$$

10