PROFIT & LOSS

Profit or Loss :

$$P\% / L\% = \frac{SP - CP}{CP} \times 100\%$$

S.P = C.P + Profit.

Profit = S.P − C.P

$$P\% = \frac{S.P - C.P}{C.P}$$

$$P\% = \frac{P}{C.P}$$

$$L\% = \frac{L}{C.P}$$

Class Assignment

Type 1.

1. Scooter : Rs 4700
   Repair : Rs 800
   Rs. 5500 C.P.

   S.P : Rs 5800.

   Profit % $= \frac{S.P - C.P}{C.P} \times 100\%$

   $= \frac{5800 - 5500}{5500} \times 100$

   $= \frac{300}{5500} \times 100 = \frac{300}{55}\%$

Or, $\frac{S.P - C.P}{C.P}$

$\frac{5800 - 5500}{5500} = \frac{300}{5500} = \frac{3}{55}$

$\frac{3}{5 \times 11}$ =>

Taking $\frac{3}{11}$ as 27.27 %

$= \frac{27.27}{5} = \simeq 5.45\%$.

Positive so ⟶ Profit = 5.45 %

Type! 2.

2. (B) let S.P = 100.

C.P = 80 % of 100

= 80.

$\frac{S.P - C.P}{C.P}$

$\frac{100 - 80}{80} = \frac{20}{80}$

$= \frac{1}{4}$

= 25 %

or, $\frac{S.P - C.P}{C.P} \times 100\%$

$\frac{100 - 80}{80} \times 100\%$

$\frac{20}{80} \times 100$

$= 25\%$.

Qs. C.P of an article = 120% of S.P. Find the profit or loss %.

C.P = 120.

SP = 100.

$\frac{100 - 120}{120}$ $\frac{20}{120} \times 100$

$= 16.66\%$ loss.

3. C.P of 100 oranges = Rs 350

1 orange $= \frac{350}{100} =$ Rs 3.50.

S.P 12 oranges = Rs 48.

1 $= \frac{48}{12} =$ Rs 4.

$\frac{4 - 3.5}{3.5} = \frac{.50}{3.50} = \frac{1}{7}$

$= 14.28\%$

4. C.P of 6 bananas = Rs 10.

1 banana = $\frac{10}{6}$.

S.P of 4 bananas = Rs 6.

S.P of 1 bananana = $\frac{6}{4}$.

Method 1: $\frac{\frac{6}{4} - \frac{10}{6}}{\frac{10}{6}}$.

Method 2.

C.P of 6 Bananas = Rs 10 $\xrightarrow{\times 2}$

C.P of 12 bananas = Rs 20

S.P of 4 Bananas = Rs 6 $\xrightarrow{\times 3}$

S.P of 12 Bananas = Rs 18

LCM of 6 and 4 = 12.

$\frac{18 - 20}{20} = -\frac{2}{20} = -\frac{1}{10}$

$-\frac{1}{10}$ i.e, = 10%

Loss = 10%.

Method 3. Cross multiplication Method

	Items	Amount
C.P	6 bananas	Rs 10
S.P	4 bananas	Rs 6

6×6 = 36

4×10 = 40

$$\frac{36-40}{40} = -\frac{4}{40}\,1$$

$$= -\frac{1}{10} = 10\%$$

Loss = 10%.

$$\begin{array}{r} 11 \\ \times 16 \\ \hline 66 \\ 11\times \\ \hline 176 \end{array}$$

5.

	Items	Amount
C.P	9 oranges	Rs 16
S.P	11 oranges	Rs 20

Method 2

C.P = 9 oranges = Rs 16 (×11)

S.P = 11 oranges = Rs 20 (×9)

$$\frac{180-176}{176} = \frac{4}{176}$$

$$= \frac{1}{44}$$

$$\frac{180-176}{176} = \frac{1}{44}$$

$$= \frac{1}{4\times 11} = \frac{9.09}{4}$$

$$= 2.27\%$$

$$= 2.27\%$$

Type: 4

C.P of (x) Articles = S.P of (y) Article.

6. C.P of 15 ice-creams = S.P of 12 ice-creams

Let, C.P of 15 ice-creams = Rs 100

S.P of 12 ice-creams = Rs 100.

Method 1

	Item	Amount
C.P	15	100
S.P	12	100

$$\frac{1500 - 1200}{1200} = \frac{300}{1200}$$

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

Method 2. $P\%/L\% = \frac{x-y}{y}$

C.P of x Articles = Rs 1

1 " $= \frac{1}{x}$.

S.P of y Articles = Rs 1

1 " $= \frac{1}{y}$.

$$\frac{\frac{1}{y} - \frac{1}{x}}{1/x} = \frac{x-y}{xy} = x\,\frac{x}{1}$$

$$\frac{X-4}{4}$$

$$\frac{15-12}{12} = \frac{3}{12} = \frac{1}{4}$$

$$= .25\%$$

7.

	Items	Amount
C.P	24	100
S.P	16	100

$$\frac{2400-1600}{1600} = \frac{800}{1600}$$

$$= \frac{1}{2} = 50\%$$

Or, $\frac{24-16}{16} = \frac{8}{16} = \frac{1}{2}$

50%

8.

	Item	Amount
C.P	20	100
S.P	24	100

$$\frac{2000 - 2400}{2400}$$

$$\frac{-400}{2400} = -\frac{1}{6}$$

$= 16.66\%$ loss

Or, $\frac{x - 4}{4}$

$= \frac{20 - 24}{24} = \frac{-4}{24}$

$= -\frac{1}{6}$

$= 16.66\%$.

Type:5.

9) Let 1000 gm = Rs 1000

800 = Rs 800.

$$\frac{1000 - 800}{800} = \frac{200}{800} = \frac{1}{4}$$

$= 25\%$.

10. Let 1000 gm = Rs 1000.

S.P = Rs 1000.

950 gm = Rs 950.

$$\frac{1000-950}{950} = \frac{50}{950}$$

$$= \frac{1}{19} \simeq 5.25\%.$$

Suppose:

1. No profit No Loss. → Less weight / more weight.

2. Profit → Less weight / more weight.

$\frac{10}{100} \times 1000$

100.

3. Loss → Less weight. / more weight

11. Price of 1000 gm = Rs 1000.

10% of 1000 = Rs 100

S.P = Rs 1100

20% weight = $\frac{20}{100} \times 1000$

= 800 gm.

$$\frac{1100 - 800}{800} = \frac{300}{800}$$

$$= \frac{3}{8} = 37.5\%$$

A dealer claim that he is selling the good at 10% (discount at cost Price) by mistake has given 20% extra weight. Find his actual loss %.

C.P of 1000 gm = Rs 1000.

S.P 10% = Rs 100

= 1000 − 100

= 900.

20% of 1000 = 200.

C.P. = Rs 1000 + 200

= 1200.

$$\frac{900 - 1200}{1200} \times 2$$

$$\frac{900 - 1200}{1200} = \frac{-300}{1200} = -\frac{1}{4}$$

= 25%

Type: 6.

12.

$$P\% = \frac{S.P - C.P}{C.P} = 16.66\%.$$

$$P\% = \frac{P}{C.P} = \frac{1}{6}.$$

Type: 7. Successive Discount.

Method 2.

$$\underset{-50}{\underline{-50\%}} \quad 50 \quad \underset{-15}{\underline{-30\%}} \quad 35 \quad \underset{-7}{\underline{-20\%}} \quad = 28\%$$

13.

$$100 \quad \underset{10}{\underline{-10\%}} \quad 90 \quad \underset{-10.8}{\underline{-12\%}} \quad 79.2 \quad \underset{-11.88}{\underline{-15\%}}.$$

15% 79.2.

10% = 79.2

5% = 3.96

15% = 11.88.

10.0
10.8
11.88
32.68 %.

10%
1%
1%

Type - 8.

Home Assignment.

1.

$$P\% = \frac{SP - C.P}{C.P}$$

$$SP = CP + P$$

$$P\% = \frac{P}{C.P}$$

$$16.66\% = \frac{1}{6} \begin{matrix} \text{— Profit} \\ \text{— S.P} \end{matrix}$$

$$\frac{P}{S.P} = \frac{1}{6}$$

S.P = C.P + Profit

S.P	−	P	=	C.P
↓		↓		
6	−	1	=	5

$$P\% = \frac{P}{C.P} = \frac{1}{5}$$

$$= 20\%.$$

A student calculated the profit as 25% on S.P. Find his actual profit %.

$$P\% = \frac{P}{S.P} = 25\%.$$

$$\frac{P}{S.P} = \frac{1}{4}.$$

$$S.P - P = C.P$$

$$4 - 1 = 3.$$

$$P\% = \frac{P}{C.P} = \frac{1}{3}$$

$$= 33.33\%.$$

2.

$$L\% = \frac{L}{S.P} = 16.66\%$$

$$\frac{L}{S.P} = \frac{1}{6}.$$

$$S.P - L = C.P$$

$$6 + 1 = 7.$$

$$\text{Loss } \% = \frac{P}{C.P} = \frac{1}{7} = 14.28\%.$$

A student calculated loss @ 25% on S.P find out actual loss.

$$25\% = \frac{1}{4}.$$

$$4 + 1 = 5.$$

$$= \frac{1}{5} \Rightarrow 20\%.$$

27.9.18.

S.P = Rs 100

P% = 20%

C.P = ?

Method 1

Taking C.P = x

$$P\% = \frac{S.P - C.P}{C.P}$$

$$20\% = \frac{100 - x}{x}.$$

$$\Rightarrow \frac{1}{5} = \frac{100 - x}{x}.$$

$$\Rightarrow x = 500 - 5x.$$

$$\Rightarrow x + 5x = 500$$

$$6x = 500$$

$$x = \frac{500}{6} = 83.33$$

Method : 2

Taking C.P has = 100 % = ?

P % = 20 %.

S.P = 120 % = Rs 100.

120 % = Rs 100.

$$1\% = \frac{100}{120}$$

$$100\% = \frac{100}{6\cancel{120}} \times \overset{5}{\cancel{100}}$$

$$= \frac{500}{6} = 83.33.$$

Method : 3

C.P ——— Rs 100.

P % ——— 20 % = $\frac{1}{5}$.

$\frac{1}{5}\uparrow$ compensated by $\frac{1}{6}\downarrow$

C.P ← $\frac{1}{5}\uparrow$ (+) ——— 100.

Decrease $\frac{1}{6}$ from 100 = 16.66

= 83.33.

$\frac{1}{6}\downarrow$ (−) 16.66

= 83.33.

$\frac{1}{6}$ = 16.66.

Type : 9

Handout

14. C.P$_1$ ——— Price P% = 25%.

Method 1:

S.P$_1$ = C.P$_2$.

P = 25%.

S.P$_2$ = C.P$_3$

P = 25%

S.P 3 = 250.

$\frac{1}{5}$ = 20%.

C.P 3 — 25% = $\frac{1}{4}$ ↑ — 250

$\frac{1}{5}$ ↓ — 50

= 200.

$\frac{1}{5}$ of 250 = 250.

$\frac{1}{5}$ = 50.

C P$_2$ — 25% = $\frac{1}{4}$ ↑ — 200

$\frac{1}{5}$ ↓ — 40

160

$\frac{1}{5}$ of 200

= 240.

CP$_1$ — 25% = $\frac{1}{4}$ ↑ — 160

$\frac{1}{5}$ ↓ — 32

128.

$\frac{1}{5}$ of 160.

Method 2.

$$C.P_1 \ (100\% + x\%) + (100\% + y\%) + (100\% + z\%) = S.P_3.$$

$$C.P_1 * (100\% + 25\%) + (100\% + 25\%) + (100\% + 25\%) = S.P_3$$

$$C.P_1 * 125\% + 125\% + 125\% = S.P_3.$$

$$C.P_1 \times \frac{5}{4} \times \frac{5}{4} \times \frac{5}{4} = 250.$$

$125\% = \frac{5}{4}$.

$$C.P_1 \times \frac{125}{64} = 250.$$

$$C.P_1 = \frac{\overset{2}{\cancel{250}}}{\cancel{125}} \times 64$$

$$= 128.$$

Suppose, $C.P_1 \ (100\% + x\%) + (100\% + y\%) + (100\% + z\%) + \ldots$ $S.P_4$.

$$C.P_1 * (100 \pm 10\%) + (100 \pm 20\%) + (100\% \pm 30\%) + (100 + 40\%) = S.P_4.$$

$$110\% + 120\% + 130\% + 140\% = S.P_4$$

It can be a mixture too

*

$$90\% + 120\% + 70\% = S.P_3.$$

Or, $C.P_1 (100\% + 20\%) = 100$.

$C.P_1 \times 120\% = 100$

$C.P_1 \times \frac{6}{5} = 100$. $\quad 120\% = \frac{6}{5}$.

$C.P_1 = 100 \times \frac{5}{6} = \frac{500}{6}$

$= 83.33$

15. Type 10.

$S.P_1 = S.P_2$

$+10\% \quad -10\%$

Let, $P\% / L\% = \frac{100(x+y)+2(x)(y)}{200+x+y}\%$.

$(+)10\% \quad (-)10\%$

$(+)20\% \quad (-)20\%$

$(+)30\% \quad (-)30\%$.

without taking x, you can also take $+10$ and -10.

$\frac{100(+x-x)^0 + 2(+x)(-x)}{200+x-x}$.

$= \frac{-2x^2}{200}\%$.

$\frac{-(x^2)}{100}\%$.

$= +10 - 10$.

$\Rightarrow -\frac{(10)^2}{100}$.

$\Rightarrow -\frac{100}{100} = -1\%$ loss.

$+20 - 20$.

$= -\frac{(20)^2}{100}$

$= -\frac{400}{100}$. $= -4\%$ loss

$+30 - 30$.

$= -\frac{(30)^2}{100}$

$= -\frac{900}{100} = -9\%$ loss.

Type: II.

16. 10% loss Rs 300. Profit = 20%.

C.P = 100%.

Loss = -10%

S.P = 90% — x ①

C.P — 100%

P% = 20%

S.P$_1$ = 120% ——— (2).

S.P = 90% $\xrightarrow{+30\%}$ SP$_1$ = 120%

x $\xrightarrow{+300}$ $x+300$

30% = 300.

or x = 90%

$x+300$ = 120%

$-x$ = 90%

300 = 210%

30% = 300

1% = $\frac{300}{30}$ = 10

100% = 10×100

= 1000.

Suppose,

C.P = 1000.

Loss = 10%

= 1000 − 10

= Rs 900

Rs 900 + Rs 300

= Rs 1200.

20% Profit = 300.

➡ Sold a car for 20% loss, Had I got 50,000 more of the car, I would make loss of 10%. Find the cost price of the car.

C.P = 100.

loss = − 20%

S.P = 80%

x

C.P = 100 %

loss = − 10%

S.P$_1$ = 90%

x + 50,000.

10 % = 50,000.

1% = $\frac{50000}{10}$

10% = 5000

100% = $\frac{100 \times 50000}{100}$.

$\frac{50,000 \times 10}{1}$

Rs 5,00,000

$\frac{50,000 \times 10}{1}$.

= 5,00,000

Bike — 20% loss, Had I got Rs 20,000 more for that Bike I would make a profit of 20%.

C.P = 100%
loss = −20%
S.P = 80%

C.P = 100%
P = 20%
S.P$_1$ = 120%.

40% = 20,000

1% = $\frac{20\,000}{40}$

100% = $\frac{20,000}{40} \times \frac{100}{1}^{25}$

= 50,000.

Type: 12.

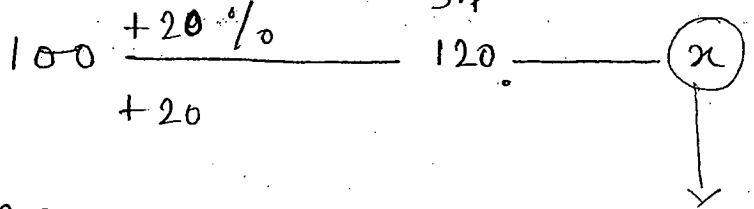
Mark Up Price − Discount = S.P.

Discount is always calculated on Mark up Price.

C.P is linked with Mark Up Price and Discount.

17. Discount = 25%.
Gain = 20%.

let, C.P = 100



Gain = 20%
So, S.P = 100 + 20
= 120%.

Mark up price − Discount = S.P. price

25% = 1/4

x − 25% of x = 120.

$\frac{x}{1} - \frac{1}{4} \times x = 120.$

$\frac{3}{4} x = 120.$

$x = \frac{40}{\cancel{120}} \times \frac{4}{\cancel{3}}$

$= 160.$

$\therefore \frac{160 - 100}{100} = \frac{60}{100}$

$= 60\%.$

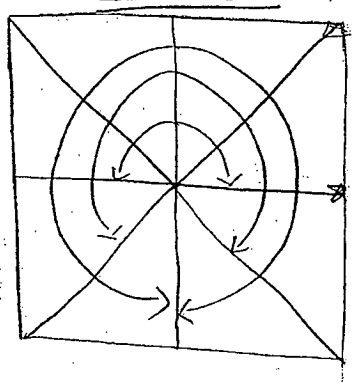
NON-VERBAL REASONS

M S G
- Movement
- Sequence
- Grouping

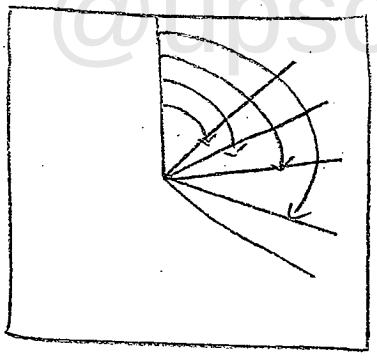
3. Position

4. Angle
- Direction
- Clock

Direction.



Clock.



$\frac{360^\circ}{12} = 30^\circ$

5. Mirror Image

A | A

Same mirror image :-
A, H, I, M, O, T,
U, V, W, X, Y.

Water image.

A

O, 8 having same mirror image

i, l, o, v, w, x

Mirror - Left becomes right :
Right becomes left -

Top — Top.

Bottom — Bottom.

Water - Top — Bottom.

Bottom - Top.

Left - Left.

Right - Right.

Exact same Water Image = C, D, E, H, I, K, O, X

The digit [0] has same water image.

c, l, o, x.

$\frac{M}{W} \quad \frac{W}{M}$

Number Analogy.

↳ having same relationship.

ex. A : B :: C : D

3 : 27 :: 4 : ?

3^3 : 4^3

= 64

Type: 1 Class Assignment.

Subtype: 1

1.

A ——— 18 days.

B ——— 9 days.

L.C.M of 18 and 9 = 18.

Per day work of A = $\frac{18}{18}$ 1

= 1 chair/day.

Per day work of B = $\frac{18}{9}$ 2.

= 2 chairs/days.

1 + 2.

= 3 ch/days.

∴ No. of days = $\frac{\text{Total work}}{\text{Per day work}}$.

= $\frac{18}{3}$ 6

= 6 chairs/day.

2. A ——— 10

= $\frac{30}{10}$ 3 days.

L.C.M of 10 and 30

= 30.

B ——— 30.

= $\frac{30}{30}$ 1 days

= 3 + 1

= 4.

$$\frac{\text{TW}}{\text{P.D.W}} = \frac{30}{4} = 7.5 \text{ ch/day}.$$

3.

Ashok = ——— 36 days L.C.M = 36 & 18

2 | 36, 18

$= \frac{36}{36} \times 1$ = 1/day. = 36.

Rakin ——— 18 days.

$= \frac{36}{18} \times 2$

= 2/day.

1 + 2 = 3/day.

∴ Total no. of days = $\frac{36}{3}$ = 12 days.

Type: 2.

6.

Man can do the work ——— 5 days.

Man with son can do the work ——— 3 days.

∴ Son alone can do the work in ——— day.

L.C.M of 5 & 3 = 15.

Man can make = $\frac{15}{5}$ 3

Man + Son = $\frac{15}{3}$ 5 ch/day = 3 ch/day.

Son can make = x.

3 + x = 5

x = 5 − 3

∴ Son alone will take

$= \frac{15}{2} = 7.5$ ch/day.

7.

Woman ——— 15 days.

Daughter + Woman ——— 5 days.

L.C.M = 15 and 5

= 15.

Woman can do = $\frac{\cancel{15}\,1}{\cancel{15}} = 1$/day.

Daughter + Woman = $\frac{\cancel{15}}{\cancel{5}}\,3$

= 3/day.

Daughter can alone = x.

$1 + x = 3$.

$x = 3 - 1$

$= 2$.

∴ Daughter alone will take.

$= \frac{15}{2} = 7.5$ ch/day.

8.

A + B ——— 4 days.

A ——— 12 days.

L.C.M = 4 and 12

= 12.

A ——— $\frac{12}{12}$ 1/day.

A + B ——— $\frac{12}{4}$ 3 = 3/day.

B alone = x.

$1 + x = 3$

$x = 3 - 1$

$= 2$.

B alone = $\frac{12}{2}$ 6 cm/days.

= 6 days.

Type: 3.

11.

A ——— 12 days

B ——— 15 days

C ——— 20 days.

L.C.M of A + B + C

= 12 & 15 & 20

= 60

$$A = \frac{60}{12} = 5 \text{ day}$$

$$+$$

$$B = \frac{60}{15} = 4 \text{ day}$$

$$+$$

$$C = \frac{60}{20} = 3 \text{ day}$$

$$12 \text{ days}$$

∴ Total days taken = $\frac{60}{12}$ 5 days.

12.

A ——— 24 days.

B ——— 6 days.

C ——— 12 days.

$$6 \mid 24, 6, 12$$
$$2 \mid 4, 1, 2$$
$$2 \mid 2, 1, 1$$

$$A = \frac{24}{24} = 1 \text{ day}$$

$$+$$

$$B = \frac{24}{6} = 4 \text{ day}$$

$$+$$

$$C = \frac{24}{12} = 2 \text{ day}$$

$$7 \text{ day}$$

$$7 \overline{)24} \; 3,4$$
$$21$$
$$30$$
$$28$$
$$2$$

∴ Total days taken = $\frac{24}{7}$

$$= 3\frac{3}{7} \text{ days.}$$

Type: 2.

Subtype 2.

17.

$$A + B = 12 \text{ days}$$
$$B + C = 15 \text{ days}$$
$$C + A = 20 \text{ days}$$

L.C.M of 12, 15, 20

$$= 60.$$

$$A + B = \frac{60}{12} = 5 \text{ day} \quad \text{——} (1).$$

$$B + C = \frac{60}{15} = 4 \text{ day} \quad \text{——} (2).$$

$$C + A = \frac{60}{20} = 3 \text{ day} \quad \text{——} (3).$$

$$2A + 2B + 2C = 12 \text{ day}.$$

$$2(A + B + C) = 12 \text{ day}.$$

$$A + B + C = \frac{12}{2} = 6 \text{ day} \quad \text{——} (4).$$

A + B + C can do the work in $= \frac{60}{6}$

$= 10$ days.

A alone = Equation (4) − (2).

$A + B + C = 6$ / day.

$B + C = 4$ / day.

$A = 6 - 4$

$= 2$ / day.

A alone will take

$= \frac{60}{2} = 30$ / day.

∴ for B = $A + B = 5$ / day.

$2 + B = 5$

$B = 5 - 2$.

$= 3$.

∴ for 60 chains = $\frac{60}{3} = 20$ / day.

for C = $C + A = 3$.

$C + 2 = 3$.

$C = 3 - 2$

$= 1$ / day.

C alone with take = $\frac{60}{1} = 60$ / day..

14.

A + B ——— 15 days.

B + C ——— 20 days.

C + A ——— 30 days.

5 | 15, 20, 30.
3 | 3, 4, 6.
2 | 1, 4, 2.
1, 2, 1

L.C.M of 15, 20, 30

= 60.

$A + B = \frac{60}{15} = 4$ / day.

$B + C = \frac{60}{20} = 3$ / day.

$C + A = \frac{60}{30} = 2$ / day.

$2A + 2B + 2C$. 9 / day.

$2A + 2B + 2C = 9$.

$(A + B + C) = \frac{9}{2} = 4\frac{1}{2}$.

4.5.

$A + B + C = 60 \div \frac{9}{2}$ or $\frac{60}{4.5}$ $\frac{60 \times 10}{45}$.

$= \frac{60}{1} \times \frac{2}{3} = \frac{40}{3}$ / day.

A alone =

$A + B + C = 4.5$ cm/day.

$B + C = 3$ cm/day.

$A = 4.5 - 3$

$= 1.5$ cm/day.

$A = \frac{60}{1.5}$

$= \frac{\cancel{60}^{4}}{\cancel{15}} \times 10$.

$= 40$ cm/day.

Type: 3.

⇒ A and B can do one work in 10 and 20 days respectively. A alone started the work for 5 days and left the job.

Find in how many days B alone will complete the remaining work?

A —— 10 days.

B —— 20 days.

L.C.M of 10 & 20

$= 20$.

A —— $\frac{20}{10} = 2$ cm/day.

B —— $\frac{20}{20} = 1$ cm/day.

A left the job after 5 days.

$= 5 \times 2$.

$= 10$ cn.

$\therefore B = 20 - 10$.

$= 10$ days.

$\therefore$ B alone $= \frac{10}{1}$.

$= 10$ days to complete the remaining work.

Or,

A ——— $\frac{100}{10} = 10\%$.

B ——— $\frac{100}{20} = 5\%$.

$\frac{50}{5} : 10$ days.

Or.

A ——— 10 days

B ——— 20 days.

50% work = 2nd 10 days.

20.

A ——— 10 days.

B ——— 20 days.

L.C.M of 10, 20.

= 20.

A = $\frac{20}{10}$ = 2 cm/day.

B = $\frac{20}{10}$ = 1 cm/day.

If A starts the work, then.

1	2	3	4	5	6	7	8	9	10	11	12	13
A	B	A	B	A	B	A	B	A	B	A	B	A
2	+ 1	2	+ 1	2	+ 1	2	+ 1	2	+ 1	2	+ 1	2

= (20).

= 13 days.

If B starts the work.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
B	A	B	A	B	A	B	A	B	A	B	A	B	A
1	+ 2	1	+ 2	1	+ 2	1	+ 2	1	+ 2	1	+ 2	1	

13.5 days.

21.

Arjun — $\frac{30}{10} = 3$

Arvind — $\frac{30}{30} = 1$

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	B	A	B	A	B	A	B	A	B	A	B	A	B	A
3+1	3+1	3+1	3+1	3+1	3+1	3+1								
4	4	4	4	4	4	4								
							28	2/3						

$3, 2\frac{2}{3}$

$11.14\frac{2}{3}$ days

$= 14.66$

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A
1+3	1+3	1+3	1+3	1+3	1+3	1+3	1+3	1+							
4	4	4	4	4	4	4	4	29	1/3						

$= 15\frac{1}{3} = 15.33.$

Or,

4 chairs = 2 days. 15th day. Arvind Arjun

×7 | ×7 1

28 chairs = 14 days

$= 29 \text{ — } 1/3$

$15\ 1/3 = 15.33$

Type: 4

Efficiency

Mr. A is double efficient than Mr. B.

$$= \text{Efficiency} \times \frac{1}{\text{Time}}$$

Represented in the form of Ratio & Proportion and Percentage.

25. A ——— 50 days.

B twice efficient.,

So B will take.

= 25 days.

(1)

	A	B
Efficiency	1	2
Time	2x	1x
	⇓	⇓
	50	25

Efficiency & Time inversely related.

$2x = 50$

$x = \frac{50}{2}$

$= 25$.

26.

	Anil	Sunil
Efficiency	1/2 : 1	1+2 : 3
Time	3x	1x

$3x = 15$

$x = \frac{15}{3} = 5$.

5×1

Sunil = 5 days.

27.

	Renu	Seema
Efficiency	1/1	4/3
Eff.	3	4
Time	4x	3x

$4x = 40$.

$x = \frac{40}{4}$

$= 10$.

$3x = 10 \times 3$

$= 30$ days Seema will take.

28.

	B	:	A
Efficiency	1	:	$1+1/3$
	1	:	$\frac{3+1}{3}$
	1	:	$\frac{4}{3}$
	3	:	4
Time	4	:	3
	$4x$	:	$3x$
	4×4		4×3
	16		12

$3x = 12$

$x = 4$

$4x = 4 \times 4$

$B = 16$

$12+16 = 28$

$A = \frac{14}{28} = \frac{1}{3}$

$B = \frac{14}{28} = \frac{1}{4}$

Type: 4.

Ram is 50% efficient than Sita. If Sita can do one work in 30 days then Ram alone will take how much time for same work.

	Ram	Sita.
Efficiency	50%	100%
	$= 1/2$	1
	$= 1$	2.
Time	$2x = 60$.	$1x = 30$
	$= 2x$	$1x$.

$1x = 30$

$2x = 30 \times 2$

$= 60$.

29.

Ram : Shyam

100% : 100+50

$= 150\%$.

$\frac{100}{100} 1 : \frac{150}{100}$

$\frac{1}{1} : \frac{3}{2}$

Efficiency 2 : 3.

Time 3 : 2.

$3x : 2x$.

$3x = 30$

$x = \frac{30}{3} = 10$.

$2x = 10 \times 2$.

$= 20$ days Shyam.

$\Rightarrow$ Mr. A is double efficient than Mr. B

Efficiency directly proportional to Wages

31,

Anil : Sunil

$1 + 2/3$: 1

Efficiency $\frac{5}{3}$: 1

$= 5 : 3$

Wages $= 5 : 3$

8.

$\text{Anil} = \frac{5}{8} \cdot 2 = \frac{5}{8} \times \frac{125}{1000} 2625$

$\text{Sunil} = \frac{3}{8} \cdot 2 = \frac{3}{8} \times \frac{125}{1000}$

2375.

32.

Arun : Ganesh.

100+30 : 100.

130 : 100.

$\frac{130}{100}$ $\frac{100}{100}$ 1.

$\frac{13}{10}$. (cross multiply.

Efficiency 13 : 10

Time : 13 : 10

23.

Arun. $\frac{13}{23} \times 1150$. $= \frac{\cancel{13}^{6.5}}{\cancel{2 \times 11.5}} \times \cancel{1150}^{100}$

$= 650$.

Ganesh $\frac{10}{23} \times 1150$.

$= \frac{\cancel{10}^{5}}{\cancel{2 \times 11.5}} \times \cancel{1150}^{100}$

$= 500$.

Wages is inversely proportional to Time

$W \propto E \propto \frac{1}{T}$.

$= W \propto \frac{1}{T}$.

33.

	A	:	B
Time	12	:	18

Time $\frac{12}{6}$: $\frac{18}{6}$

$= 2 : 3$

Wages $= 3 : 2$

5

A will get $= \frac{3}{5} \times 600 = 360$

Or,

A ——— 12

B ——— 18

L.C.M of 12 & 18 $= 36$.

Per day work of A $= \frac{36}{12} = 3$/day.

Per day work of B $= \frac{36}{18} = 2$/day.

Efficiency of A : B.

3 : 2.

Time 2 : 3

5.

$\frac{3}{5} \times \cancel{600}^{120}$.

$= 360$.

34.

A ——— 12

B ——— 16

C ——— 24.

2 | 12, 16, 24
2 | 6, 8, 12
3 | 3, 4, 6.
2 | 1, 4, 2
1, 2, 1

Per day of A = $\frac{\cancel{48}}{\cancel{12}}$ 4/day.

B = $\frac{\cancel{48}}{\cancel{16}}$ 3/day.

C = $\frac{\cancel{48}}{\cancel{24}}$ 2/day.

Efficiency = 4 : 3 : 2

Taking it $4x + 3x + 2x = 1800$

$9x = 1800$.

$x = 200$.

$A = 4x$

$= 4 \times 200$

$= 800/-$

$B = 3x$.

$= 3 \times 200$

$C = 2x$

$= 2 \times 200$

$= 400/-$

Men Days

No. of men increase

No. of days decrease

Type: 5 i) $M_1 \times D_1 = W$ —— (1)

ii) $M_2 \times D_2 = W$ —— (2)

$$\boxed{M_1 D_1 = M_2 D_2}$$

Class Assignment

1.

$8 \times 10 = x \times 40$

$80 = 40x$

$\frac{80}{40} = x$

$x = 2$

$M \times D = W$

$M = \frac{W}{D}$

$M \times \frac{1}{D}$

} Inversely proportional.

8 ——— 10 days.

↓ ÷4 ↓ ×4

2 ? ——— 40 days.

If multiplied on right side, then it is divided by the same number on the left.

2.

12 Boys ——— 5 days

÷3 ↓ ×3

4 ? ——— 15 days

Ex.

10 men ——— 10 days.

↓ ×2 ↓ ÷2

20 men ——— ? 5 days.

20 women	——	20 days
↓ ÷ 4		↓ × 4
5 women	——	?80 days

5 girls	——	25 days
↓ × 5		↓ ÷ 5
25 girls	——	?5 days

Subtype 1

$$M_1 \times D_1 \times T_1 = W_1 \quad \text{——— (1)}$$

$$M_2 \times D_2 \times T_2 = W_2 \quad \text{——— (2)}$$

$$\rightarrow \frac{M_1 \times D_1 \times T_1}{M_1 \times D_1 \times T_1} = \frac{W_1}{M_1 \times D_1 \times T_1}$$

$$= \frac{W_1}{M_1 D_1 T_1}$$

$$\frac{M_2 \times D_2 \times T_2}{M_2 D_2 T_2} = \frac{W_2}{M_2 D_2 T_2}$$

$$1 = \frac{W_2}{M_2 D_2 T_2}$$

3. $\frac{W_1}{M_1 D_1 T_1} = \frac{W_2}{M_2 D_2 T_2}$

$$\frac{\cancel{10}\,x}{\cancel{5} \times \cancel{6}^{3} \times 6} = \frac{\cancel{16}\,\cancel{8}}{\cancel{12} \times x \times \cancel{8}^{6}}$$

$$\frac{1}{18} = \frac{1}{6x}$$

$$6x = 18$$

$$x = \frac{18}{6} = 3 \text{ days}.$$

Subtype 2:

$$\frac{W_1}{M_1 D_1 T_1} = \frac{W_2}{M_2 D_2 T_2}$$

(Or)

$$\frac{W_1}{M_1 D_1} = \frac{W_2}{M_2 D_2}$$

(Or)

$$\frac{W_1}{M_1 T_1} = \frac{W_2}{M_2 T_2}$$

It is inversely proportional when work is same $= M \propto \frac{1}{D}$

Type: 6

✓ 10 men ——— 8 days 10 children ——— 16 days

**

We cannot compare the efficiency of two different groups of people.

ex: men and women, men and children.

Until and unless they are doing the same work in same time.

↳

10 men ——— 8 days 10 children ——— 16 days

×2 | ÷2.

? children ——— 8 days

20.

5 M + 10 C.

5 M + 5 M.

10 men ——— 8 days.

In term of efficiency 10 M = 20 children.

20 children = 10 men.

1 men = 2 children.

10 men or 1 men can be replaced by 20 children or 2 children.

5.

Let $A + C \longrightarrow 5$ days

$B \longrightarrow 15$ days.
(thrice) (5×3)

B ——— 15 days
×3 ↓÷3
? 3B ——— 5 days

In terms of efficiency now we can say, efficiency same time same, work same, we can do replacement.

$3B = A + C$

$A + B + C = 10$ days.

$\boxed{A + C} + B = 10$ days.

replacing A+C with 3B ↓

$3B + B = 10$ days.

$4B = 10$ days.

÷4 | ×4

$B = 40$ days.

6. Let, $A + B = 5$ days.

C twice = 5×2

= 10 days.

C ——— 10 days.
×2 | ÷2
2C ——— 5 days.

$A + B + C = 10$ days

$2C + C = 10$ days.

$3C = 10$ days

$\div 3$ | | $\times 3$.

$C = 30$ days

7. Let $A + C = 5$ days.

B ~~thrice~~ three times $= 5 \times 3$.

$= 15$ days

B ——— 15 days.

$\times 3$ | | $\div 5$

3B ——— 3 days

$A + C + B = 6$ days.

$3B + B = 6$

$4B = 6$

$\div 4$ | | $\times 4$

$B = 6 \times 4$

$= 24$ days.

8.

$3B = A + C$

$2C = A + B$

$A + B + C \longrightarrow 6$.

$2C + C \longrightarrow 6$

$3C \longrightarrow 6$

$\div 3 \longrightarrow \times 3$

$C \longrightarrow$ 18 days

9. 10 men + 14 Boys — 6 days | ×6 → 60 men | ÷6 → 1 days

16 men + 18 boys — 4 days | ×4 → 64 men | ÷4 → 1 days

→ 6 (10 m + 14 boys) — 1 days

= 60 men + 84 B — 1 days

4 (16 men + 18 boys)

64 men + 72 boys = 1 days.

using 1 is better, it gives no fraction

60 men + 84 Boys = 64 men + 72 boys

$84B - 72B = 64M - 60M$

$12B = 4M$

$\frac{12B}{4} = \frac{4M}{4}$

$3B = 1M$.

10 men + 14 B —— 6 days

| ×3

30 B + 14 B —— 6 days

44 B —— 6 days

| ÷ 44 | × 44

1 B —— 6 × 44

= 264 days.

Or, 8 men + 16 B —— ?

24 Boys + 16 B —— ?

40 B —— ?

1 B —— 264

| × 40 —— ÷ 40

40 B —— $\frac{264}{40}$

= $\frac{66}{10}$ = 6.6 days.

10. 12 men + 16 B —— 5 days

×5	——	÷5
60 men		1 days

60 men + 16 B = 1 days

60 men + 60 Boys = 1 day

13 men + 24 Boys —— 4 days.

× 4

52M + 96 B —— 1 day.

60M + 80B = 52M + 96 B.

60m − 52M = 96B − 80B.

$\frac{8M}{8} = \frac{16B}{8}$

1 M = 2 B.

24 B + 16 B —— 5 days

40 B	——	5 days
÷40		×40
1 B	——	200 days.

7 Men + 10 B

×2
14 B + 10 B

1 B —— 200.

×24	÷24
24 B	? ~~200~~ 100
	~~24~~ 12

⇒ 8:33.

Type 8.

wages.

Anil ——— 20 days.

Sunil ——— 30 days.

L.C.M of 20 & 30 = 60.

Per day wages of Anil

$= \frac{60}{20} = 3$ Rs/day.

Per day wages of Sunil.

$= \frac{60}{30} = 2$ Rs/day.

3 + 2 = Rs 5 per day.

$\frac{\text{Total wages}}{\text{Per day wages}} = \frac{60}{5}$

= 12 days.

12.

$\frac{24}{\times 2}$
$\frac{}{48}$.

A ——— 12 days.

B ——— 16 days

2 | 12, 16
2 | 6, 8
| 3, 4

A's per day = $\frac{48}{12} = 4$

+

B's per day = $\frac{48}{16} = 3$

7

L.C.M. 12 & 16 = 48.

$$\frac{\text{Total wages}}{\text{Per day}} = \frac{48}{7}$$

PIPE AND CISTERNS

Type : 1

1.

A ——— 20 min.

B ——— 30 min

L.C.M of 20 & 30 = 60.

60 ltrs.

A alone = $\frac{60}{20}$ = 3 l/min.

B alone = $\frac{60}{30}$ = 2 l/min

+

5 l/min.

$$\frac{\text{Total Capacity}}{\text{P/min work}} = \frac{60}{5}$$

= 12 minutes

2. A ——— 4 min.

B ——— 5 min

L.C.M of 4 & 5 = 20 l.

A alone = $\frac{20}{4}$ = 5 l/min.

B alone = $\frac{20}{5}$ = 4 l/min

+

9

$\frac{\text{Total Capacity}}{\text{l/min}} = \frac{20}{9}$ l/min

Type : 2

7. A ——— 5 hrs

B ——— 6 hrs

L.C.M of 5, 6, 12 = 60.

C empty the tank ——— 12 hrs.

A ——— $\frac{60}{5}$ = 12.

B ——— $\frac{60}{6}$ = 10

+

22

C ——— $\frac{60}{12}$ = 5 l/hr.

22 − 5 = 17 l/hr.

$$\frac{\text{Total Capacity}}{\text{L/min}} = \frac{60}{17} \text{ hrs.}$$

8.

A ——— 4 hrs.

B empties 9 hrs.

L.C.M of 4 & 9 = 36.

A ——— $\frac{36}{4} = 9$.

B ——— $\frac{36}{9} = 4$

5 L/min.

∴ it is $\frac{36}{5} = 7.2$ hrs.

9.

A full time to fill the tank 4 hr.

After half the tank is filled.

A takes 2 hr. for half.

A will take another 2 hrs to fill the tank.

After half filling half the tank, Three pipes are open.

$A + 3A = 4A$

A —— 2 hrs.

$\times 4$ | $\div 4$

$4A$ —— $\frac{2}{4_2} = \frac{1}{2} = 0.5$

$2 + 0.5 = 2.5$.

10. A can fill the tank = 2 hrs.

because of leak

it takes = $2\frac{1}{2}$ hrs. $\frac{1}{2}$.

$= 2.5$ hrs.

because of the leak it takes $\frac{1}{2}$ hours more to fill the tank

L.C.M of 2 and 2.5 = 10.

2 = 2, 4, 6, 8, 10.

2.5 = 5.0, 7.5, 10.

Pump = $\frac{100}{2} = 50$

Leak = $50 - 10$

$= 40$ ∴ Total time = $\frac{100}{10}$ 10 hrs.

Pump + Leak = $\frac{100}{2.5} = 40$.

11.

L.C.M of 6, 2, 7 = 42 L.

A + B + C ——— 6 hrs.

After two hours C is closed.

A + B ——— 7 hrs remaining part

C alone will take ?

A + B + C ——— 42 Lt.

A + B + C ——— $\frac{42}{6}$ 7 Lt/hr. —— (1)

In 2 hours 14 Ltrs gets filled.

C is closed, A and B can fill it in 42 − 14 = 28.

$A + B = \frac{42-14}{7} = \frac{28}{7} = 4$ L/hr —— (2)

C can fill = Eq. 1 — Eq. 2.

= 7 − 4

= 3 L/hr

C alone will take = $\frac{42}{3}$

= 14

12.

Fast pipe = 3 times slow time.

Fast + Slow pipe = 16 hours.

|

3 Slow + Slow = 16

4 Slow = 16.

÷ 4 × 4

1 Slow pipe = 64 min.

(Or)

Let Slow = 1 lt/min.

Fast = 3 lt/min.

4 lt/min.

They fill the tank together = 16 hr.

∴ Capacity of the tank = 16 × 4

= 64 lt.

Slow pipe will take = $\frac{64}{1}$ = 64 min.

Fast pipe will take = $\frac{64}{3}$?

Home Assignment No. 12.

17.

A + B ——— 4 days.

B + C ——— 5 days.

C + A ——— 7 days.

B will take minimum no. of days.

14.

Anil = 2 Sunil

Anil + Sunil = 7 days

2 Sunil + Sunil = 7.

3 Sunil = 7.

| ÷3 | ×3

Sunil 21 days

Anil is twice Sunil.

$\frac{21}{2}$ = 10.5 days.

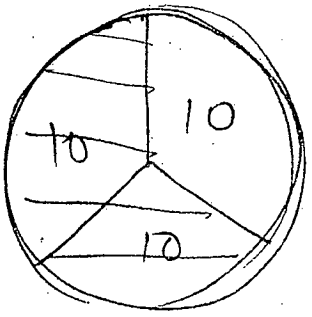
Sunil will take = $\frac{21}{1}$

= 21 days

9. A + B ——— 30 days.

A+B can complete the work —— 20 days.

B left, A finishes the remaining work —— 20 days.



2/3 in total. $\frac{1}{3}$ left.

A = $\frac{1}{3}$ —— 20 days.

$1 = \frac{20 \times 3}{1}$

A alone will take = 60 days.

Class Test.

1. A : B

= $1 - \frac{1}{3}$: B

= $\frac{2}{3} : \frac{1}{1}$

Eff. = 2 : 3

Time 3x : 2x

$3x = 12$

$x = \frac{12}{3}$

24.

$2x = 4$

$x = 4 \times 2 = 8$.

2. Ram : Shyam

100% : 100 + 25

= 125%.

100% : 125%.

Eff. 4 : 5

Time. 5x : 4x.

30	

$5x = 30$

$x \frac{30}{5} = 6.$

$4x = 6$

$x = 6 \times 4$

$= 24.$

3. Arun : Ganesh

Eff. 100+10% : 100%

$\frac{110}{100}$: $\frac{100}{10}$ %.

Eff. 11 : 10

Time 10x : 11x

$A = 10$

$Q = 11$

$$A = \frac{110}{10} = 11$$

$$Q = \frac{110}{11} = \frac{10}{21}$$

$\therefore$ 9+ is $\frac{110}{21}$

4.

	A	:	B
T	12	:	8
Time	4	:	2

8. 30 W — 15 days 20 ch — 30 days.

÷2 | ×2

15W — 30 days

Eff = 15W = 20ch.

15W + 20C =

|

15W + 15W

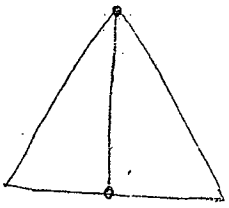
30W = 15 days.

LINE GRAPH

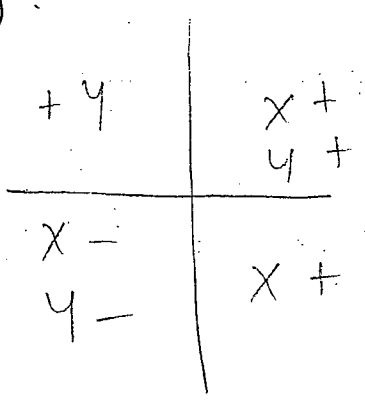
Mean - It is like average.

Mode - Max. representation
Max. repetation
Max. frequency

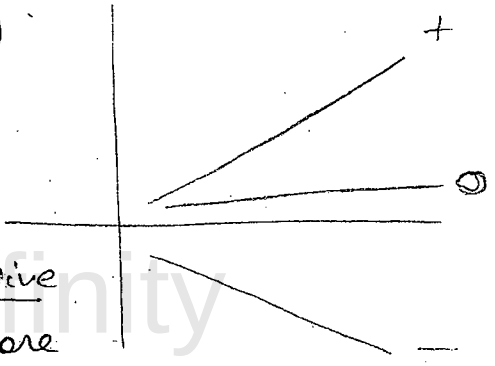
Median - bisects opposite side into two equal parts. In data interpretation it will divide the data.



(1)



(2)

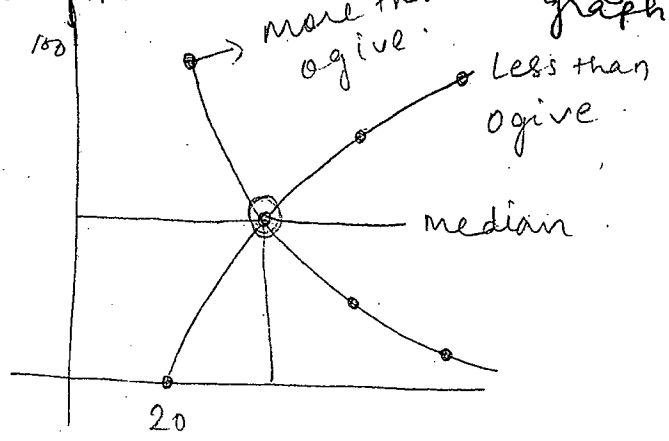


Less than Ogive

A curve less than cumulative frequency, have positive slope graph.

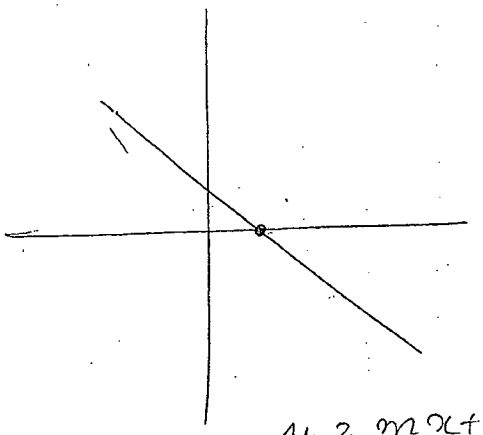
More than Ogive

A curve more than cumulative frequency, having negative slope graph.



$y \propto x \rightarrow y = mx + c$ m – Slope C - Constant

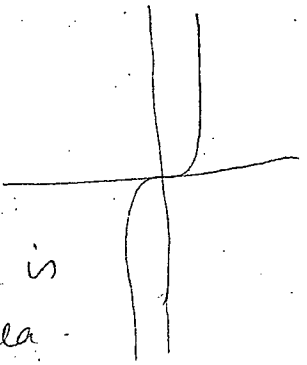
A straight line graph is always directly proportional, no matter value of (m) is −, + or 0 or the slope of graph is +ve, −ve or 0.

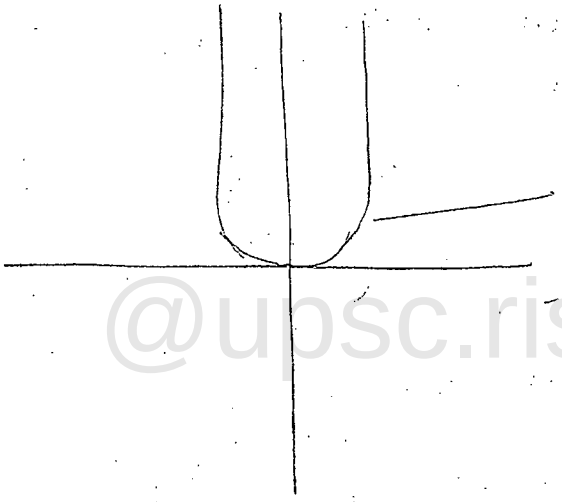


$y = mx + c$.

But the slope is −ve

$y = mx + c$.

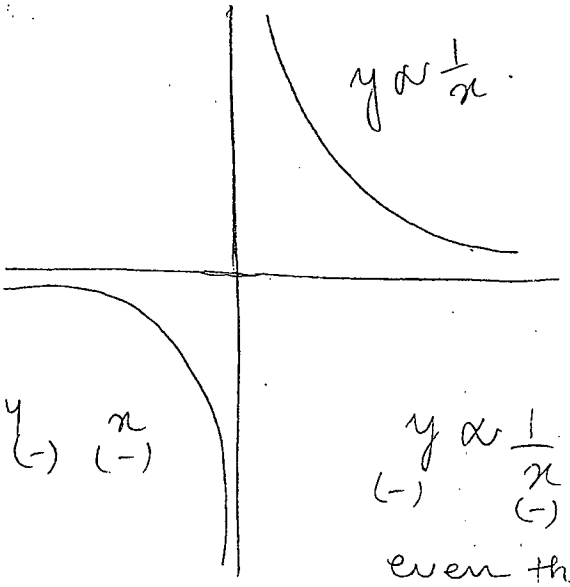




This graph is hyperbola.

U-Shaped

1 m	80 Days
10 m	40 Days
20 m	20 D.
40 m	10 D.
80 m	5 Days



$y \propto \frac{1}{x}$.

y (−) x (−)

$y \propto \frac{1}{x}$.

(−) (−)

even though.

−ve inversely proportional.

NUMBER RANKING

$R_S + R_L = T_N + 1$

$R_T + R_B = T_N + 1$

$R_L + R_R = T_N + 1$

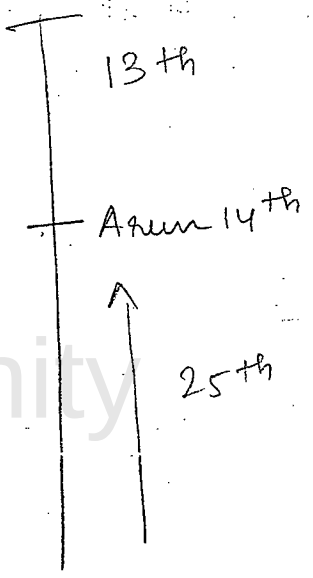
1. $R_T + R_B = T_N + 1$

$14^{th} + 26^{th} = x + 1$

$40 = x + 1$

$40 - 1 = x$

$x = 39$



$= 13 + 25 = 28 + 1$

Arun

2. $R_L + R_R = T_N + 1$

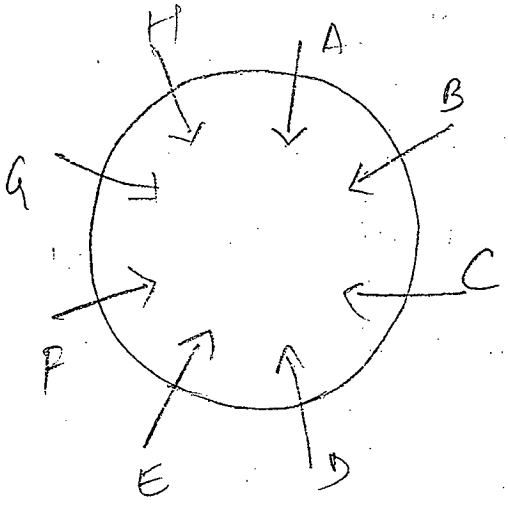
$x + 7^{th} = 50 + 1$

$x + 7 = 51$

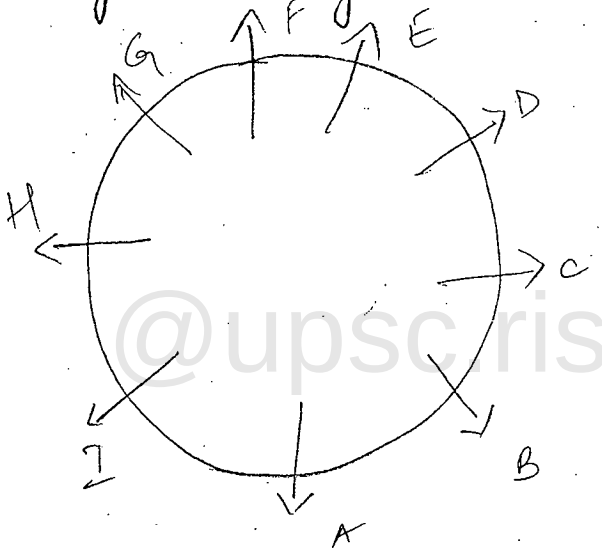
$x = 51 - 7$

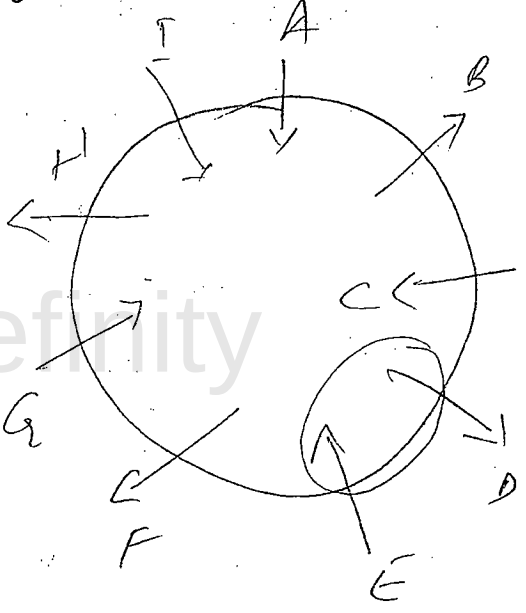
$= 44^{th}$

1. Linear Arrangement
2. Circular "
3. Polygon "



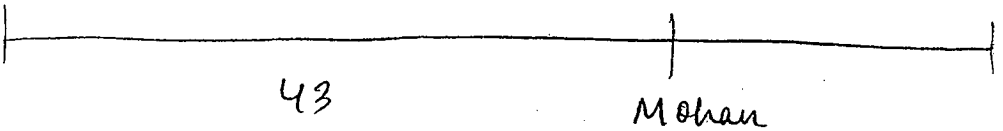
Make yourself part of the question and your right is right and left is left.





Both right to each other.

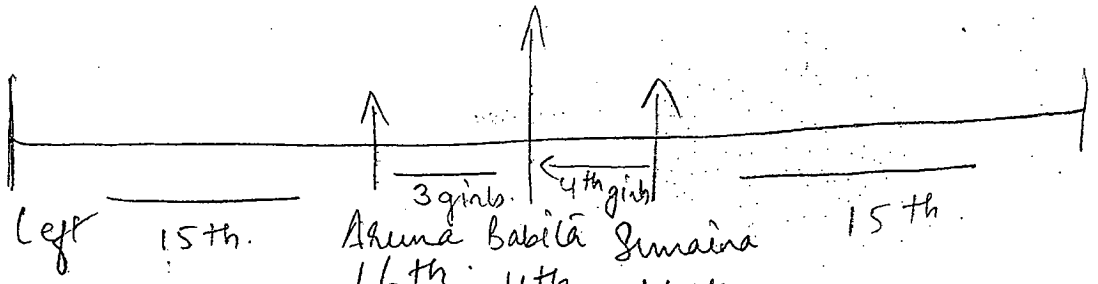
2.



7th

= 44th.

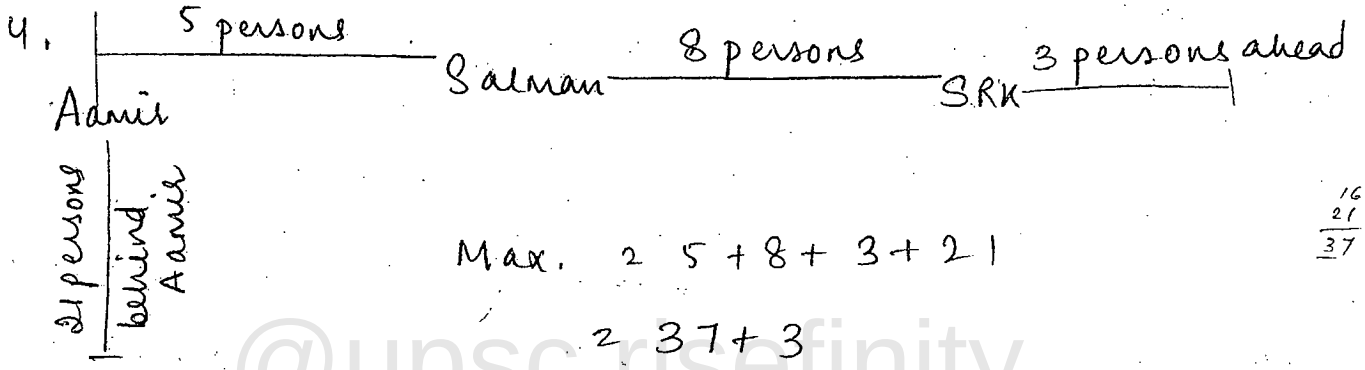
3.



$15 + 15 + 3 + 4 + \text{Aruna} + \text{Babita} + \text{Sumaina}$

$= 40$

4.

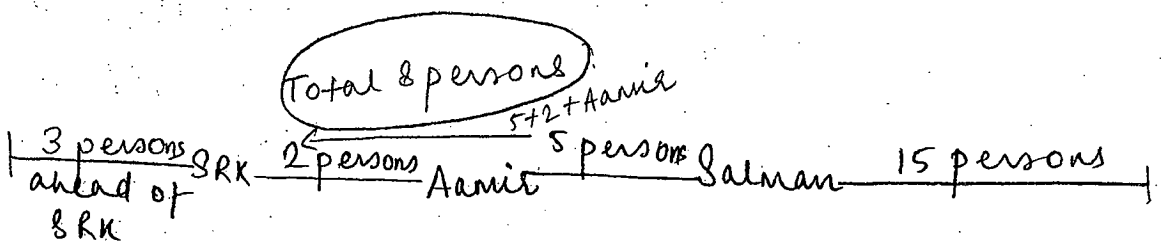


16
21
37

Max. $= 5 + 8 + 3 + 21$

$= 37 + 3$

$= 40$



3 SRK 2 Aamir 5 Sal 15 = 28. Min.

How to detect prime number?

1. $\sqrt{97}$

Step 1: $9^2 = 81$

$\sqrt{97} = 9.....$

$10^2 = 100$.

Take < 10.

2. $\sqrt{141}$

$= < 12$.

3. $\sqrt{241}$

$= < 16$.

1. $\sqrt{97}$

Step 2: Prime number less than 10,

2, 3, 5, 7

Step 3: $\frac{97}{2}, \frac{97}{3}, \frac{97}{5}, \frac{97}{7}$.

2. $\sqrt{141}$

< 12

Prime no. less than 12,

2, 3, 5, 7, 11

$\frac{141}{2}, \frac{141}{3}, \frac{141}{5}, \frac{141}{7}, \frac{141}{11}$

141 is a composite number because it is divisible by 3.

3. $\sqrt{241}$

< 16

Prime no. less than 16

2, 3, 5, 7, 11, 13

$\frac{241}{2}, \frac{241}{3}, \frac{241}{5}, \frac{241}{7}, \frac{241}{11}, \frac{241}{13}$

$\sqrt{131}$ < 12

2, 3, 5, 7, 11

Prime number

$\sqrt{161}$ < 13

2, 3, 5, 7, 11

$\frac{161}{7} = 23$.

Composite number

$\sqrt{251}$ < 16

2, 3, 5, 7, 11, 13

Prime number.

11 × 11 = 121

13 × 13 = 169

Extra Questions :

1. Check through options.

Multiple of 5 it has to be.

First condition Remainder : 1 / 2, 3, 4.

Second " " : 0.

Ans : 25

4. 6.4 ——— 8

milkman = i) 6 ——— 8

ii) 1l ——— 800 M

iii) M ——— M+W.

Profit = 37.5%

Profit here is because of

high price + water

C.P

i) 10lt × 6.4 = 64

10lt + 1l water = 11 l

milk

$\frac{P}{C.P} = \frac{M}{W}$.

S.P.

$11 \times 8 = 88$

88
64
4

$$P\% = \frac{SP - C.P}{C.P} = \frac{88-64}{64}$$

$$= \frac{24}{64}\ 3 = 37.5\%$$

8

* Check through the options.

5.

C.P	+	Profit	=	S.P.
x		25%		$x + 25\%$ of x
		25% of x		$x + \frac{25}{100} \times x$
		$= .25x$		$= 1.25x$ $= x + .25x$

-10%

$2.9x$ — 33.33% — $1.25x - 4$

Through options:-

i) $20 = 20 + 5 = 25$

$\times$ -10%

$-2 = -4$

C.P

18 —— 21

$= 16.66\%$

ii) 80 + 20 = 100

25% of 80

$\frac{25}{100} \times 80 = 20$

$\frac{10}{100} \times 80$

-10% of $80 = 2$ $\quad -4$

-8

72 ——— 96

$\frac{S.P - C.P}{C.P} = \frac{96-72}{72}$

$= \frac{24}{72} \times 100 = 33.33\%$.

6. $P \times x = 180$ ——— (1).

-10%

$P' \times (x+1) = 180$ ——— (2).

i) $18 \times \frac{10}{} = 180$.

-10%

-1.80

$16.20 \times x = 180$ ✗

$x = \frac{180}{16.2} =$

ii) 20×9 ——— 180.

-2 +1 dozen extra

-10%

$18 \times 10 = 180$.

7.

A ——— x

B ——— $x+6$

A+B ——— 4 days

1 day work of A = $\frac{1}{x}$.

1 day work of B = $\frac{1}{x+6}$

Together = $\frac{1}{4}$.

$\therefore$, $\frac{x+6+x}{x(x+6)} = \frac{1}{4}$.

$\frac{2x+6}{x^2+6x} = \frac{1}{4}$.

$= 8x+24 = x^2+6x$

$x^2-2x-24 = 0$.

(Or) $x(x+6)$ unit

A $\frac{x(x+6)}{x} = x+6$

B $\frac{x(x+6)}{(x+6)} = \frac{x}{2x+x}$

A+B $\frac{x(x+6)}{}$

(or) Through options:

A = 10 days.
B = 16 days.

L.C.M of 10, 16

2 | 80

$A = \frac{80}{10} = 8$

$B = \frac{80}{16} = 5$

$8 + 5 = 13$

ii) A = 6 days
B = 12 days

L.C.M of 6 & 12 = 12

$A = \frac{12}{6} = 2$

$B = \frac{12}{12} = 1$

$2 + 1 = 3$

$\frac{12}{3} = 4$

A + B = 4 days ✓

8. Let, Hari chand = 1 chair/day. H = x.

Gopi chand = 3 chair/day G = 3x.

Dhuni chand = 6 chair/day. D = 2x.

10 chair/day.

Together they take = 9 days.

$\therefore$ $10 \times 9 = 90$.

$H.C = \frac{90}{1} = 90$ days.

$G.C = \frac{90}{3} = 30$ days.

$D.C = \frac{90}{6} = 15$ days.

9. $8\overline{)y(x}$ $\quad \frac{y}{8} = \frac{8x+3}{8}$

3 $\quad y^2 = (8x+3)^2$

$\frac{y^2}{8} = \frac{64x^2 + 48x + 9}{8}$ ← leaves a remainder (1)

Or) $\frac{11}{8}$ = Remainder = 3.

$\frac{11^2}{8} = \frac{121}{8}$ R = 1.

(or) $y = 8x + R - 3$.

If $R = 3$.

$$R^2 = 3^2$$

$$= 9.$$

$$\therefore \frac{9}{8} = R = 1$$

A number when divided by 7 leaves a Remainder 2, when the cube of the number is divided by 7, find the Remainder ?

$R = 2$.

$$R^3 = 2^3$$

$$= \frac{8}{7} = R = 1.$$

* amitgarg.maths@gmail.com.

PROGRESSION

ARITHMETIC PROGRESSION

A series having common difference. like,

2, 4, 6, 8, 10, 12.

$= 4-2 = 6-4 = 8-6$.

Common Difference = 2nd Term − 1st Term = 3rd Term − 2nd Term.

a (first term) $\quad a+d$ (second term) $\quad a+2d$ (third term) $\quad \ldots\ldots\ldots\ldots \quad a+(n-1)d$ (n^{th} term)

$t_n = a+(n-1)d$

where $t_n = n^{th}$ term

a = first term

d = cd

n = nos. of terms

1. 3, 5, 7, 9 ..... upto 10^{th} term.

Here, $a = 3$

c.d $= 5-3 = 2$.

$n = 10$

$t_n = a+(n-1)d$

$= 3+(10-1)2$

$= 3+9\times 2$

$= 21$

3. 10 th term = 41

18 th term = 73.

$t_{10} = a + (10-1)d$

$= a + 9d$

$t_{18} = a + (18-1)d$

$a + 17d = 73$ —— (i)

$a + 9d = 41$ —— (ii)

(-) (-) (-)

$8d = 32$

$d = 4$

Substituting value of d in equation ..... (i).

$a + 17 \times 4 = 73$

$a + 68 = 73$

$a = 73 - 68$

$= 5$.

5, 9, 13, 17 .....

$$\text{Average} = \frac{\text{Sum of all terms}}{\text{Total nos. of terms}}$$

Sum of all terms = average × total nos. of terms

$$= \frac{(1\text{st term} + \text{last term})}{2}$$

eg. 2, (4), 6 $= 4 \times 3 = 12$

$= \frac{2+6}{2} = \frac{8}{2} = 4$.

2, 4, 6, 8 ... = 5 × 4

= 20.

$\frac{2+8}{2} = \frac{10}{2} = 5$

$S_n = (a) + (a+d) + (a+2d) + (a+3d) \ldots\ldots (a+(n-1)d)$

$= \left(\frac{a+a+(n-1)d}{2}\right) \times n$

$S_n = \frac{n}{2}\left[2a + (n-1)d\right]$

10. Natural numbers between 300 to 500 which are multiples of 7

↳ Instead of 300, it had to be 301 which is perfectly divisible by 7.

↳ Instead of 500, it had to be 500 − 7 which is perfectly divisible by 7.


```
   43
7)300(
  28
  20
  21
```

```
   7
7)500(
  49
  10
```

301, 308, 315 497

$a = 301$ c.d $= 7$ $t_n = 497$

$t_n = a + (n-1)d$

$497 = 301 + (n-1)7$

$196 = (n-1)7$

$n-1 = \frac{196}{7} = 28$

$n = 28 + 1$

$= 29.$

or, Nos. of terms $= \left(\frac{\text{last term} - \text{first term}}{\text{c.d}} + 1\right)$

$\frac{497 - 301}{7} + 1$

$= 28 + 1$

$= 29.$

13. 100 and 500 divisible by 3.

$3\overline{)100}$ (3, 9, 10)

102, 105, 108 ..... 498.

$t_n = a + (n-1)d$.

$498 = 102 + (n-1)3$

$396 = (n-1)3$

$n - 1 = \frac{396}{3} = 132$.

$n = 132 + 1$

$= 133$.

$S_n = \frac{n}{2}[2a + (n-1)d]$.

$S_n = \frac{133}{2}[2 \times 102 + 132 \times 3]$

$= \frac{133}{2}[204 + 396]$

$= \frac{133}{2}[600]$

$= 133 \times 300$

$= 39,900$.

(Or),

$102 + 105 + 108 \ldots\ldots\ldots 498$.

Sum = average × total nos. of terms

$\left(\frac{a+l}{2}\right)\left(\frac{l-a}{d} + 1\right)$

$\left(\frac{102+498}{2}\right)\left(\frac{498-102}{3} + 1\right)$

300×133

$= 39,900$.

C. A. 2, 4, 5, 6, 7, 20

C. T. 4, 5, 7, 8, 9, 10.

5 workers were engaged to finish a work in certain no. of days. 1 worker dropped out on second day, 1 more worker dropped out on third day and so on. It took 2 more days to finish the work. Find the no. of days in which the work was completed?

5 workers ——— x no. of days.

$\therefore$ 5x.

$5+4+3 \ldots\ldots = 5x$.

$a = 5$ c.d $= 1$ $n = (x+2)$ days

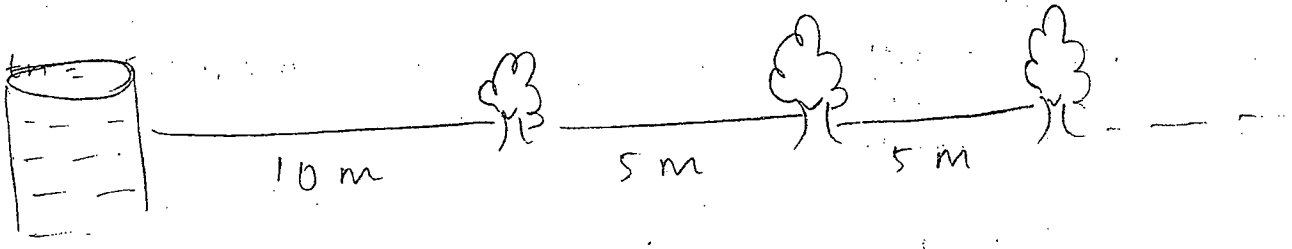
$$\frac{x+2}{2}\left[10+(x+2-1)(-1)\right] = 5x$$

$$(x+2)(10-x-1) = 10x$$

$$(x+2)(9-x) = 10x.$$

$$x = 3.$$

8.



$10 + (10+15) + (15+20) + (20+25) \ldots\ldots$ upto 25 trees

$= 10 + [25+35+45+ \ldots\ldots$ upto 25 trees$]$

$= 10 + [25+35+45+ \ldots\ldots$ 24 trees$]$.

↓

leaving out the first tree.

$$10 + \left[\frac{24}{2}\left[50 + 23 \times 10\right]\right] = 10 + 12 \times 280$$

$$= 10 + 3360$$

$$= 3370 \text{ mts.}$$

(Or) $(20 + 30 + 40 + 50 + \ldots\ldots\ldots \text{ upto 25 trees}) - 130$

$$\frac{25}{2}\left[40 + 24 \times 10\right] - 130$$

$$\frac{25}{\cancel{2}}\left[\overset{140}{\cancel{280}}\right] - 130$$

$$= 3700 - 130$$

$$= 3370.$$

GEOMETRIC PROGRESSION

In Geometric Proportion we have ratio common.

2, 4, 8, 16, 32, 64, 128

$$\frac{4}{2} = \frac{8}{4} = \frac{16}{8} = \frac{32}{16} = \frac{64}{32} = \frac{128}{64} = 2.$$

first term $= a$

2nd term $= a \times r = ar^1$

3rd term $= a \times r \times r = ar^2$

4th term $= a \times r \times r \times r = ar^3$

$\vdots$

n^{th} term $= ar^{n-1}$

$t_n = ar^{n-1}$

example : 3, 9, 27, 81, ... 729

$t_n = ar^{n-1}$

$729 = 3 \times 3^{n-1}$

$729 = 3^n$

$3^6 = 3^n \Rightarrow n = 6.$

$$S_n = \frac{a(r^n - 1)}{r - 1}$$

where $r > 1$

$$S_n = \frac{a(1 - r^n)}{1 - r}$$

where $r < 1$

$$S_\infty = \frac{a}{1 - r}$$ where, $r < 1$

In bases are same and multiplied powers are added $a^x \times a^y = a^{x+y}$

In bases are same and divided powers are subtracted.

9.

1st day = 1 rupee.

2nd day = 2 rupees

3rd day = 4 rupees.

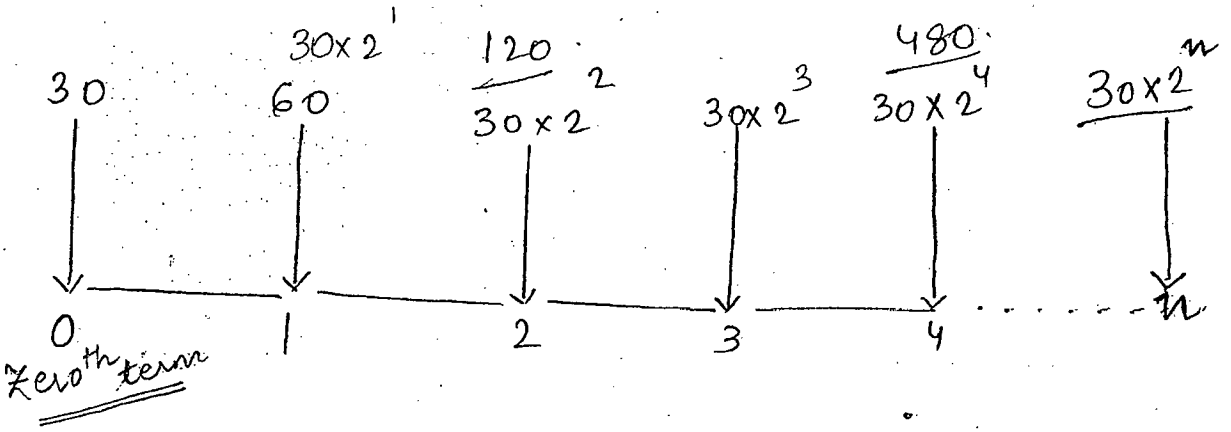
$S_n = 1 + 2 + 4 + \ldots\ldots\ldots\ldots$ upto 20 days.

Here, $a = 1$ $r = 2$ $n = 20$

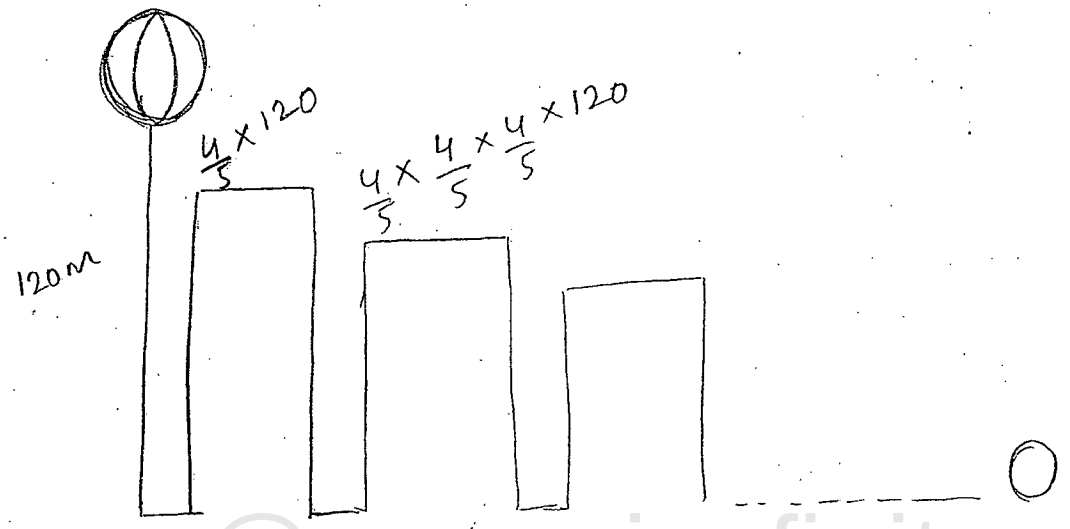
$$S_n = \frac{a(r^n - 1)}{r - 1} = \frac{1(2^{20} - 1)}{2 - 1}$$

$$= 2^{20} - 1$$

16.



21.



Total distance covered by the ball =

$\Rightarrow 120 + 2\times\frac{4}{5}\times 120 + 2\times\frac{4}{5}\times\frac{4}{5}\times 120 + 2\times\frac{4}{5}\times\frac{4}{5}\times\frac{4}{5}\times 120 + \ldots\ldots O$

$= 120 + 2\times\frac{4}{8}\times\overset{24}{\cancel{120}}\left(1+\frac{4}{5}+\left(\frac{4}{5}\right)^2+\ldots\ldots O\right)$

$= 120 + 192\left(\frac{1}{1-4/5}\right) \quad \therefore \left(S_\infty = \frac{a}{1-r}\right)$

$= 120 + 192\times 5 = 120 + 960$

$= 1080\ m.$

(or)

$120 \overset{\times}{\div} 4/5$

$= 120 \times 4 \div 5$

$= 120 \times 9 = 1080\ m$

After striking the floor, a certain ball 3/4 of its height from which it has fallen. Find the total distance that it travels before coming to rest if it is gently dropped from a height of 130 M.

$= 130 + 2 \times \frac{3}{5} \times 130 + 2 \times \frac{3}{4} \times \frac{3}{5} \times 130 + 2 \times \frac{3}{5} \times \frac{3}{5} \times \frac{3}{5} \times 130 \ldots \ldots 0$

$= 130 + 2 \times \frac{3}{5} \times 130 \; ($

$130 \times 7 = 910$

$130 \times \frac{3}{4}(3+4)$

$= 130 \times 7 = 910$ Mts.

$130 + 2 \times \frac{3}{4} \times 130 + 2 \times \frac{3}{4} \times \frac{3}{4} \times 130 + 2 \times \frac{3}{4} \times \frac{3}{4} \times \frac{3}{4} \times 130 \ldots \ldots 0$

$= 130 + 2 \times \frac{3}{4} \times 130 \left(1 + \frac{3}{4} + \left(\frac{3}{4}\right)^2 \ldots \ldots 0\right)$

$= 130 + 195 \left(\frac{1}{1 - 3/4}\right) \quad \therefore \left(S_\infty = \frac{a}{1-r}\right)$

$65 \times 3 = 195$; $195 \times 4 = 780$; $780 + 130 = 910$

$= 130 + 195 \times 4 =$

$130 + 780$

$= 910$ Mts.

VENN-DIAGRAM

32) 2 50 (224 — 26.

32 | 9 | 224

{ = universal set =

$n(A \cup B) + n(A \cup B)'$

$n(A)$ = nos. of elements in Set A

$n(B)$ = nos. of elements in Set B

$n(A \cap B)$ = nos. of elements in Set A and Set B

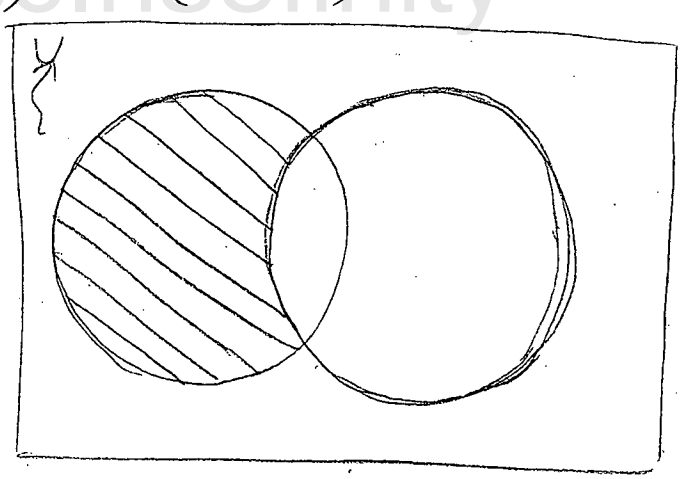
$n(A \cup B)$ = nos. of elements in either Set A or Set B.

$n(A \cup B)'$ = nos. of elements in neither Set A nor in Set B.

$n(A)$ only = $n(A) - n(A \cap B)$

$n(B)$ only = $n(B) - n(A \cap B)$

{



$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

1. {

= 1000

$n(E) = 700$ $n(H) = 500$

$n(E \cup H) = 1000$

$= n(E \cup H) = n(E) + n(H) - n(E \cap H)$

$1000 = 700 + 500 - n(E \cap H)$

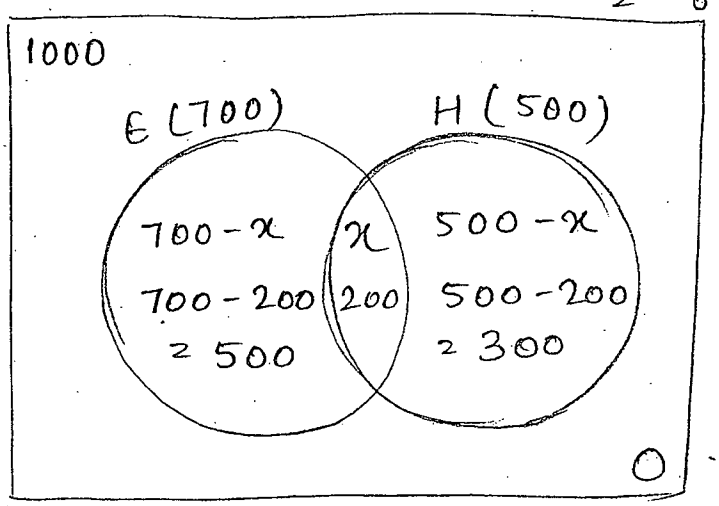
$n(E \cap H) = 1200 - 1000$

$= 200$

exactly one language $= n(E \cup H) - n(E \cap H)$

$= 1000 - 200$

$= 800$



$700 - x + x + 500 - x = 1000$

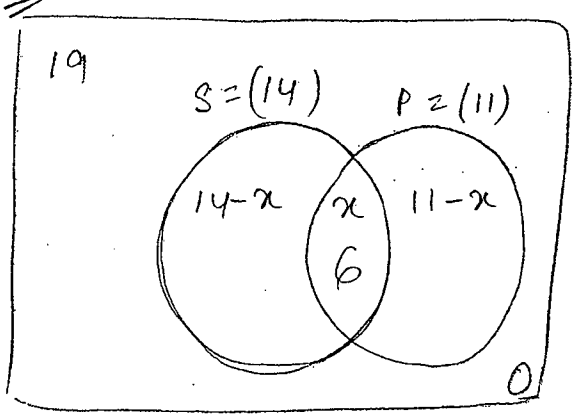
$1200 - x = 1000$

$x = 200$

exactly one language $= 500 + 300$

$= 800.$

7.



$14 - x + x + 11 - x = 19$

$25 - x = 19.$

$x = 6.$

7, 6, 3, 4, 5, 14-18

14
-6

6. Students = 50.

Speak English & Hindi = 10.

who can speak English = 21

Only English = 21 − 10

= 11

Speak hindi = 50 − 11

= 39

Speak only hindi = 39 − 10

= 29.

3. ~~60% passed in Maths~~

= ~~180 students~~.

~~70% passed in English~~

= ~~210 students~~.

~~10% failed in both~~ = ~~30 students~~.

~~Total~~ = ~~300~~.

$\frac{60}{100} \times 300$

180.

$\frac{70}{100} \times 300$

210

$\frac{10}{100} \times 300$

30.

180
210
210
−180
30.

3. Total = 100%.

60% + 70% = 130%.

Excess = 30%.

$\frac{30}{300} \times \frac{300 \times 100}{30}$

= 1000

$300 \times \frac{100}{300}$

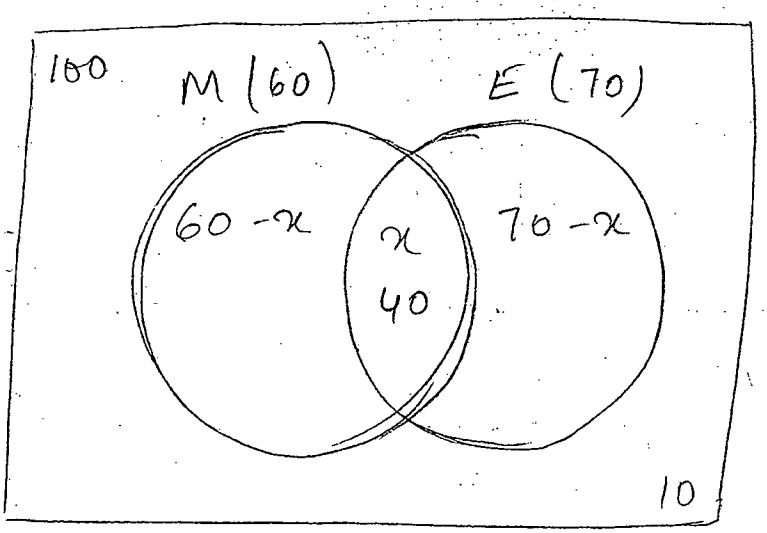
$30 \times \frac{10}{300} \times 100$

$= 1000$

10% fail = 1000 - 10

= 900.

3.



$60 - x + x + 70 - x + 10 = 100$

$140 - x = 100$

$x = 40$

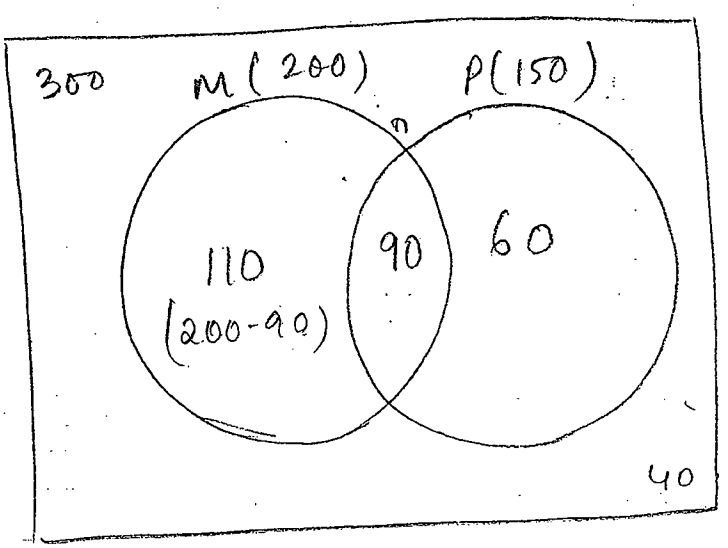
2 150

~~4ϕ~~ N = ~~300~~

~~5L0ϕ~~

N = 750.

4.



300 - 260

= 40.

110

~~+ 90~~

+ 60

260

5.

Total = 85 — 100 − 15 = 85

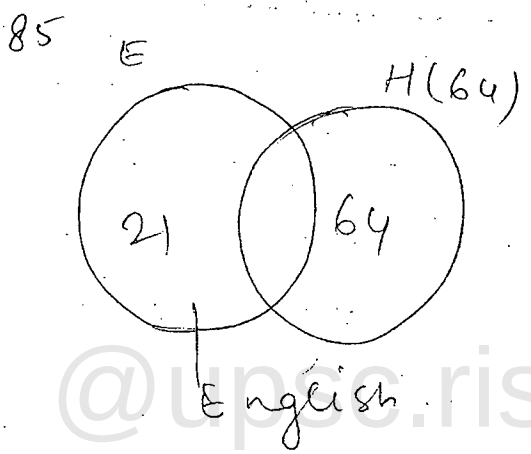
Remaining = 64

85 − 64

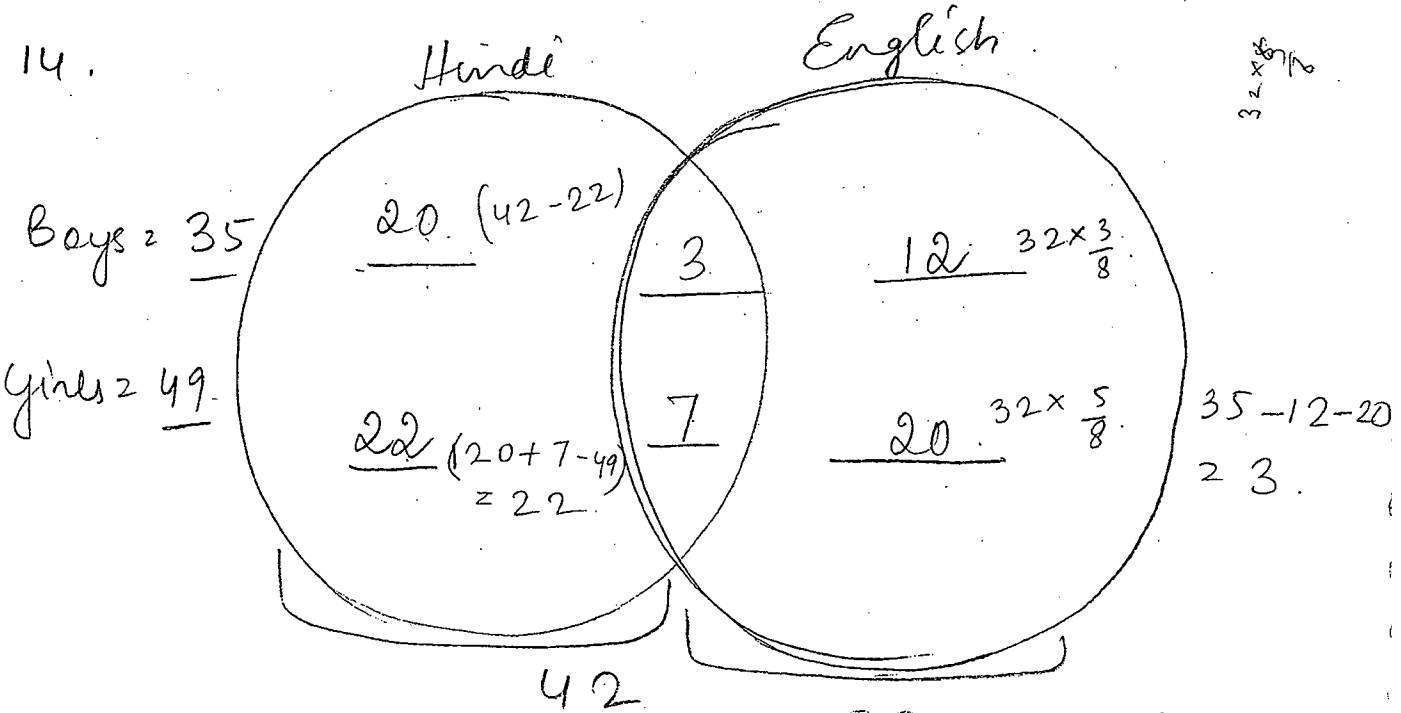
= 21 only in english.

$\frac{21N}{100} = 630$

$N = 3000.$



14.



$21x \quad 16x \qquad 32$

$3y + 5y = 32$

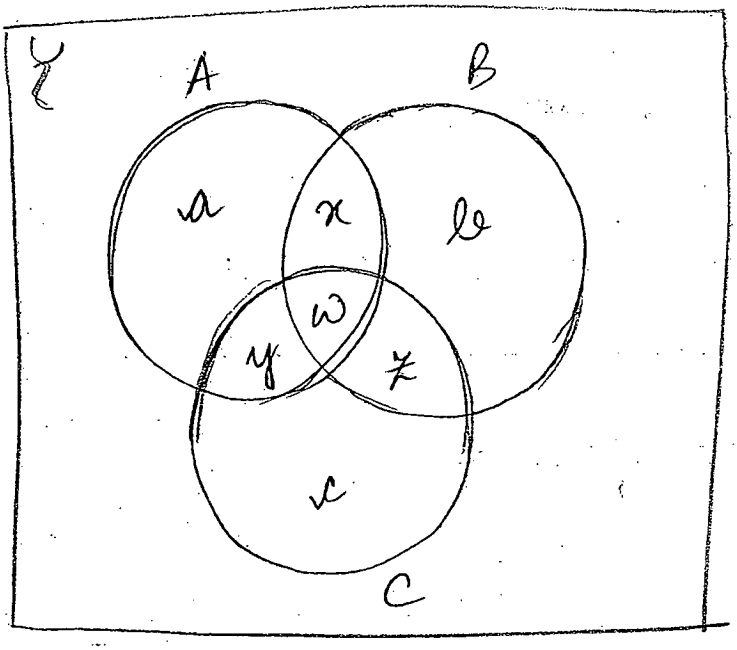
$8y = 32$

$y = 4$

$21x = 42$

$x = 2$

$16x = 16 \times 2$



$a+b+c+x+y+z+w \Rightarrow$ No. of items in atleast one of the three sets

↳ No. of items in either set A or set B or set C

$a+b+c$ = Nos. of items in exactly one set

$x+y+z$ = Nos. of items in only two sets

$$n(A \cup B \cup C) = n(A)+n(B)+n(C)-n(A \cap B)-n(B \cap C) - n(C \cap A)+n(A \cap B \cap C)$$

Nos. of items in exactly two sets.

$$= n(A \cap B)+n(A \cap C)+n(B \cap C)-3n(A \cap B \cap C)$$

Nos. of items in atleast two sets.

$$2\,n(A \cap B)+n(A \cap C)+n(B \cap C)-3n(A \cap B \cap C)+ n(A \cap B \cap C)$$

$$2\,n(A \cap B)+n(A \cap C)+n(B \cap C)-2n(A \cap B \cap C)$$

23.10.12

20. $n(T) = 28$ $n(V) = 30$ $n(G) = 32$

$n(T \cap V) = 6$ $n(V \cap G) = 8$ $n(G \cap T) = 10$

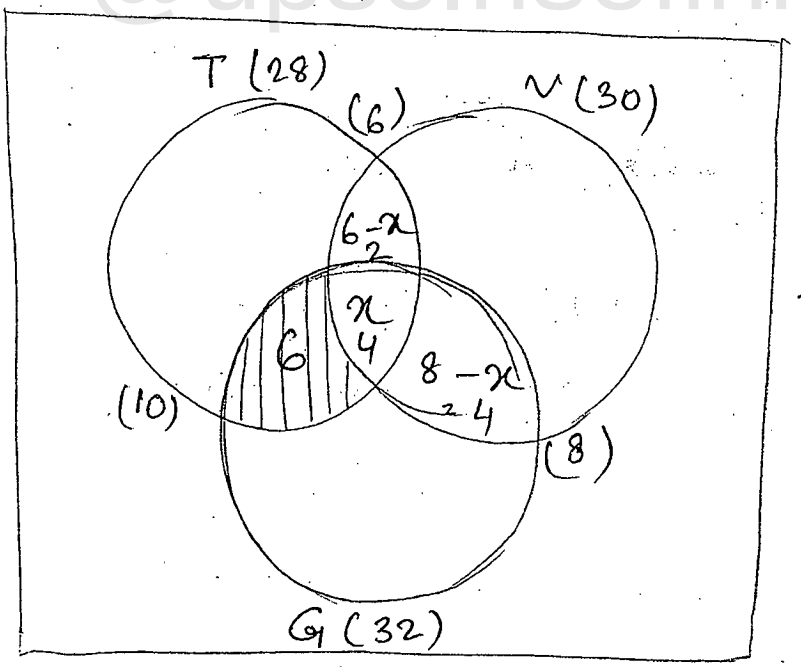
Only one instrument = 54

Only violin = 20

Every student learn atleast one instrument out of the three.

$n(T \cup V \cup G) = n(T) + n(V) + n(G) - n(T \cap V) - n(V \cap G) - n(G \cap T) + n(T \cap V \cap G)$

$28 + 30 + 32 - 6 - 8 - 10 + ?$



only one = 54

Then = 54
+12
+4

70

$6 - x + x + 8 - x = 10$

$14 - x = 10$

$x = 4$.

Q 21. The shaded portion = 6.

9 to 11, 8, 19, 22, 12, 13

Q9.

$m+p+x = 30$

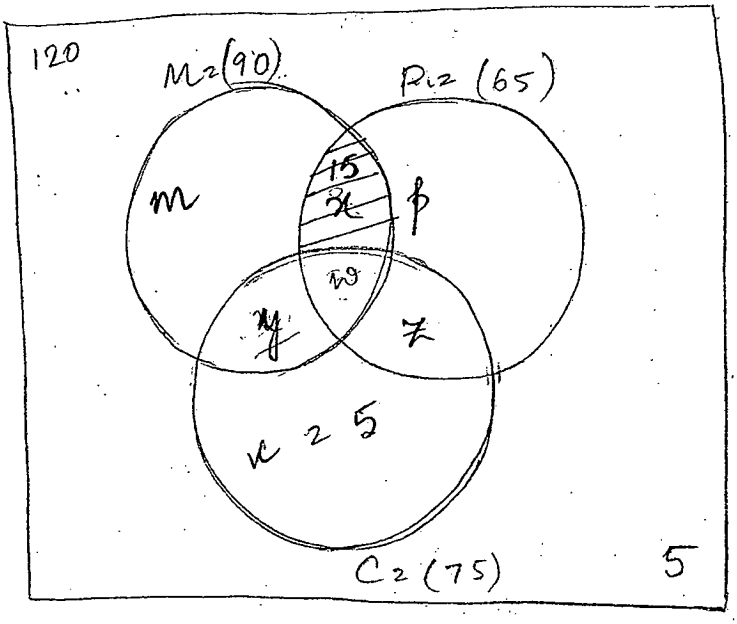
$x+y+z = 55$

$m+p+x+x+y+z+w+5 = 120$

$= 90+w = 120$

$w = 120-90$

$= 30$



Q9.

30 + 55 + 5 = 90

120 − 90 = 30

Ans: 30

Q10. No. of students passed only in one = 30

No. of students passed only in two = 55

∴ No. of students who passed in at least two subjects $= 30+55$

$= 85$

Q11.

$x+y+z+w = 75$

$5+y+z+30 = 75$

$y+z = 75-35$

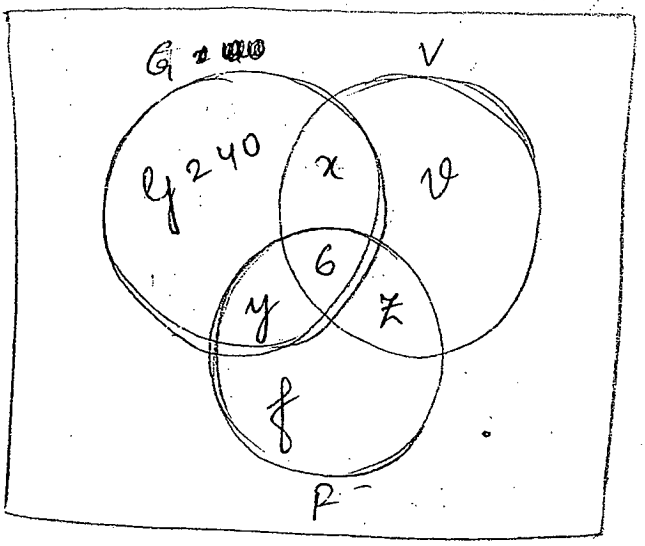
$= 40$

$x+y+z = 55$

$x+40 = 55$

$x = 15$

8.



$\frac{5}{100} \times 120$

Any two and only two, is exactly two

$x + y + z = 30$

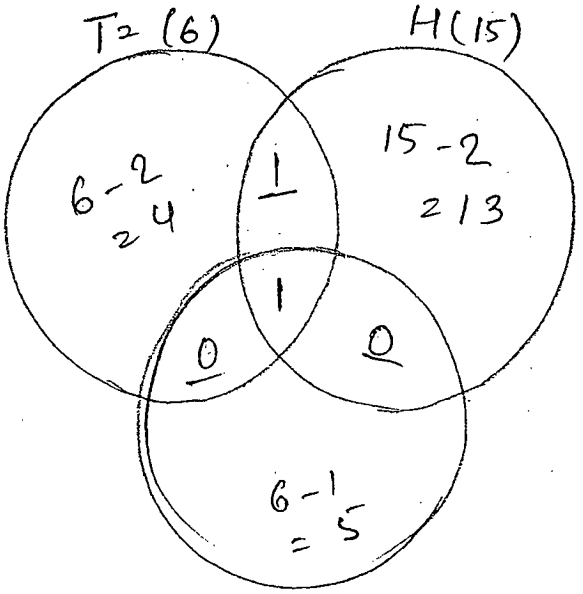
$240 + v + f + x + y + z + 6 = 120$

$240 + v + f + 30 + 6 = 120$

$v + f = 120 - 76$

$= \underline{44}$.

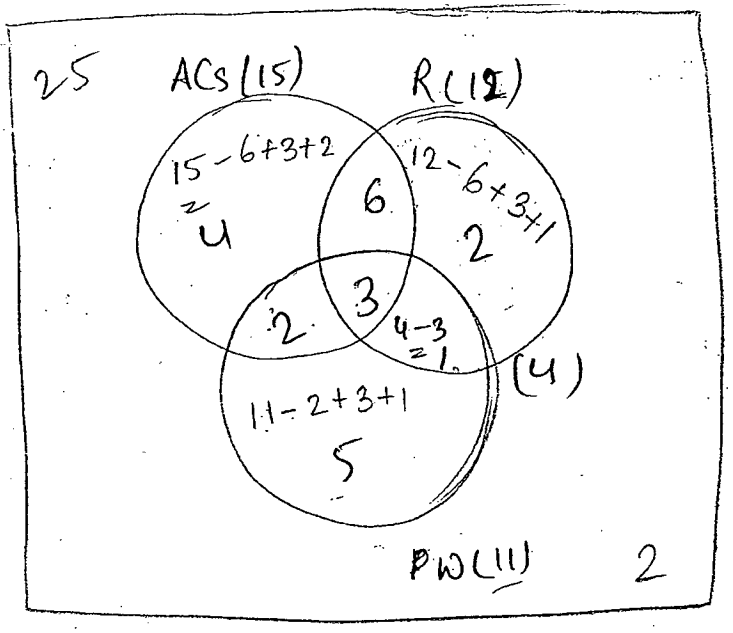
19.



$= 13 + 4 + 5 + 1 + 1$

$= \underline{24}$.

22.



$25 - 6 + 4 + 2 + 2 + 3 + 1 + 5$

$= 25 - 23$

$= 2$

12.

Tea = 52

Coffee = 38

Milk = 10

TQ = 73 - 7

= 66

$100 - 21 = 79 - 66 = 13$ → They consumed two times

(7×3) 13 + 7

They consumed = 20.

All the three

So 7×3.

13. $58 - 3 = 55$ $\quad 3 \times 3 = 9$.

15

$+ 38$

20

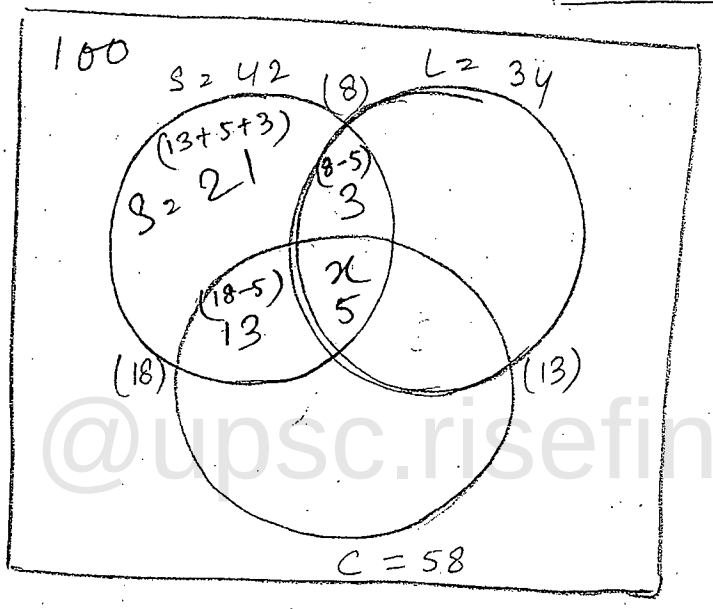
73.

$73 - 9 = 64 - 55$

$= 9$.

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

3.



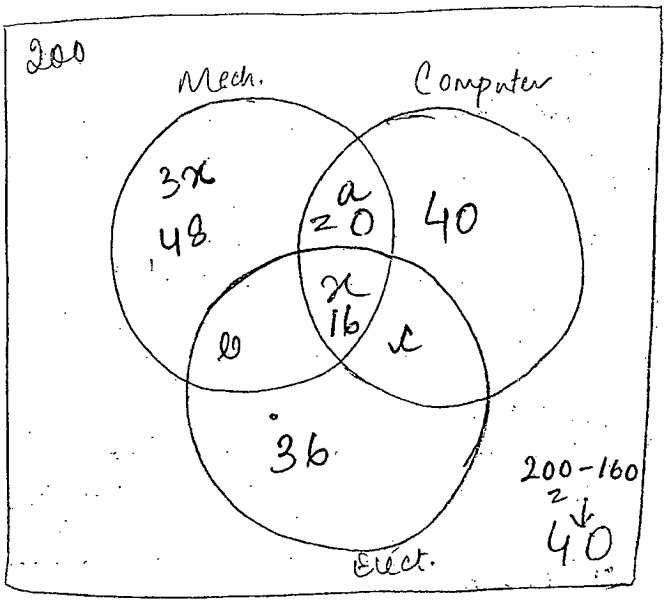
$n(S \cup L \cup C) = n(S) + n(L) + n(C) - n(S \cap L) - n(S \cap C) - n(L \cap C) + n(S \cap L \cap C)$

$100 = 42 + 34 + 58 - 8 - 18 - 13 + x$

$100 = 134 - 39 + x$

$x = 5$.

1



Exactly two = 20.
which is half of
Computer Engineer
= 40.

$$y + \frac{1}{4}y = 200$$

$$\frac{5y}{4} = \cancel{200}^{40}$$

$$y = 160.$$

$$a + b + c = 20.$$

$$3x + x + a + b + c + 40 + 36 = 160$$

$$4x + 20 + 40 + 36 = 160$$

$$4x = 160 - 96 = 64$$

$$x = 16.$$

$$b + c + x$$

$$= 20 + 16 = 36.$$

5. Total Employees = 500

$n(C) = 320$

$n(B) = 230$

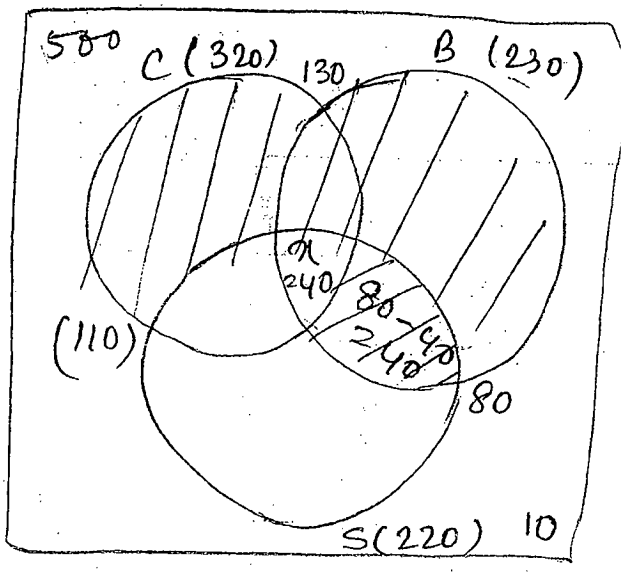
$n(S) = 220$

$n(C \cup B \cup S) = 10$

$n(C \cup B) = 420$

$n(C \cup S) = 430$

$n(B \cup S) = 370$



$n(C \cup B) = n(C) + n(B) - n(C \cap B)$

$420 = 320 + 230 - x \quad (C \cap B)$

$n(C \cap B) = 550 - 420$

$= 130$

$n(C \cup S) = n(C) + n(S) - n(C \cap S)$

$430 = 320 + 220 - n(C \cap S)$

$n(C \cap S) = 540 - 430$

$= 110$

$n(B \cup S) = n(B) + n(S) - n(B \cap S)$

$370 = 230 + 220 - n(B \cap S)$

$n(B \cap S) = 450 - 370$

$= 80$

$490 = 320 + 230 + 220 - 130 - 110 - 80 + x$

$= 490 = 770 - 330 + x$

$490 = 430 + x$

Q5. $x = 40$.

Q6. $500 - 10 = 490 - 220$

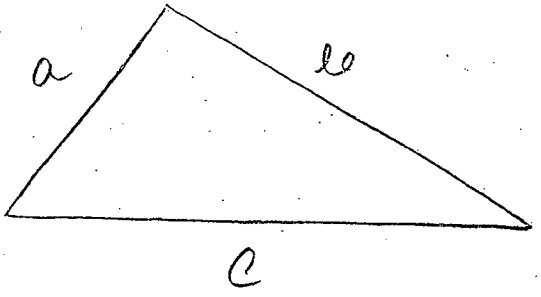
$= 270$.

Q7. $80 - 40$

$= 240$.

MENSURATION AND GEOMETRY

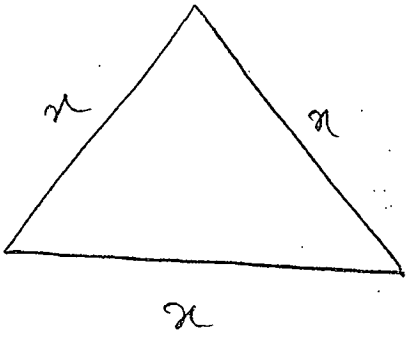
1. Scalene Triangle is called the mother of all triangles.



$$\text{Area} = \sqrt{S(S-a)(S-b)(S-c}$$

where $S = \frac{a+b+c}{2}$

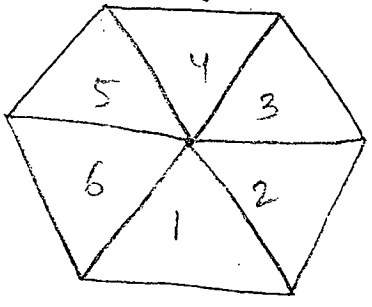
2. Equilateral Triangle → all sides equal.



$$\text{Area} = \sqrt{\frac{3x}{2} \times \frac{3x}{2} \times \frac{3x}{2}}$$

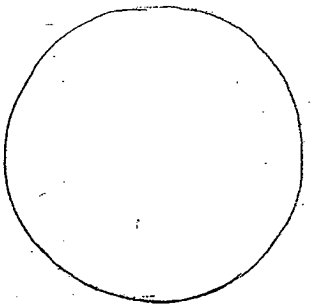
$$= \sqrt{\frac{3x^4}{16}} = \frac{3x^2}{4}$$

3. Regular Hexagon has 6 equilateral triangles.



$$\text{Area} = 6 \times \frac{\sqrt{3}}{4} \times (\text{side})^2$$

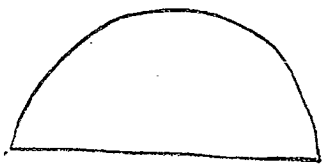
4. Circle



$$\text{Area} = \pi r^2$$

$$C = 2\pi r$$

Semi-circle



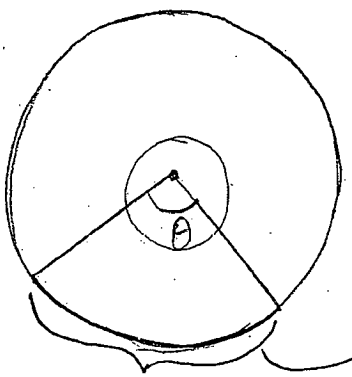
$$\text{Area} = \frac{\pi r^2}{2}$$

$$C = \pi r + 2r.$$

In revolution distance covered $= 2\pi r$

In n revolution distance covered $= 2\pi r n$

$$n = \frac{\text{Total distance covered}}{\text{Circumference}}$$



$$\text{Area} = \frac{\pi r^2 \cdot \theta}{360}$$

$$\text{Length} = \frac{2\pi r \times \theta}{360}$$

$360^\circ \sim 2\pi r$

$\theta^\circ \sim \frac{2\pi r \times \theta}{360}$

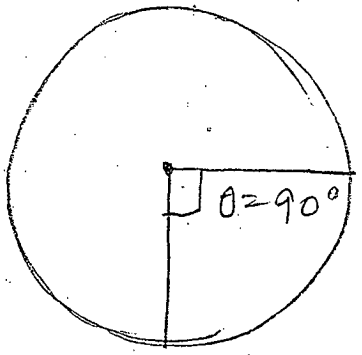
$360^\circ \sim \pi r^2$

$\theta^\circ \sim \frac{\pi r^2 \theta}{360}$

- Median intercepts in the ratio of 2:1
- Perpendicular bisector on the line parallel to which it is formed.

- In equilateral triangle median are equal.

5. Area of 4 Quadrant together = area of circle.

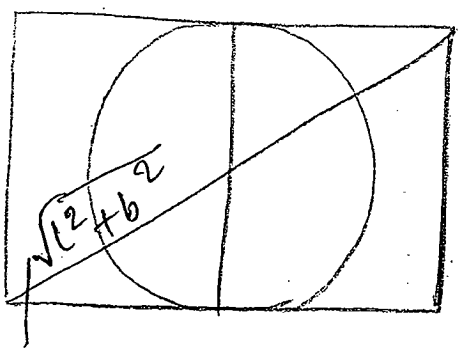


$$\text{Area} = \frac{\pi r^2 90}{360^\circ} = \frac{1}{4}\pi r^2$$

- If a circumcircle is drawn and in circle is drawn in the same triangle then ratio of their radius are 2:1

- If a circumcircle is drawn on a regular hexagon, then radius of the circle is equal to side of a regular hexagon.

- The maximum area of a circle drawn inside a rectangle will have its diameter equal to the shortest side of the rectangle.

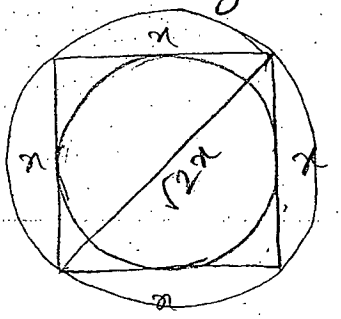


Pythagoras Theorem.

$$A = l \times b$$

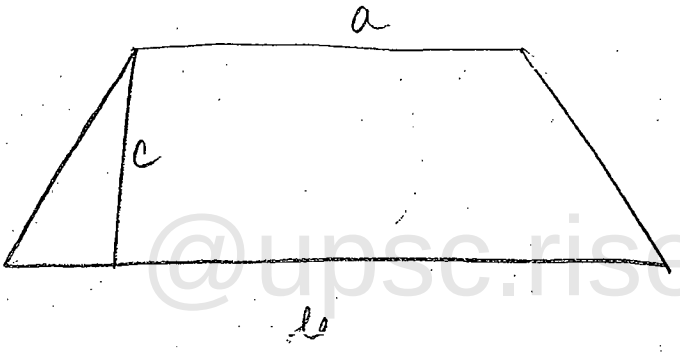
$$P = 2(l+b)$$

- The maximum area of ~~a square~~ a circle drawn inside a square will have its diameter equal to the size of the square

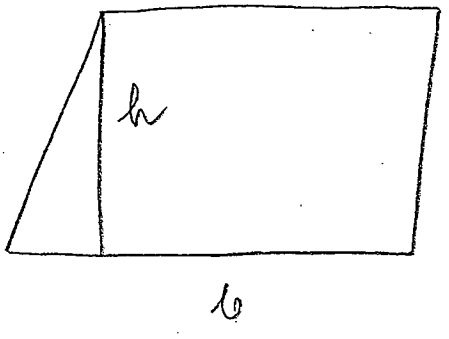


$$A = x \times x = x^2$$
$$P = 2(x+x) = 4x$$
$$d = \frac{\sqrt{x^2+x^2}}{x} = \sqrt{2x^2} = \sqrt{2}x$$

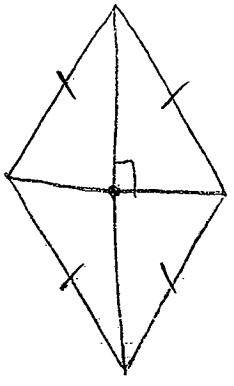
- ~~The~~ If a circumcircle is drawn on a square, then diameter of the circle is equal to diagonal of the square.



$$A = \frac{1}{2}(a+b) \times c$$

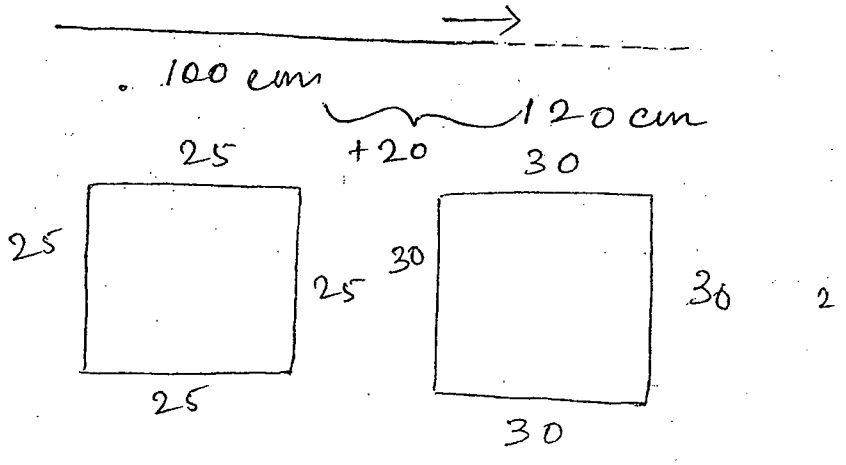


$$A = b \times h$$



$$A = \frac{1}{2} \times \text{Product of dingonals.}$$

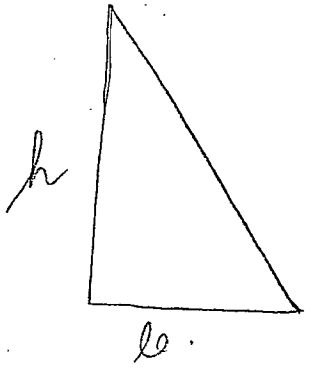
• If there x% change in the size or a radius in any figure, the perimeter or the circumference will also change by x%.



→ All squares are rectangle but are not squares.

O.A = 10×10 = 100

N.A = 12×12 = 144



Area = $\frac{1}{2} \times B \times h$.

↳ Area of 4 walls = $2lh + 2bh$

$= 2h(l+b)$

Area of wall to be painted or papered = A4 walls − A door − Area of windows

Area of paper = Area of 4 walls which is to be papered = Ay walls − Area door − Area of window.

6. Area of wall to be painted = Area of 4 walls − Area of door − Area of window.

$= 2 \times 5 (13+9) - 60$

$= 220 - 60 = 160$

Total cost incurred $= 160 \times 45$

$= ₹ 7200.$

8. Area of paper = Ay walls − Area door − Area of window.

$l \times \frac{50}{100} = 2 \times 3(8+6) - 2 \times 1.5 - 2 \times 1.5 \times 1$

$\frac{l}{2} = 84 - 6 = 78$

$l = 156 \text{ m}$

Total cost incurred $= 156 \times 25$

$= ₹ 3900.$

**Line joining the mid points of two sides of a triangle is parallel to the third side and equal to the half of the third side.

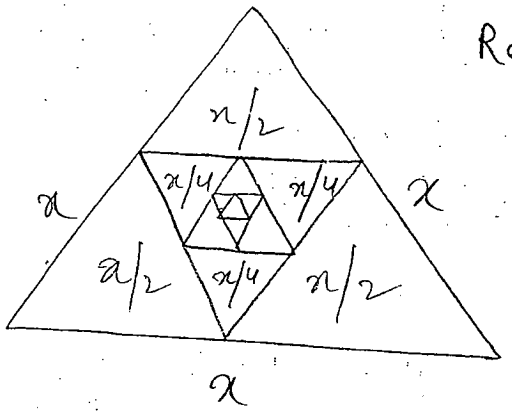
1 Equilateral triangle → 4

4 → 16.

16 → 64

64 → 256.

= 4^n



Req. ans → $\frac{\sqrt{3}}{4} \times x^2 + \frac{\sqrt{3}}{4} \times \frac{x}{4}^2 +$

$\frac{\sqrt{3}}{4} \times \frac{x^2}{16} + \ldots\ldots\ldots + \infty$

$\frac{\sqrt{3}}{4} x^2 \left[1 + \frac{1}{4} + \frac{1}{16} + \ldots\ldots\right]$

$\frac{\sqrt{3}}{4} x^2 \left[\frac{1}{1-4}\right] = \frac{\sqrt{3}}{4} \times x^2 \times \frac{4}{3} = \frac{\sqrt{3}}{3} x^2$

If an equilateral triangle of side x cm is taken, another equilateral triangle is formed by joining the mid points of the sides of the triangle and the process continues till it extinguishes, the sum of the area will be.

$\frac{\sqrt{3}}{3} \times x^2 \rightarrow (\text{side})^2$

PROBLEM SOLVING.

Question 3 - 5

	Football	Cricket	Hockey	Basketball
A	✓	✓	✗	✓
B	✓	✓	✓	✗
C	✗	✓	✓	✓
D	✓	✗	✓	✓

Question 20 - 24.

Account Assistants

A

B

C

Account Officers

D

E

F

G

H

A/c Asst. 2

A/c Officers 3

A ___X___ C

C ___X___ E

D ___X___ G

D ___X___ F

One Team:

	A/C Asst.	A/C officers
Ans: 20 and 21	B C	F G H
24:	A B	D E H

Same

Q 11-14.

Name	Hometown	Studying town	Subjects
Gopal	Ernakullam	Ahmedabad / Bhopal	Hist. / Eco.
Harsh	? Delhi	[Ahmedabad / Bhopal] ? Cuttak	Medical / Commerce
Inder	Cuttak	Bhopal / Ahmedabad	Eco. / Hist.
Jai	Ahmedabad	Ernakullam	Engineering
Krishnan	? Bhopal	Delhi	Medical / Commerce

Eco. - Bhopal
Hist. - Ahmedabad
Eng. - Ernakullam
Medical / commerce - Delhi / Cuttak.

1, 2, 9, 10, 25 to 26, 27 To 31, 37,
32 - 36 38 - 41
6 - 8 15 - 19

D ⟶ Salesman married to Teacher (?)

A is the grandmother of F ? ⟶ Doctor married to lawyer (?)

F ⟶ A/c Son of B brother of (E)

C ⟶ lawyer daughter - in - law of A

9.

	P	Q	R	S	T
A	✗	✓	✗	✗	✗
B	✗	✗	✗	✗	✓
C	✓	✗	✗	✗	✗
D	✗	✗	✓	✗	✗
E	✗	✗	✗	✓	✗

10.

	Violet	Indigo	Blue	Green	yellow	Orange	Red
A	✗		✓				
B	✗		✓	✓			
C	✗		✓	✓			
D	✗ Violet						
E		✓ Indigo			✓		✗
F	? Red						
G			✓	✓	✓	✗	✓

Orange

	Football	Cricket	Tennis	Basket Ball	Badminton	Volley Ball
R						✓
S						
Q	✓			✗		✗
T				✗		✗
P			✓			
U						

Name	City	Transport
P	Hyderabad	Bus
Q	Kolkata	Aeroplane
R	Bangalore	Car
S	Chennai	Boat
T	Delhi	Train

Q.6-8.

Males	Females
A	W
B	X
C	Y
	Z

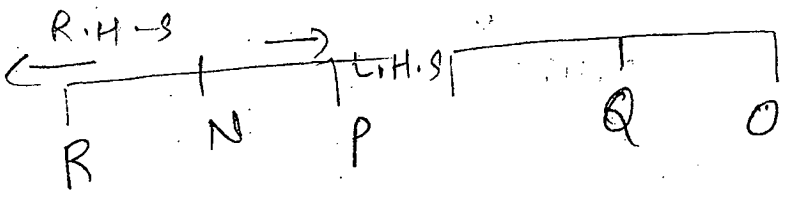
4 members
Atleast 2 males.

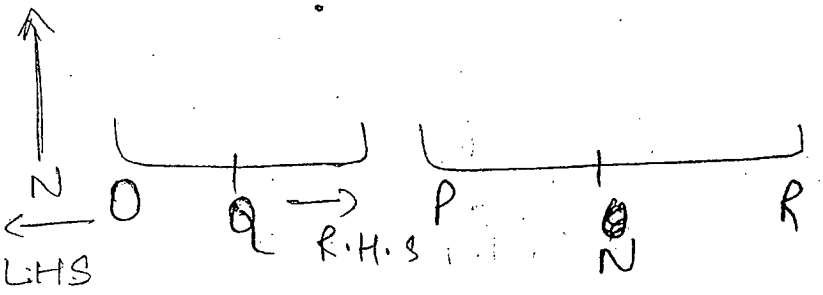
B X W
C X Z
W X Y

SEATING ARRANGEMENT

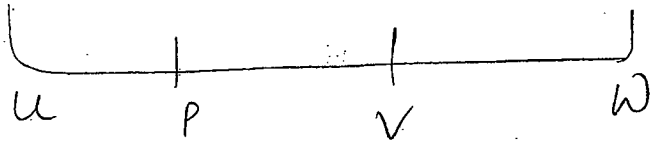
1) Directions facing
2) L.H.S or R.H.S
3) position or ranking

Q.1.



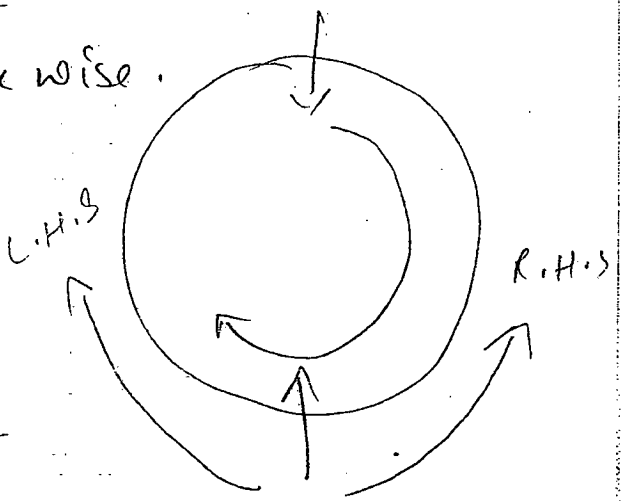


Q. ~~xxx-xxx~~ 21-25



L.H.S - ~~clockwise~~ clockwise.

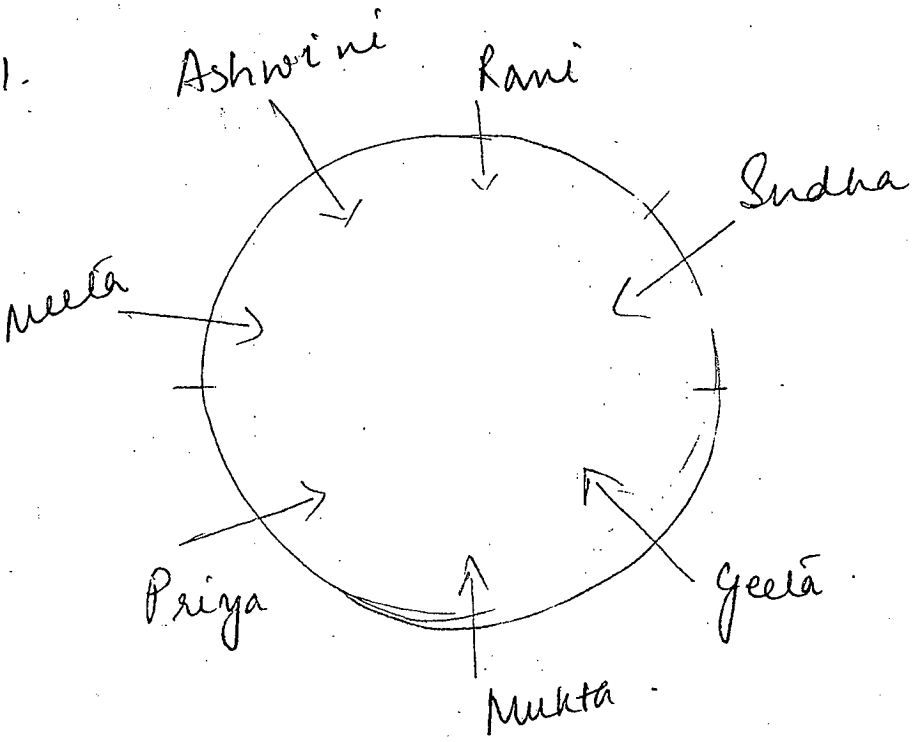
R.H.S - Anti-clockwise.



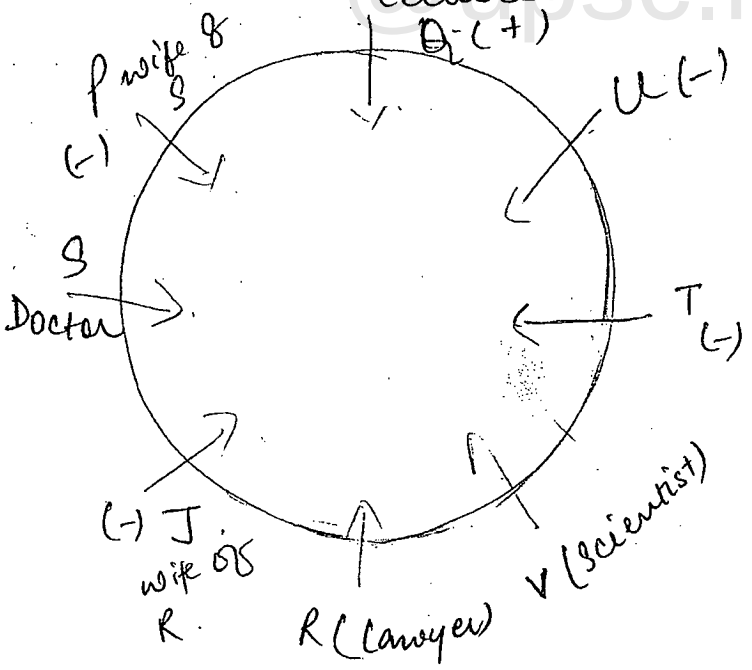
1) facing towards centre or not
2) ~~L.H.S or R.H.S~~
3) Ranks or positions of a Person w.r.t other

(*) without knowing the direction you cannot solve the question.

Q. 7-11.



Q. 26-31



Q. 37 – 40.

1. P, Q, R, S, T, U

2. No. students get same marks.

3. V always scores more than P

4. P always scores more than Q.

5. R ~~and~~ T

S U or Q.

37. R/1 V/2 U/3 P/4 Q/5 S/6 T/7

38. R/1 —/2 —/3 V/4 —/5 —/6 T/7

39. S/1 R/2 V/3 P/4 Q/5 T/6 U/7.

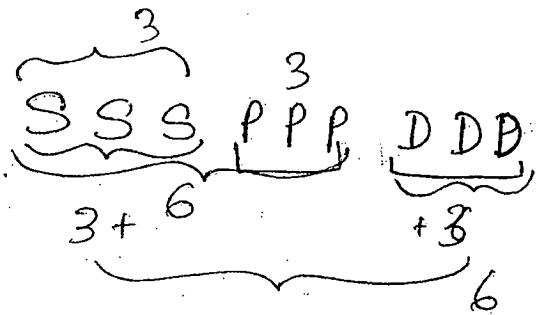
40. S/1 —/2 —/3 —/4 V/5 P/6 Q/7

ARITHMETIC REASONING.

1. All Sparrows cut 6

All Pigeons cut 6

All Ducks cut 6



$3 + 3 + 3$

$= 9$.

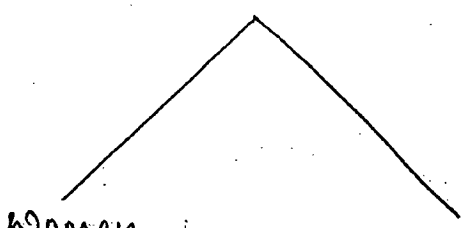
3. The 20 pairs of socks will be either black or brown.

but, 21st pair will be of his choice.

Ans = 21.

5. $11 \times 2 = 22m + 2m = 24m$.

6.



Women
$\frac{1}{3}$

Married
$\frac{1}{6}$

Married with children
$\frac{1}{18}$

Men
$\frac{2}{3}$

Married
$\frac{3}{4} \times \frac{2}{3} = \frac{1}{2}$

Married with children
$\frac{2}{3} \times \frac{1}{2} = \frac{1}{3}$

$$\frac{1}{18} + \frac{1}{3} = \frac{1+6}{18}$$

$$= \frac{7}{18}$$

$$1 - \frac{7}{18} = \frac{11}{18}$$

7. Let the number of benches = x

4 students sit on each bench,

3 bench left unoccupied = $4(x-3)$

If 3 students sit, 35 students left Standing = $3x+5$

$$4x - 12 = 3x + 5$$

$$x = 17$$

No. of Students = 4(17-3)

= 4 × 14

= 56

10. Bill = Fixed Charge (FC) + Variable Charge (VC)

VC ∝ amount of water consumed

4000 lts ~ ₹ 8,500

6000 lts ~ ₹ 11,000

2000 lts ~ ₹ 2500

2000 lts ~ ₹ 2500

800 lts ~ $\frac{2500}{2000} \times 800$

= 1000

6800 lts ~ 12,000.

13.

Ratio = 4 : 5

Total = 9.

9 × 9

= 81K.

Value of something is proportional to (weight)^2

$V \propto (W)^2$

$V = KW^2$

$K = \frac{V}{W^2}$

$81K : 16K + 25K$

$81\cancel{K} : 41\cancel{K}$

$81 : 41$

16. $n = \frac{\text{circumference of larger coin}}{\text{circumference of smaller coin}} = \frac{\pi \times 3}{\pi \times 1}$

$= 3$.

22. $150 + 120 = 270$.

270 men ~ 15 days.

1 men ~ 15×270 days.

150 men ~ $\frac{\cancel{15} \times 27\cancel{0}}{\cancel{150}} = 27$ days

No. of days delays $= 27 - 15$

$= 12$ days.

25. $100 \times 12 = 1200$.

$120 \times 10 = 1200$

So, increase in monthly deposit

is by 20%.

PERMUTATIONS & COMBINATIONS

Permutation - order matters, the sequence matters.

n will be less than r.

nP_r ; $n \geq r$.

whichever is greater becomes n, the lesser becomes r.

$$nP_r = \frac{\lfloor n}{\lfloor n-r}$$

* r = no. of times they change their position

Combination = selection of a thing in a random manner.

$$nC_r = \frac{\lfloor n}{\lfloor n-r \lfloor r}$$

$\lfloor n = n \times (n-1) \times (n-2) \times \ldots\ldots\ldots 1$

$\lfloor 5 = 5 \times 4 \times 3 \times 2 \times 1 = 120$

$\lfloor 4 = 4 \times 3 \times 2 \times 1 = 24$

$\lfloor 5 = 5 \times \lfloor 4$

$\lfloor 0 = 1$

$\lfloor 1 = 1$

$\lfloor 2 = 2$

$\lfloor 3 = 6$ $\quad$ $\lfloor 7 = 5040$

$\lfloor 4 = 24$ $\quad$ $\lfloor 8 = 40320$

$\lfloor 5 = 120$ $\quad$ $\lfloor 9 = 362880$

$\lfloor 6 = 720$ $\quad$ $\lfloor 10 = 3628800$

For, eg.

$BAT = {}^3P_3 = \lfloor 3$

$DELHI = {}^5P_5 = \lfloor 5 = 120.$

$= \lfloor 4 \times \lfloor 2 = 24 \times 2 = 48$

Delhi is written so that vowels are together

EI can interchange their position.

→ Vowels are not together.

$= 120 - 48$

$= 72.$

ALLAHABAD $= \lfloor 9$

A = 4 times

L = 2 times.

So, $\lfloor 4 \times \lfloor 2$

$\therefore \dfrac{\lfloor 9}{\lfloor 4 \times \lfloor 2}$

the letters repeated are to be deleted

vowels written together

AAAA LL HBD.

$$= \frac{\lfloor 6}{\lfloor 2} \times \frac{\lfloor 4}{\lfloor 4}$$

$\lfloor 4$ because 4 A's can be used and their position can be interchanged.

L is used 2 times.

$$= \frac{\lfloor 6}{\lfloor 2}$$

→ If vowels are not together

$$= \frac{\lfloor 9}{\lfloor 4 \times \lfloor 2} - \frac{\lfloor 6}{\lfloor 2}$$

4 A's, 2 L's

Combination

$$nCr = \frac{\lfloor n}{\lfloor n-r \lfloor r}$$

The Selection Committee of Indian Cricket Team selected 16 players, they comprises of 6 specialist batsman, 5 specialist bowler, 3 specialist all rounder, 2 specialist

wicket keeper.

i) In how many ways a team of 11 players can be selected out of ~~three~~ 16 players?

$$16C_{11} = \frac{\lfloor 16}{\lfloor 5 \lfloor 11}$$

ii) In how many ways team of 11 players can be selected such that 2 particular players are always included in the team?

$16 - 2 = 14$.

$\frac{14}{-9}$
$\frac{}{5}$

$11 - 2 = 9$

$14C_9$.

iii) In how many ways a team of 11 players can be selected such that 2 particular plays are always excluded from the team?

$16 - 2 = 14$

$\Rightarrow 14C_{11}$

The team management for a particular match wants a combination of 5 specialist batsman, 4 specialist bowler, 1 all rounder, 1 wicket-keeper. In how many ways can the team be made?

$$^6C_5 \times {}^5C_4 \times {}^3C_1 \times {}^2C_1$$

When you select people of different category, then it does not affect people of other category. It gets multiplied.

Assignment:

29.

5	4	3
EOW	ATS	IRS

$$^5C_2 \times {}^4C_2 \times {}^3C_1 = 10 \times 6 \times 3 = 180$$

$$+$$

$$^5C_2 \times {}^4C_1 \times {}^3C_2 = 10 \times 4 \times 3 = 120$$

$$+$$

$$^5C_1 \times {}^4C_2 \times {}^3C_2 = 5 \times 6 \times 3 = 90$$

$$390$$

30.

Gr I	Gr II
A	L
B	M
C	N
D	O
E	

$5C_2 \times 4C_2$

$10 \times 6 = 60$

Gr I [A, O]	Gr II
B	L
C	M
D	N
E	

$4C_1 \times 3C_1$

$= 12.$

Gr I (D, M)	Gr II
A	L
B	N
C	O
E	

$4C_1 \times 3C_1$

$= 12$

$60 - 24 = 36.$

$36 + 1 = 37.$

(1) is added because, it is one group that is subtracted twice, so we add (1).

→ If n no. of people have handshakes with each other, then total no. of handshakes =

$nC_2 = \frac{n \times n-1}{2}$

→ When sending cards two persons involved 48
If, n no. of persons are sending cards to each other, then total no. of cards transacted in this process is equal to —

$$nC_2 \times 2 = n(n-1)$$

→ If n no. of non-collinear points are there then, no. of triangles formed will be equal to :— $nC_3 = \frac{n \times (n-1) \times (n-2)}{6}$

Q.16.

→ If there are n no. of points of which m points are collinear then no. of triangles formed is equal to —

$$nC_3 - mC_3$$

$$= \frac{n(n-1)(n-2)}{6} - \frac{m(m-1)(m-2)}{6}$$

Q.17.

→ If there are n. no. of non-collinear points, then no. of quadilaterals formed is equal to —

$$nC_4 = \frac{n \times (n-1)(n-2)(n-3)}{24}.$$

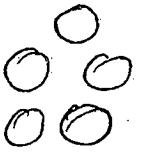
Q.18.

→ If there are n no. of collinear points, no. of straight line formed is equal to :-

$$nC_2 = \frac{n(n-1)}{2}$$

11.

B_1 B_2 B_3



$$(^5C_3 \times {}^2C_1 \times {}^1C_1) \times \frac{\lfloor 3}{\lfloor 2}$$

(or)

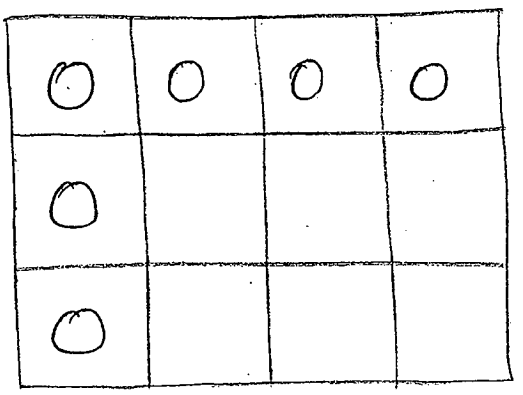
$$(^5C_2 \times {}^3C_2 \times {}^1C_1) \times \frac{\lfloor 3}{\lfloor 2}$$

Required answer :

$$(^5C_3 \times {}^2C_1 \times {}^1C_1) \times \frac{\lfloor 3}{\lfloor 2} +$$

$$(^5C_2 \times {}^3C_2 \times {}^1C_1) \times \frac{\lfloor 3}{\lfloor 2}$$

12. $^{12}C_3 - {}^3C_3 \times 4 - {}^4C_3 \times 3$



$n(P) = \frac{\text{favourable outcome}}{\text{total outcome}}$

→ If n no. of persons are seated on a circular table then number of ways they can occupy the chairs will be equal to –

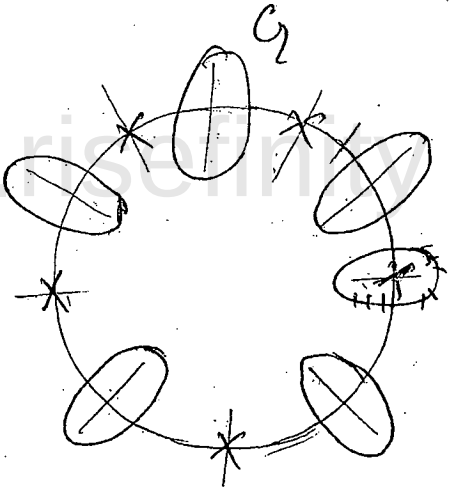
$\lfloor n-1$

24. Total = 10.

No. of ways = $\lfloor 9$

25. Boys = 5

Girls = 5



$\lfloor 4 \times \lfloor 5$

26.

$\lfloor 18 \times \lfloor 2$ ↑ interchanging their position.

$20 = (2) \cdot 18.$

$\Downarrow$

(1)

PROBABILITY

7. Total outcome = $\lfloor n-1$

Favourable outcome = ①

$n \Rightarrow (2)\ n-2$

$n-2+1 = n-1$

$\Rightarrow \lfloor n-2 \times \lfloor 2$

$$n(P) = \frac{\lfloor n-2 \times 2}{\lfloor n-1} = \frac{\lfloor n-2 \times 2}{(n-1)\lfloor n-2}$$

$$= \frac{2}{n-1}$$

11. A/B/C/D/E ⟶ A/B/C (1st, 2nd, 3rd) ___ ___

Left = 2. out of 3.

So, $\lfloor 2$.

$$n(P) = \frac{\lfloor 2}{\lfloor 5} = \frac{2}{120}$$

$$= \frac{1}{60}$$

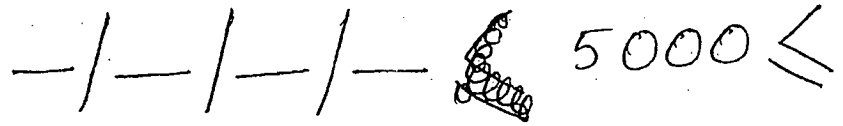
12. A/B/C/D/E ⟶ A/B/C/D (4 places = $\lfloor 4$)

E/F → after 4 places 2 places left so $\lfloor 2$

$$n(P) = \frac{\lfloor 4 \times \lfloor 2}{6} = \frac{24 \times 2}{720} = \frac{1}{15}$$

~~30~~ 15

13. 0, 1, 3, 5, 7



$n(P) = \frac{2 \times 5 \times 5 \times 2}{2 \times 5 \times 5 \times 5}$

$= 2/5$

It is not becoming 5, 4, 3, 2 because in this question repeatations are allowed.

5, 7 → only two digits which will make it greater or equal to 5,000.

14. 0–9

$\frac{1}{10/9/8/7}$

$n(P) = \frac{1}{5040}$

$$(H+T)^2 = H^2 + 2HT + T^2$$

$$2 \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{2}.$$

Two coins were tossed,

④ { H H ; H T ; T H ; T T } ② $= \frac{2}{4} = \frac{1}{2}$.

When it is atleast 1 head =

1 − No head

$= 1 - \frac{1}{4} = \frac{3}{4}$.

→ If n no. of coins are tossed simultaneously then chances of having m times head or tail is equal to =

$$n(P) = \frac{{}^nC_m}{2^n}$$

1. $$\frac{{}^8C_6}{2^8} = \frac{\lfloor 8}{\frac{\lfloor 8-6}{2}\lfloor 6}$$

$$= \frac{8^4 \times 7 \cancel{6}}{\cancel{2} \times \cancel{6}} = 28$$

$$= \frac{\cancel{28}\,7}{2^{\cancel{8}6}} = \frac{7}{64}$$

2. Atleast 4 heads = either 4 or 5 or 6

$$\frac{{}^6C_4 + {}^6C_5 + {}^6C_6}{2^6}$$

$$= \frac{15+6+1}{2^6} = \frac{\cancel{22}\,11}{2^{\cancel{6}5}} = \frac{11}{2^5}$$

$$= \frac{11}{32}$$

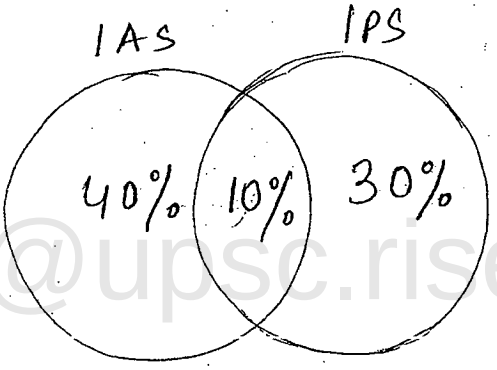
3. Atmost 2 heads = either 0 or 1 or 2.

$$10 \text{ coins} = \frac{{}^{10}C_0 + {}^{10}C_1 + {}^{10}C_2}{2^{10}}$$

$$= \frac{1 + 10 + 45}{2^{10}} = \frac{56}{2^{10}} = \frac{7}{2^7}$$

$$= \frac{7}{128}$$

23.



either or = ∪
and = ∩

Vagisha got selected =

$$n(\text{IAS or IPS}) = 40\% + 10\% + 30\%$$

$$= 80\%$$

19. Kundan — Selection $\frac{1}{3}$ — Not Selection $\frac{2}{3}$ = 0.8

Sonu — $\frac{1}{5}$ — $\frac{4}{5}$

Probability that only one of them will be selected

$$= \frac{1}{3} \times \frac{4}{5} + \frac{1}{5} \times \frac{2}{3}$$

$$= \frac{4}{15} + \frac{2}{15} = \frac{6}{15} = \frac{2}{5}$$

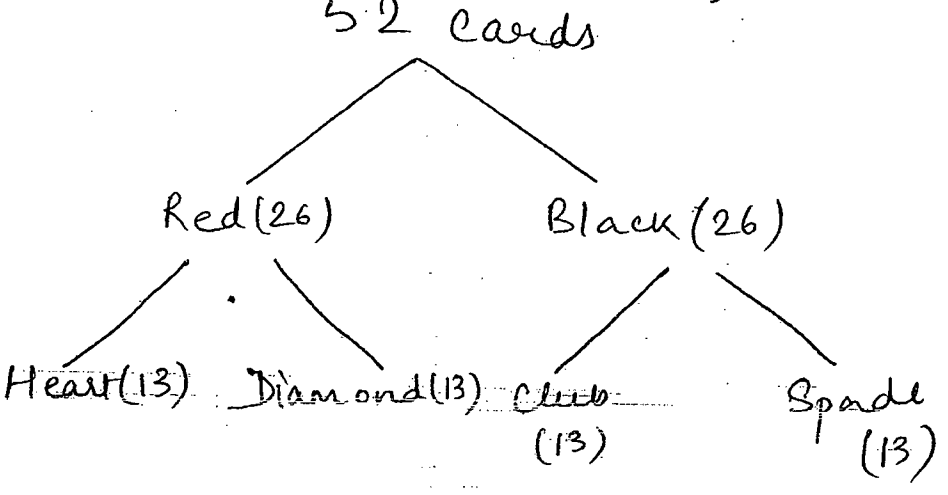
20.

Man	Truth	False
A	$\frac{80}{100}$	$\frac{20}{100}$
B	$\frac{90}{100}$	$\frac{10}{100}$

$$\frac{80}{100} \times \frac{10}{100} + \frac{90}{100} \times \frac{20}{100}$$

$$\frac{8}{100} + \frac{18}{100} = \frac{26}{100} = \frac{13}{50}$$

21.



A, J, K, Q.

= 9 digit card

= 4 picture card.

36 digit cards.

16 picture cards

From a well shuffled pack of 52 cards, a card is drawn at randomly, what is the probability that the drawn card is a card of red colour.

$$= \frac{26C_1}{52C_1}$$

From a well shuffled pack of 52 cards, two cards were drawn randomly. What is the probability that the one card is red and other is black colour,

Red ↓ Black ↓

1 + 1

2 cards.

26 Red × 26 Black

$$\frac{26C_1 \times 26C_1}{52C_2} = \frac{(26C_1)^2}{52C_2}$$

From a well shuffled pack of 52 cards, 2 cards are drawn at random, what is the probability that they are either red or black.

Red. Black.

$$\frac{26C_2}{52C_2} + \frac{26C_2}{52C_2}$$

$$= \frac{2 \times 26C_2}{52C_2}$$

21. Either Heart or Diamond or Spade or Club

$$\frac{13C_4}{52C_4} + \frac{13C_4}{52C_4} + \frac{13C_4}{52C_4} + \frac{13C_4}{52C_4}$$

$$= \frac{4 \times 13C_4}{52C_4}$$

22. Heart Diamond Spade Club

$$\frac{13C_1 \times 13C_1 \times 13C_1 \times 13C_1}{52C_4}$$

$$= \frac{(13C_1)^4}{52C_4}$$

16. King Queen Jack.

$$\frac{{}^4C_1 \times {}^4C_1 \times {}^4C_1}{{}^{52}C_3}$$

$$= \frac{({}^4C_1)^3}{{}^{52}C_3}$$

8. Blue = 3

Green = 2

Red = 5

Atleast one Red = 1 − No Red

$$= 1 - \frac{{}^5C_3}{{}^{10}C_3}$$

9. 2 Green, 3 Blue

$$\frac{{}^2C_2 \times {}^3C_2}{{}^{10}C_4}$$

24.

L_1	E_1
L_2	E_2
L_3	E_3
L_4	E_4
L_5	E_5
L_6	E_6

exactly five goes to the correctly addressed envelope

i.e, $\frac{D}{\text{anything}} = 0$.

17.

10	0
9	1
8	2
7	3
6	4
5	5
4	6
3	7
2	8
1	9
0	10

Favourable cases = 2.

No. of ~~pos~~ cases = 11.

$\Rightarrow 2/11$

18. (1), 2, (3), 4 and (5), 6, (7), 8

$$\frac{^2C_2 \times {}^2C_1 + {}^2C_1 \times {}^2C_2}{^8C_3}$$

If there would not have been and then it would have been

$^4C_2$.