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NAME: k. Gowtham STD.: _____ SEC.: _____ ROLL NO.: _____ SUB.: _____

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02/08/20
Day 1

Numerical Ability

General Aptitude (100 - 15M)

- Numerical Ability (8 - 11)
- Verbal Ability (4 - 7)

Time & Distance:

(Basics, problems on trains, Relative speed, Avg speed, boats & streams)

* Speed = $\frac{\text{Distance}}{\text{time}}$

* 1 kmph = $\frac{1000}{3600}$ m/s = $\frac{5}{18}$ m/s

$\Rightarrow$ 1 m/s = $\frac{18}{5}$ kmph

if distance is constant	if T is constant
$T \propto \frac{1}{S}$	$S \propto D$

(Q1) A man takes 5 hrs 45 min in walking to a certain place and riding back. He would have gained 2 hours by riding both ways. The time he would take to walk both ways is

a) 11 hrs
b) 8 hrs 45 min
c) 7 hrs 45 min
d) 9 hrs 20 min

Sol:

$t_1 + t_2 = 5 \times 60 + 45 = 345$

$2t_2 = 345 - 120 = 225$

$\Rightarrow t_2 = \frac{225}{2}$

$t_1 = 345 - \frac{225}{2}$

$\Rightarrow 2t_1 = 2\left(345 - \frac{225}{2}\right) = 690 - 225 = 465$

i.e., 7 hrs 45 min

(Q2) If I travel at 5/4 of my speed, I will reach my office 6 minutes early. what is original duration of time I take to reach office?

Sol:

$t_1 = \frac{d}{S_1}$ $\quad t_2 = \frac{d}{S_2}$

$t_1 - 6 = \frac{d}{\frac{5}{4}S_1}$

$\Rightarrow \frac{5}{4}(t_1 - 6) = \frac{d}{S_1}$

$\Rightarrow t_1 = \frac{5}{4}(t_1 - 6)$

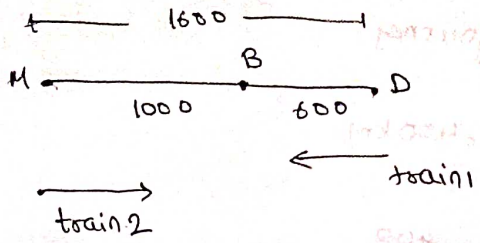
$-\frac{1}{4}t_1 = -30$

$\frac{4}{4}$

$\Rightarrow t_1 = 30$ min

(Q3) A train leaves Delhi for Mumbai, a distance of 1600 kms and at the same time another train leaves mumbai for delhi. These trains meet at bhopal at a distance of 600 km from delhi. what is ratio of their speeds.

Sol:



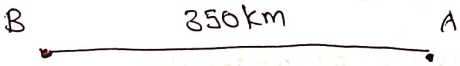
Since both the trains traveled their respective distances in same time (time is constant)

$$\Rightarrow S \propto D$$

$$\frac{S_1}{S_2} = \frac{D_1}{D_2} = \frac{600}{1000} = \frac{3}{5}$$

$$\therefore 3:5$$

(Q4)



5:20

Aruna ⟶

80kmph 60kmph

t_1 (2hrs 15min)

$$1^{st} \rightarrow 80 \times \left(2\frac{1}{4}\right) = 80 \times \frac{9}{4} = 180\text{km}$$

remaining dist = 170 km

$$t_2 = \frac{170}{60} \text{ hrs}$$

$$\text{total time} = \frac{9}{4} + \frac{17}{6} = \frac{27+34}{12} = \frac{61}{12} \text{ hrs}$$

$$= 5\text{hrs } 5\text{ min}$$

∴ She will reach by 10:25

∴ opt (d)

(Q5) total distances = 800km

∴ total time = 17 hrs

Let S be speed in return journey

the $\frac{5}{4}S$ is speed in onward journey

Onward journey	+1 hrs	return journey
$\frac{5}{4}S, t_1, 400$ km		$S, t_2, 400$ km

$$t_1 = \frac{400}{\frac{5}{4}S} \qquad t_2 = \frac{400}{S}$$

given $t_1 + t_2 + 1 = 17$

$\Rightarrow t_1 + t_2 = 16$

$$\frac{4}{5}\frac{400}{S} + \frac{400}{S} = 16$$

$$\Rightarrow \frac{9}{5}\frac{80}{S} = 16 \Rightarrow S = \frac{9 \times 80}{16} = 45 \text{ km/hr}$$

But speed of onward journey $= \frac{5}{4}S$

$$= \frac{5}{4}(45) = 56.25 \text{ km/hr}$$

(Q.6)

$$t_1 = \frac{715}{S_1} \qquad t_2 = \frac{715}{S_2}$$

$$t_1 - 2 = \frac{715}{S_1 + 10}$$

$$\Rightarrow t_1 = \frac{715}{S_1 + 10} + 2$$

$$\Rightarrow \frac{715}{S_1} = \frac{715}{S_1 + 10} + 2$$

$$\Rightarrow \frac{715}{S_1} = \frac{715 + 2S_1 + 20}{S_1 + 10}$$

$$\Rightarrow 715S_1 + 7150 = 715S_1 + 2S_1^2 + 20S_1$$

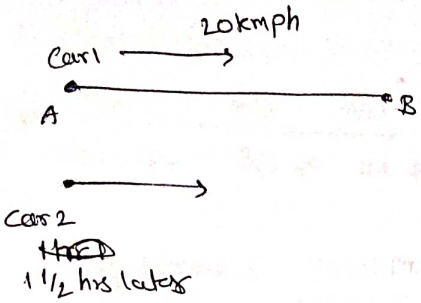
$$\Rightarrow 2S_1^2 + 20S_1 - 7150 = 0$$

$$S_1^2 + 10S_1 - 3575 = 0$$

$$S_1(S_1 + 10) = 3575$$

$$\therefore S_1 = 55 \qquad 65 \times 55 = 3575$$

Q7



Car 1	Car 2
20kmph, t_1, d	30kmph, $t_1 - 1\frac{1}{2} - 2\frac{1}{2}$, d

$t_1 = \frac{d}{20}$ $\quad t_1 - 4 = \frac{d}{30}$

$\Rightarrow \frac{d}{20} = \frac{d}{30} + 4$

$\frac{d}{20} - \frac{d}{30} = 4 \Rightarrow \frac{d}{2} - \frac{d}{3} = 40$

$\Rightarrow \frac{d}{6} = 40$

$\Rightarrow d = 240 km$

Q8

Case 1	Case 2	Case 3
s_1, t_1, d_1	s_1+10, t_1-1, d_1	$s_1+20, t_1-1-\frac{3}{4}, d_1$
$d = st$	$d = (s+10)(t-1)$	$d = (s+20)(t-\frac{7}{4})$
↓ ①	$d = st - s + 10t - 10$ ↓ ②	$d = st - \frac{7}{4}s + 20t - 35$ ↓ ③

① - ②

$0 = s - 10t + 10$

$\Rightarrow s = 10t - 10$

② - ③

$\Rightarrow 0 = -s + 10t - 10 + \frac{7}{4}s - 20t + 35$

$\Rightarrow \frac{3}{4}s - 10t + 25 = 0$

$\Rightarrow 3s - 40t + 100 = 0$

$\Rightarrow 3(10t - 10) - 40t + 100 = 0$

$30t - 30 - 40t + 100 = 0$

$\Rightarrow -10t = -70 \Rightarrow t = 7 \Rightarrow s = 60$

$\Rightarrow d = 420 km$

Q9

∴ distance in 1 min = 1000 m

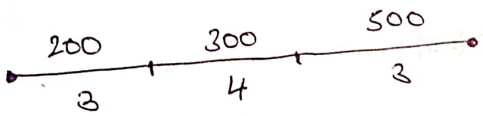
distance in 1 hr = 1000 × 60 m

∴ 60 km/hr

Average Speed:

$$\text{Avg speed} = \frac{\text{total distance}}{\text{total time}}$$

Q10



$$\text{Avg Spee} = \frac{1000}{10} = 100 \text{ km/hr}$$

Q11

$v_1 = 50$, $t_1 = 1$ | $v_2 = 48$, $t_2 = 2$ | $v_3 = 52$, $t_3 = 3$

b

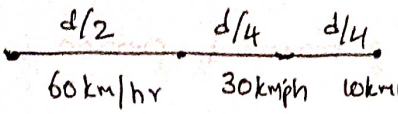
$$\text{Avg speed} = \frac{\text{total distance}}{\text{total time}}$$

$$= \frac{v_1 t_1 + v_2 t_2 + v_3 t_3}{t_1 + t_2 + t_3}$$

$$= \frac{50 + 96 + 156}{6}$$

$$= \frac{302}{6} = 50\frac{1}{3} \text{ km/hr}$$

Q.12



Avg speed = $\frac{\text{total dist}}{\text{total time}}$

$= \frac{d}{\frac{d}{120} + \frac{d}{120} + \frac{d}{40}}$

$= \frac{40}{\frac{1}{3} + \frac{1}{3} + 1} = \frac{40}{\frac{5}{3}} = 24$ km/hr

$t_1 = \frac{d/2}{60} = \frac{d}{120}$

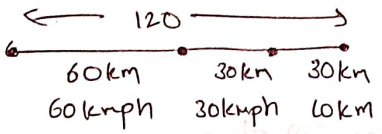
$t_2 = \frac{d}{120}$

$t_3 = \frac{d}{40}$

Method 2 :

For easier calculation we assume some d value for d

Here appropriate value for d could be 120



$t_1 = \frac{60}{60} = 1$ $t_2 = 1$ $t_3 = 3$

Avg speed = $\frac{120}{1+1+3} = \frac{120}{5} = 24$ kmph

Q.13

$\frac{d}{\frac{\frac{d}{3}}{80} + \frac{\frac{d}{3}}{60} + \frac{\frac{d}{3}}{30}} = \frac{d\ 3}{\frac{1}{80} + \frac{1}{60} + \frac{1}{30}} = \frac{30}{\frac{1}{8} + \frac{1}{6} + \frac{1}{3}}$

$= \frac{30}{\frac{8+4+8}{24}} = \frac{\overset{2}{\cancel{30}} \times 24}{\cancel{48}}$

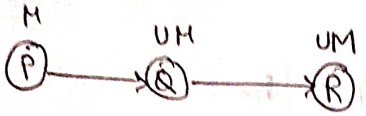
$= 48$ kmph

(P1) P looks at Q while Q looks at R. P is married, R is not. The number of pair of people in which a married person is looking at an unmarried person is

a) 0 b) 1 c) 2 d) can't be determined

Sol:

Q can be either married or unmarried



Here req pair is (P, Q)

Here req pair is (Q, R)

∴ 1 pair

(Q14) total distance = 40000km

at any moment we have 4 tyres travelling

total distance travelled by tyres = 40000 × 4

Now this is equally distributed among 5 tyres

∴ avg distance by each tyre = $\frac{40000 \times 4}{5}$ = 32000 km

03/08/20
day 82

(Pu 2) P, Q, and R talk about S's car collection. P states that S has atleast 3 cars. Q believes that S has less than 3 cars. R indicates that to his knowledge S has atleast one car. Only one of P, Q and R is right. The number of cars owned by S, is.

a) 0 b) 1 c) 3 d) Can't be determined.

Sol:

One of the conditions is true. So we check for all possibilities

	≥ 3	< 3	≥ 1
①	T	F	F

This not possible because

≥ 3 is true $\Rightarrow$ ≥ 1 is true

②	F	T	F

This is possible only if '0' cars

③	F	F	T

This not possible because ≥ 3 & < 3 can't have same truth values.

$\therefore 2^{nd}$ is true

$\therefore$ 0 cars.

Method 2 :

All possible values are

$\{0, 1, 2, 3, 4, 5, 6, 7 \ldots\}$

Q, R are true

P, R are true

only Q is true

$\therefore$ 0

$P \rightarrow \geq 3$

$Q \rightarrow < 3$

$R \rightarrow \geq 1$

Problems on trains:

① Train crossing a stationary object:

Speed = speed of train

② Train crossing moving object:

Relative speed = $\begin{cases} S_1 + S_2 & \leftarrow \text{both moving in opposite direction} \\ |S_1 - S_2| & \leftarrow \text{both moving in same direction.} \end{cases}$

3) Train crossing an object with negligible length

to cross the object

distance = length of train

4) Train crossing an object with some length:

to cross the object

distance = length of train + length of object.

(Q1)

$t_1 = \frac{d_1}{v}$ $\qquad$ $t_2 = \frac{d_2}{v}$

$23 = \frac{272 + l}{v}$ $\qquad$ $19 = \frac{200 + l}{v}$

$\Rightarrow \frac{272 + l}{23} = \frac{200 + l}{19}$

$19(272) + 19l = 200(23) + 23l$

$\Rightarrow 4l = 19(272) - 200(23)$

$l = 19(68) - 50(23)$

$l = 142\,m$

(Q2)

$t_1 = 25$ $\quad v = 54\ km/h$

$= 54 \times \frac{5}{18}$

$= 15\ m/s$

$D_1 = l_p + l_t$

$d_1 = vt_1$

$(l_p + 210) = 15 \times 25$

$l_p = 375 - 175$

$= 200$

$t_2 = 14$ $\quad v_t = 15\ m/s$

$d_2 = l_t$

$\Rightarrow d = vt_2$

$= 15 \times 14$

$= 210$

$\Rightarrow l_t = 210$

$v_m = 9 \times \frac{5}{18} = 2.5\ m/s$

$v_R = 15 - 2.5 = 12.5$

$= 12.5 \times 14$

$= 175$

$\Rightarrow l_t = 175$

$\therefore$ opt (d)

(Q3) $10 = \frac{l_t}{v_t}$ $\quad 44 = \frac{l_t + l_p}{v_t}$ $\quad v_t = 72 \times \frac{5}{18} = 20 m/s$

$\Rightarrow 10 v_t = 44 v_t - l_p$

$10(20) = 44(20) - l_p$

$l_p = 34(20) = 680\ m$

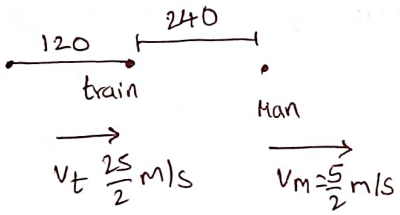
Method 2

34 sec increased for platform

$\therefore$ length of platform $= 20 \times 34$

$= 680 m/s$

(Q4)



$45 \times \frac{5}{18} = \frac{25}{2}$

$9 \times \frac{5}{18} = \frac{5}{2}$

$v_R = v_t - v_m$

$= \frac{25}{2} - \frac{5}{2} = 10 m/s$

$t = \frac{d}{s} = \frac{360}{10} = 36$ sec

(Q5)

$v_R = 60 - 50 = 10 kmph$

for 20 km — 2hrs.

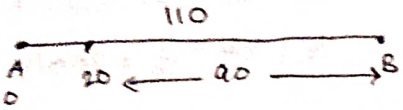
(Q6)

$v_R = 80 + 100 = 180 kmph$

$t = \frac{540}{180} = 3 hrs$

$\therefore 7 + 3 = 10$ A.M

Q7



at 8 am 1st train will be at 20 km

90 km need to be covered

$V_R = 20 + 25 = 45$ km/h

$\therefore t = \frac{90}{45} = 2$ hrs

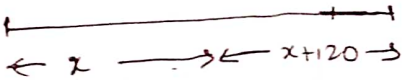
$\therefore 8 + 2 = 10$

$\therefore$ They meet at 10 am

Q8

$V_A = 50 \quad V_B = 60$

$V_R = 110$ kmph



$2x + 120 = ?$

Let t be time

$t = \frac{x}{50} \quad t = \frac{x+120}{60}$

$\frac{x}{50} = \frac{x+120}{60}$

$6x = 5x + 600 \Rightarrow x = 600$

$\Rightarrow 2x + 120 = 1320$ km

Method 2:

bus 2 travelled 120 km more

$\because$ it speed is 10 kmph more

it means 12 hrs are travelled before they met

$\therefore$ dist by bus1 + dist by bus2

$50 \times 12 + 60 \times 12$

$110 \times 12 = 1320$ km

Boats & Streams

terminology :

Speed of boat in still water = S_B

if speed of stream / current / water flow = S_w then

upstream (against the stream)

$S_{US} = |S_B - S_w|$

Downstream (along with the stream)

$S_{DS} = S_B + S_w$

(Q9) $S_B = 16$ kmph

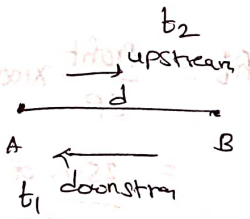
$S_{US} = S_B - S_S = 12$

$\Rightarrow S_S = 4$ kmph

$\frac{20}{S_B + S_S} = \frac{12}{S_B - S_S} \Rightarrow \frac{5}{16 + S_S} = \frac{3}{16 - S_S}$

$\Rightarrow S_S = 4$ kmph

(Q10) $S_B = 20$ kmph $S_S = 10$ km/s



$t_1 = \frac{d}{20+10}$ $t_2 = \frac{d}{20-10}$

$t_1 + t_2 = \frac{d}{30} + \frac{d}{10} = 10$

$\frac{4d}{30} = 10 \Rightarrow d = 75$ km

(Q11) $S_B = 20$ kmph

down stream up stream

$t = \frac{d}{20+S_S}$ —① $3t = \frac{d}{20-S_S}$ —②

$\frac{①}{②} \Rightarrow \frac{1}{3} = \frac{\frac{1}{20+S_S}}{\frac{1}{20-S_S}} \Rightarrow 20 + S_S = 60 - 3S_S$

$\Rightarrow S_S = 10$ kmph

Profit & Loss

→ profit % & loss % is should calculated on cost price.

$$\text{profit \%} = \frac{\text{profit}}{CP} \times 100 \qquad \text{Loss \%} = \frac{\text{loss}}{CP} \times 100$$

→ profit % & loss % is calculated on SP only if it is mentioned

Eg: 10% loss ⇒ SP = 90% CP

20% profit SP = 120% CP

(Q12) SP = 418

SP = 110% CP

$$418 = \frac{110}{100} CP$$

$$\Rightarrow CP = \frac{100}{110} 418 = 380$$

(Q13)

~~Prof~~ profit = 25% SP

SP − CP = profit

SP − CP = 25% SP

$$SP - CP = \frac{SP}{4}$$

$$\Rightarrow CP = \frac{3}{4} SP$$

$$\text{Original profit} = \frac{\text{Profit}}{CP} \times 100$$

$$= \frac{25\% \text{ of SP}}{CP} \times 100$$

$$= \frac{\frac{1}{4} SP}{\frac{3}{4} SP} \times 100$$

$$= \frac{100}{3} = 33.33\%$$

Method 2:

assume SP = 100

⇒ profit = 25

CP = 75

$$\text{profit \%} = \frac{25}{75} \times 100 = 33\frac{1}{3}\%$$

Q14

CP of 120 reams = $120 \times 80 + 280 + 120 \times 0.4 + 72$

$CP = 10000$

$SP = 108\%$ of CP

$= 10800$

SP per ream = $\frac{10800}{120} = 90$

Q15

~~SP = ?~~

$450 = 90\%$ CP

$\Rightarrow CP = \frac{100}{90}(450) = 500$

$SP = 540 \Rightarrow$ profit $= 40$

profit % $= \frac{40}{500} \times 100 = 8\%$ gain

Q16

$SP_1 = 97.5\%$ CP $\quad SP_2 = 107.5\%$ CP

$SP_2 - SP_1 = 10\%$ CP $= 100$

$\Rightarrow CP = 1000$

$SP = \frac{112.5}{100} \times 1000$

$SP = 1125$

Q17

~~12.5 loss~~

22.5% CP $= 108$

$\frac{22.5}{100} CP = 108 \Rightarrow CP = \frac{108 \times 100}{22.5}$

loss is $12.5\% \Rightarrow \frac{108 \times 100}{22.5} \times \frac{12.5}{100} = 60$

04/08/20
day 3

PU13 Find the sum of the series given below

$1(1!)+2(2!)+3(3!)+\cdots+2020\,(2020!)$

a) $2021!+1$

b) $2021!-1$

c) $2021*2021!$

d) Can't be determined

Sol:

Consider

$1(1!)+2(2!) = 5 = 3!-1$

$1(1!)+2(2!)+3(3!) = 23 = 4!-1$

∴ Sly

$1(1!)+2(2!)+\cdots+2020(2020!) = 2021!-1$

Q1 $CP = 5600$

$SP = \frac{3}{4}(5600)$

i.e., 25% loss

Q2

$CP \times 40 = SP \times 50$ if P is profit or loss

$CP \times 40 = \frac{100+P}{100} CP \times 50$

$40CP = \left(1+\frac{P}{100}\right) CP \times 50$

$1+\frac{P}{100} = \frac{4}{5}$

$\frac{P}{100} = -\frac{1}{5} \Rightarrow P = -20\%$

i.e., 20% loss

Method 2 :

$40 CP = 50 SP$

$\Rightarrow SP = \frac{4}{5} CP$

$SP = \left(1 - \frac{1}{5}\right) CP$

$\therefore$ loss = 20%

(Q3)

$20 CP = x SP$

$SP = \frac{20}{x} CP$

to get 25% profit

$\frac{20}{x} = \frac{125}{100} \Rightarrow \frac{20^4}{x} = \frac{5}{4} \Rightarrow x = 16$

(Q4)

~~Money spent = 12×10~~

~~CP = 120~~

CP : $\frac{10}{12} = \frac{5}{6}$

SP : $\frac{12}{10} = \frac{6}{5}$

Profit = $\frac{6}{5} - \frac{5}{6} = \frac{36-25}{30} = \frac{11}{30}$

profit % = $\frac{\frac{11}{30}}{\frac{5}{6}} \times 100 = 44\%$

(Q5)

$2SP = 10SP - 10CP$

profit on 10 apples

$\Rightarrow$ ~~10SP~~ $10CP = 8SP \Rightarrow SP = \frac{5}{4} CP$

$\Rightarrow$ 25% profit

(Q6) $SP(800gm) = CP(1kg)$

$800SP = 1000CP$

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

$\Rightarrow$ 25% profit

(Q7)

Merchant A

$SP_A = 1000$

$P_A = 25\%$ of CP

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

$\Rightarrow CP = 800$

$P_A = \frac{1}{4} \times 800 = 200$

Merchant B

$SP_B = 1000$

$P_B = 25\%$ of SP

$= \frac{25}{100} \times 1000 = 250$

$\therefore P_B - P_A = 50$

(Q8)

18% − 11% — 175

7% — 175

1% — 25

100% — 2500

(Q9)

Profit = loss

$SP_1 - CP = CP - SP_2$

$\Rightarrow CP = \frac{SP_1 + SP_2}{2} = \frac{575+295}{2} = \frac{870}{2} = 435$

$\therefore$ opt (E)

(Q10)

M —(10%)— W —(30%)— R —(50%)— C

x, 1.1x, (1.3)(1.1)(x), (1.5)(1.3)(1.1)x

$(1.5)(1.3)(1.1)x = 4290$

$\Rightarrow x = 2000$

Q11

A ——— B ——— C ——— D

$x+110$ $\quad 1.2(x+110)$ $\quad 0.9(1.2)(x+110)$ $\quad (1.1)(0.9)(1.2)(x+110)$

$$1.1 \times 0.9 \times 1.2 \times (x+110) = 1188$$

$$\Rightarrow x + 110 = 1000$$

$$\Rightarrow x = 890$$

Q12

$SP_1 = 9900$ | $SP_2 = 9900$

10% gain | 10% loss

$SP_1 = \frac{11}{10} CP$ | $SP_2 = \frac{9}{10} CP$

$CP = \frac{10}{9} (9900)$

$CP = 11000$

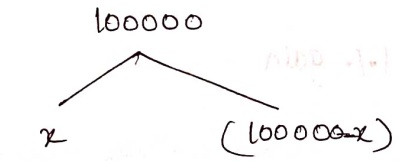
$P_1 = 900$ | $P_2 = -1100$

$\therefore$ 200 loss

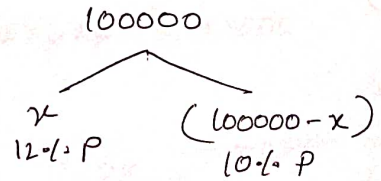
total CP $= 9000 + 11000 = 20000$

$\Rightarrow$ loss% $= \frac{200}{20000} \times 100 = 1\%$

Q13



$$P_1 = 10\% x + 12\% (100000 - x)$$



$$P_2 = 12\% x + 10\% (100000 - x)$$

$$\Rightarrow P_2 = P_1 - 120$$

$$\Rightarrow P_1 - P_2 = 120$$

$$-2\% + 2\% (100000 - x) = 120 \Rightarrow x = 47000$$

$\therefore 47 : 53$

(Q14) $SP_1 = 9086$ $SP_2 = 9086$

$9086 = \frac{118}{100} CP_1$ $9086 = \frac{88}{100} \cdot CP_2$

$CP_1 = 7700$ $CP_2 = 10325$

$P_1 = 1386$ $P_2 = 1239$

total profit = $1386 - 1239$

$= 147$

total CP $= 18025$

Profit % $= \frac{147}{18025} \times 100 = 0.815\%$

(Q15)

$CP_1 = 750$ $CP_2 = 750$

$+6\%$ -4%

overall gain $= \frac{6}{100}(750) - \frac{4}{100}(750)$

$= 15$

Overall gain $= \frac{15}{1500} \times 100 = 1\%$ gain

(Q16)

$CP_1 = x$ $C_2 = 2x$

Overall $= \frac{-15}{100}x + \frac{12}{100}(2x)$

$= \frac{9x}{100}$

net profit $= \frac{\frac{9x}{100}}{3x} \times 100$

$= 3\%$

Discount

The new price other than CP is called

CP ⟶ Marked price / labelled price / list price / tage price ⟶ SP

* Discount is by default ~~call~~ calculated on Marked price

(Q17) labelled price = $\frac{130}{100}$ CP

$SP = \frac{90}{100}\left(\frac{130}{100} CP\right)$

$= \frac{117}{100} CP$

i.e., 17 % profit

(Q18) $SP = \frac{125}{100} CP$

$\frac{125}{100} CP = \frac{90}{100} (LP)$ LP - List price

$\frac{5}{4} CP = \frac{9}{10} \left(\frac{500}{100}\right)^{10}$

CP = 360/-

(Q19)

CP = 150×250 + 2500 = 40000

LP = 150×320

↓ -5 %

$SP = \frac{95}{100} \times 150 \times 320 = 45600$

$P\% = \frac{5600}{40000} \times 100 = 14\%$

→ Successive discounts of 10%, 20%, 50% is equal to

_____ % single discount

Sol:

Start assuming initial price is 100

$$100 \xrightarrow{-10\%} 90 \xrightarrow{-20\%} 72 \xrightarrow{-50\%} 36$$

$$100 - 36 = 64$$

∴ 64 % discount

Simple Interest & Compound Interest

* Interest is always calculated on principle

P → principal / sum R → Rate of interest (P.C.Pa)
% per annum

CI → After certain time, interest is added to principal

SI → Interest is never added to principal

* Amount = Principal + interest.

Eg: P = 10000 R = 10% Pa T = 3 years

CI:

Here let us calculate Compounding anually

$$10000 \xrightarrow{+10\%} 11000 \xrightarrow{+10\%} 12100 \xrightarrow{+10\%} 13310$$

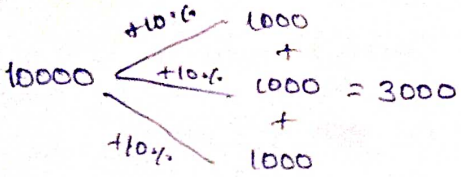
Now CI for 3 years = 13310 − 10000 = 3310

Method 2:

$$\frac{110}{100} \quad \frac{110}{100} \quad \frac{110}{100} \quad P = \left(\frac{11}{10}\right)^3 (10000) = 13310$$

$$\boxed{CI \text{ for } n \text{ years} = P\left(1 + \frac{R}{100}\right)^n - P}$$

SI:



∴ SI for 3 years = 3000

SI for Time T = $\frac{PTR}{100}$

→ SI for 1st year and CI for 1st year when compounded anually is same, if P & R is same in both cases.

day 4

(PU4) A function f defined as $2f(n) = f(n+2) + f(n+1)$ when $n > 0$ and $f(1) = f(2) = -1$. what is the value of $f(1) + f(2) + f(3) + \cdots + f(2020)$?

Sol:

n=1

$2f(1) = f(3) + f(2)$

$-2 + 1 = f(3) \Rightarrow f(3) = -1$

n=2

$2f(2) = f(4) + f(3)$

$f(4) = -2 + 1 = -1$

Sly $f(n) = -1$

$\therefore f(1) + f(2) + f(3) + \cdots + f(2020)$

$-1 + (-1) + (-1) + \cdots + (-1) = -2020$

(Q1) P = 500

SI1:

$\frac{5}{100} \times 500 = 25$

for 3 years, SI = 3×25 = 75

SI2:

500 —(+4%)→ 520 —(+4%)→

$\frac{4}{100} \times 500 = 20$

for 4 years, SI = 4×20 = 80

∴ 80 − 75 = 5

Method 2:

5% pa
3 years
15%

4% pa
4 years
16%

∴ 16% − 15% = 1%

∴ 1% (500) = 5

(Q2)

10% for 1 year —— 1000

10% pa, 2 years —— 2000

73 days = $\frac{1}{5}$th year ⟶ $\frac{1}{5}$ (1000) = 200

∴ total = 2000 + 200 = 2200

(Q3) diff —— 4%

2 yrs —— 8% —— 72

1% —— 9

100% —— 900

Now P = 900

(Q4) $100 \xrightarrow{12 \text{ year}} 200$

12 years produces 100/- interest

we need another 12 yrs to get another 100/- interest

Now after 24 yrs

total = 100 + 100 + 100 = 300

∴ tripled after 24 yrs.

(Q5) diff in 3yrs = 1350 − 1260

= 90

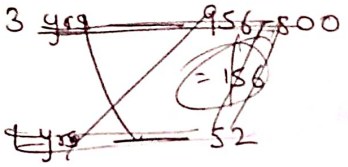
in 1 yr = 30/-

initial amount = 1260 − 2(30)

= 1200

$R = \frac{30}{1200} \times 100 = 2.5\%$ p.a

(Q6)



4% (800) = 32

i.e., 3 yrs ⇒ 32 × 3 = 96

∴ 956 + 96 = 1052

(Q7) $SI_1 = 10\%(12000)$ $SI_2 = 20\%(x)$

= 1200

total SI = 14 PCPA

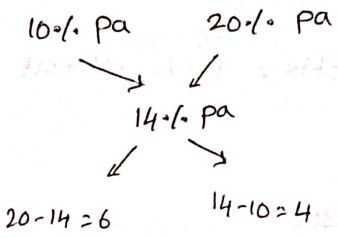
$SI_1 + SI_2 = 14\%(12000 + x)$

$1200 + \frac{20}{100}x = \frac{14}{100}(12000) + \frac{14}{100}x$

$\frac{6}{100}x = 14(120) - 10(120) \Rightarrow \frac{6}{100}x = 4(\frac{20}{120}) \Rightarrow x = 8000$

∴ total investment = 12000 + 8000 = 20000

Method 2 :



$6:4 = 3:2$

$3 - 12000$
$2 - 8000$ } — 20000

★

(Q8) ~~8160~~ $= \frac{(6)3}{100}P + \frac{(9)5}{100}P + \frac{(13)3}{100}P$

~~8160~~ $= \frac{18+45+39}{100}P$

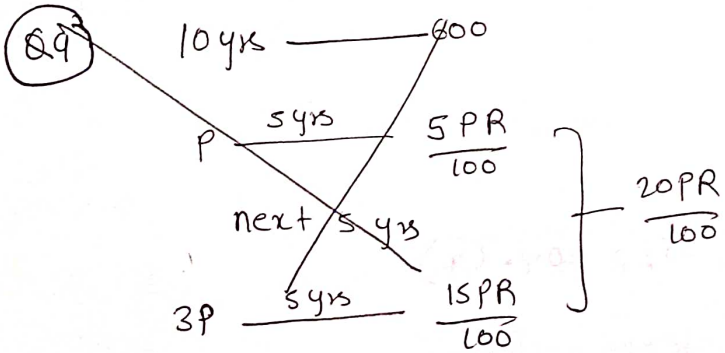
$8160 = \frac{102}{100}P$

~~$8160 = \frac{2}{100}P \Rightarrow P = 8160 \times 50$~~

$P = \frac{50}{51}(8160)$

$P = 8000$

(Q9)



(Q9) 10 yrs — 600

1 yrs —

5 yrs — ~~600~~ 300

2nd 5 yrs — 6 300 × 3

$\therefore$ 300 + 900 = 1200

(Q10) $\frac{105}{100} \cdot \frac{110}{100} \cdot \frac{120}{100} x = 1386$

$x = 1000$

(Q11) for 2yrs ——— $\frac{110}{100} \frac{110}{100} 4000$

4840

for 3mnths — 2.5

$\frac{2.5}{100}(484) \quad \frac{41}{\cancel{102.5}} \frac{121}{100}(484)$

121×41
121
484
4961

$= 4961$

$CI = 4961 - 4000 = 961$

(Q12) 20% for 1yr

5% for quarter year

~~amount = 16000~~ $\frac{8}{100} \frac{8}{100} \frac{5}{100}$

amount $= 16000 \frac{21}{100} \cdot \frac{21}{100} \cdot \frac{21}{100}$

21×21
21
42
441

441×42
882
1764
18522

$= 42 \times 441 = 18522$

$\therefore CI = 18522 - 16000 = 2522$

(Q13) $P \xrightarrow{4yrs} 3P \xrightarrow{4yrs} 9P \xrightarrow{4yrs} 27P \xrightarrow{4yrs} 81P$

$\therefore$ 16 yrs.

(Q14) $x^3 P = 2200$

$x^6 P = 4400 \Rightarrow x^3 = 2$

$x^3 P = 2200$

$\Rightarrow P = \frac{2200}{2} = 1100$

Method 2 :

$P \xrightarrow{+3yrs} 2200 \xrightarrow{3\ yrs} 4400$

∴ amount is doubling after 3 yrs

$\therefore P = \frac{2200}{2} = 1100$

(Q15) $P \xrightarrow{+8} 3P \xrightarrow{+8} 3^2P \xrightarrow{+8} 3^3P \xrightarrow{+8} 3^4P \xrightarrow{+8} 3^5P$ (243P)

∴ 40 yrs

(Q16) $x^{15}P = 27P \Rightarrow x^{15} = 27 \Rightarrow (x^5)^3 = 3^3 \Rightarrow x^5 = 3$

In 25 years,

$x^{25}P = (x^5)^5 P$

$= 3^5 P$

∴ 243 times

(Q17) 5% — 1yrs

10% — 2yrs

10% → 60

100% — 600

P = 600

CI :

600 → +5% → 630 → +5% → 661.5

600 → +10% → 660 → +10% → 726

∴ 661.5 − 600

= 61.5

Method 2

SI for 1st yr = 30

SI for 2nd yr = 30

CI for 1st yr = 30

CI for 2nd yr = 30 + 5% (30)

= 30 + 1.5 = ₹31.5

∴ Total CI = 30 + 31.5 = 61.5

Q18

12500

+20%

15000

-2000 (repayment)

end of 1st yr 13000

+20%

15600

-2000 (repayment)

end of 2nd yr 13600

+20% i.e. 2720

16320

-2000 (repayment)

14320

Q19

$\left(\frac{R}{100}\right)^3 P - \left(\frac{R}{100}\right)^2 P$

$x^3P - x^2P = 5324 - 4840$

$x^2P(x-1)$

(819) $P\left(1+\frac{R}{100}\right)^2 = 4840$ — (1)

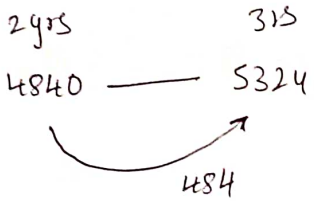
$P\left(1+\frac{R}{100}\right)^3 = 5324$ — (2)

$\frac{(2)}{(1)} \Rightarrow 1+\frac{R}{100} = \frac{5324}{4840}$

$\frac{R}{100} = \frac{484}{4840}$

$\Rightarrow R = 10\%$ pa

Method 2



$R = \frac{484}{4840} \times 100 = 10\%$

(820) $\left(\frac{110}{100}\right)^5 P \geq 10^6$

$P \geq \frac{10^6 \times 10^5}{115}$

$\Rightarrow P = 621000$

(821) CI for 1st yr $= x$

CI for 2nd yr $= x + \frac{12.5}{100}x$

$\Rightarrow x + x + \frac{12.5}{100}x = 510$

$x\left(2+\frac{0.125}{1}\right) = 510$

$x = \frac{510}{2.125}$

SI for 2yrs $= 2x = \frac{1020}{2.125} = 480$

Method 2 :

$P\left(\frac{112.5}{100}\right)^2 - P = 510$

$P\left(1+\frac{1}{8}\right)^2 - P = 510$

$P\left(\frac{9}{8}\right)^2 - P = 510$

$P\left(\frac{81-64}{64}\right) = 510 \Rightarrow P = 1920$

SI = 12.5% pa

for 2yrs 25%

$\frac{25}{100}(1920) = 480$

Problems on Ages:

present age = 'x' years

After / from now / hence / in / later 5 years $\longrightarrow$ x+5 years

3 year ago / before / back $\longrightarrow$ x-3 years

(Q22) Present age = 3

$(x+3)(3) - 3(x-3)$

$3x+9-3x+9 = 18$

(Q23) $\frac{x}{y} = \frac{5}{3} \Rightarrow x = \frac{5y}{3}$

$\frac{x-4}{y+4} = \frac{1}{1} \Rightarrow x-4 = y+4$

$x-y = 8$

$\frac{5y}{3} - y = 8 \Rightarrow \frac{2y}{3} = 8 \Rightarrow y = 12$

$\Rightarrow x = 20$

$\frac{x+4}{y-4} = \frac{24}{8} \Rightarrow 3:1$

Q24

A – x B – y

$x + 10 = 2(y - 10)$ — ①

$x = y + 9$ — ②

② in ① $\Rightarrow 10 + y + 9 = 2y - 20$

$\Rightarrow y = 39$

Q25

$x = 5 + 2y \Rightarrow y = \frac{x-5}{2}$

Hema – x
Hari – y
Suraj – z

$z = 10y - 13$

$z = 3x$

$3x = 10y - 13$

$3x = 5\left(\frac{x-5}{2}\right) - 13$

$3x = 5x - 25 - 13$

$2x = 38 \Rightarrow x = 19$

Q26

$\frac{x-6}{y-6} = \frac{6}{5} \Rightarrow 5x - 30 = 6y - 36$

$\Rightarrow 5x - 6y = -6$

$\frac{x+4}{y+4} = \frac{11}{10} \Rightarrow 10x + 40 = 11y + 44$

$\Rightarrow 10x - 11y = 4$

$10x - 12y = -12$

$10x - 11y = 4$

$- \quad + \quad -$

$-y = -16 \Rightarrow y = 16$

Q27

$M - 10 = 4(d - 10)$

$M + 10 = 2(d + 10)$

$-20 = 2d - 60$

$\Rightarrow 2d = 40 \Rightarrow d = 20$

Q28

$F = 38$

$S = x$

At the time of birth fathers age $= 38 - x$

$\therefore 38 - x = x$

$\Rightarrow 2x = 38 \Rightarrow x = 19$

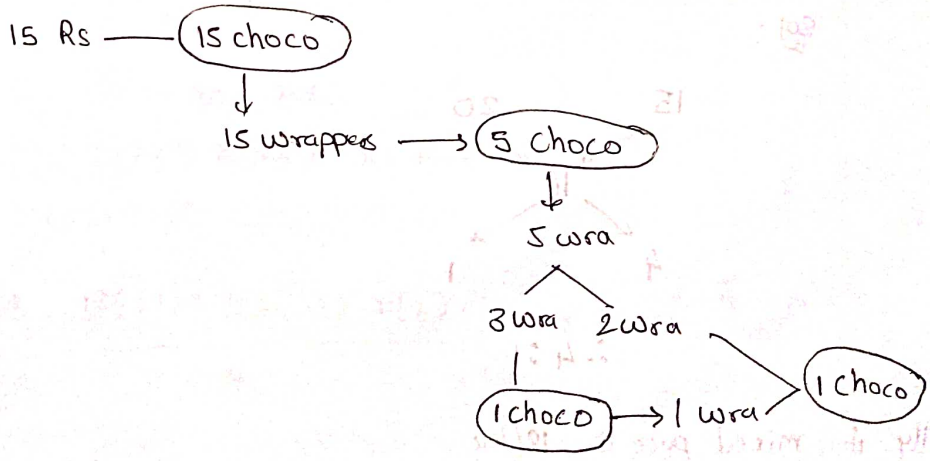
5 yrs back

$\therefore x - 5 = 19 - 5 = 14$

06/08/20
day 5

PU5 you have 15 Rs with you. You go to a shop and shopkeeper tells you price as 1 Rs per chocolate. He also tells you that you can get a chocolate in return of 3 wrappers. How many maximum chocolates you can eat?

Sol:



$\therefore$ Total of 22 chocolates.

Allegations & Mixture

Eg: The cost of type 1 rice is Rs. 15 per kg and type 2 rice is Rs. 20 per kg. If both type 1 and type 2 are mixed in the ration of 2:3, then mixed rice price per kg is:

Sol:

15 kg 20 kg

2 : 3

$$\text{Mixed rice/kg} = \frac{15(2)+20(3)}{2+3} = \frac{90}{5} = 18$$

Silly if the ratio is 4:1

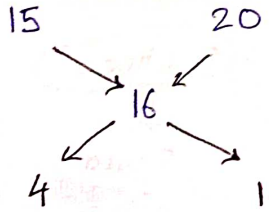
$$\text{Mixe rice/kg} = \frac{15(4)+20(1)}{5} = \frac{60+20}{5} = 16$$

→ Mixed price must be b/w ~~extreem~~ extremes

i.e., b/w the two prices

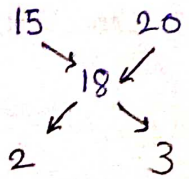
Eg: Type 1 is 15/kg, Type 2 is 20/kg. Mixed price is 16/kg. Now find the ratio in which they are mixed.

Sol:



∴ 4:1

Silly if mixed price is 18/kg



∴ 2:3

(Q1)

P_1	P_2	P_3
50%	60%	65%

$$\text{Overall \%} = \frac{50(1) + 60(2) + 65(2)}{1+2+2} = 60\%$$

(Q2)

B		G
x%		90%
	80%	
4		3

$$\frac{90-80}{80-x} = \frac{4}{3}$$

$$30 = 320 - 4x$$

$$x = \frac{290}{4} = 72.5$$

(Q3)

9.30		x
	10	
8		7

$$\frac{x-10}{10-9.30} = \frac{8}{7}$$

$$7x - 70 = 0.56$$

$$7x = 70.56 \Rightarrow x = 10.8$$

(Q4)

$$153 = \frac{126(1) + 135(1) + x(2)}{4}$$

$$261 + 2x = 612$$

$$2x = 351$$

$$x = 175.5$$

Q5

-5 $\qquad$ 10

7

3 $\qquad$ 12

$1 : 4$

$\therefore$ 40 kgs & 10 kgs

Q6

$SP = 110\%\ CP$

$CP = \frac{10\cancel{0}}{11\cancel{0}}(9.24)$

$CP = 10(0.84) = 8.4$

9 $\qquad$ 7

8.4

$x : 27$

$$\frac{9-8.4}{8.4-7} = \frac{27}{x}$$

$x(0.6) = 27(1.4)$

$x(\frac{\cancel{6}}{\cancel{10}}) = \cancel{27}^{9}(\frac{14}{\cancel{10}}^{7})$

$x = 63$ kgs

Q7

A	B
60	100
3 : 2	1 : 4
36 (lead) 24 (tin)	20 (tin) 80 (cu)

A	B
3 : 2	1 : 4
36	24

$\therefore 20 + 24 = 44$

Q8

$CP = \frac{100}{120}(SP) = \frac{10\cancel{0}}{12\cancel{0}}(96) = 80$

T_1	T_2	T_3
60	75	100

80/kg

T_1	T_2
60	75
80	
α	

Avg must be blw extremes

T_2	T_3
75	100
80	
20	5
4 : 1	

T_1	T_3
60	100
80	
20	20
1 : 1	

(In case of joint ratio we don't add)

$T_1 : T_3 = 1 : 1$

$T_2 : T_3 = 4 : 1$

This mixed joint ratio but not joint ratio.

Here next we add the common values i.e., T_3 in this case

$\therefore T_1 : T_2 : T_3 = 1 : 4 : (1+1)$

$= 1 : 4 : 2$

☆

Eg : Mixed ratios.

$a : b = 2 : 3$

$b : c = 4 : 5$

$a : b : c = 2 : (3+4) : 5$

$= 2 : 7 : 5$

(89)

A	B
5 : 2	7 : 6

$C = A : B$

$|$

$8 : 5$

Consider only spirit

A	B
$\frac{5}{7}$	$\frac{7}{13}$

$\frac{8}{13}$

$\frac{8}{13} - \frac{7}{13} : \frac{5}{7} - \frac{8}{13}$

$\frac{\frac{1}{13}}{\frac{5}{7} - \frac{8}{13}} = \frac{\frac{1}{13}}{\frac{65-56}{91}} = \frac{7}{9}$

gold 1 gold 2

$\frac{7}{9}, \frac{2}{9}$ $\frac{13}{16}, \frac{3}{16}$

3 : 4

i.e., $\frac{\frac{7}{9}(3) + \frac{13}{16}(4)}{\frac{2}{9}(3) + \frac{3}{16}(4)} =$ $\frac{287 + 117}{36} = \frac{404}{36} = 35$

$\frac{8+27}{36}$

$\frac{\frac{28+39}{12}}{\frac{8+9}{12}} = \frac{67}{17}$

$\therefore 67 : 17$

(8.12)

A B

$\frac{2}{5}, \frac{3}{5}$ $\frac{3}{10}, \frac{7}{10}$

1 : 1

$\frac{\frac{2}{5} + \frac{3}{10}}{\frac{3}{5} + \frac{7}{10}} = \frac{4+3}{6+7} = \frac{7}{13}$

Remove & Replacement Questions :

(8.13)

Step 1 :

Split: 200 $\xrightarrow{-20 \text{ lit}}$ S 180 l $\xrightarrow{+20}$ S → 180, W → 20 (200)

Step 2 :

S : 180
W : 20

-20 lit $S' = 180\left(1 - \frac{20}{200}\right) = 180 \times \frac{9}{10} = 162$

$W' = 20\left(1 - \frac{20}{200}\right) = 20 \times \frac{9}{10} = 18$

$\left.\begin{matrix} \\ \end{matrix}\right\}$ +20W $\left\{\begin{matrix} S = 162 \\ W = 38 \end{matrix}\right.$

Step 3

$S = 162$, $W = 38$ $\xrightarrow{-20\text{lit}}$ $S'' = 162\left(1-\frac{20}{200}\right) = 162 \times \frac{9}{10} = 145.8$

$W'' = 38\left(1-\frac{20}{200}\right) = 38 \times \frac{9}{10} = 34.2$ $\xrightarrow{+20}$ $S : 145.8$, $W : 54.2$

Spirit % $= \frac{145.8}{200} \times 100 = 72.9\%$

Shortcut:

spirit left

$$= 200\left(1-\frac{20}{200}\right)\left(1-\frac{20}{200}\right)\left(1-\frac{20}{200}\right)$$

180

162

145.8

i.e., $200\left(\frac{9}{10}\right)^3$

Eg: If removal & replacement is as shown below, then find amount of spirit left

Spirit 200l $\xrightarrow{-20S, +20W}$ ① $\xrightarrow{-30S, +20W}$ ② $\xrightarrow{-40S, +40W}$ ③

Spirit left $= 200\left(1-\frac{20}{200}\right)\left(1-\frac{30}{190}\right)\left(1-\frac{40}{180}\right)$

↑ cuz we add only Col back

Spirit left $= 200\left(\frac{9}{10}\right)\left(\frac{16}{19}\right)\left(\frac{14}{18}\right)$

water left = total - spirit left

(Q14)

20 lit

M W

12.5 7.5

$-4(2.5, 1.5)$

i.e., 10, 6

+4 M

14, 6

i.e., 7 : 3

Method 2

water left $= 20 \times \frac{3}{8}\left(1-\frac{4}{20}\right)$

$= \frac{\cancel{20}^{2} \times 3}{\cancel{8}_{2}} \times \frac{4}{\cancel{5}} = 6$ lit

∴ Milk left $= 20-4-6 = 10$

$10 + 4 : 6$

$14 : 6$

$7 : 3$

Method 3 :-

20

-4 lit

16 lit left

However the ratio in which we have milk & water won't be disturbed.

16

10M 6W

5 : 3

+4 M

⇒ 14 M 6 W

i.e., 7 : 8

(Q15) total $= x$ lit

milk remaining $= x\left(1-\frac{4}{x}\right)^4$

⇒ water $= x - x\left(1-\frac{4}{x}\right)^4$

$\frac{\text{Milk}}{\text{water}} = \frac{x\left(1-\frac{4}{x}\right)^4}{x-x\left(1-\frac{4}{x}\right)^4} = \frac{\left(\frac{x-4}{x}\right)^4}{1-\left(\frac{x-4}{x}\right)^4}$

$= \frac{(x-4)^4}{x^4-(x-4)^4} = \frac{16}{65}$

$\Rightarrow 65(x-4)^4 = 16x^4 - 16(x-4)^4$

$\Rightarrow 16x^4 = 81(x-4)^4$

$\Rightarrow (2x)^4 = [3(x-4)]^4$

$\Rightarrow 2x = 3x-12$

$\Rightarrow x = 12$

Method 2 :

Milk left $= x\left(1-\frac{4}{x}\right)^4$

milk : water = 16 : 65

$\Rightarrow \frac{\text{milk}}{\text{total}} = \frac{16}{81} = \frac{x\left(1-\frac{4}{x}\right)^4}{x}$

$\Rightarrow \left(\frac{x-4}{x}\right)^4 = \frac{16}{81}$

$\Rightarrow \frac{x-4}{x} = \frac{2}{3}$

$\Rightarrow 3x-12 = 2x \Rightarrow x = 12$

07/08/20
day 6

(PU6) If $f(f(n)) + f(n) = 2n+3$, $f(0)=1$ find $f(2012)$.

Sol :

$n=0$

$f(f(0)) + f(0) = 2(0)+3$

$f(1) = 2$

$n=1$

$f(f(1)) + f(1) = 2(1)+3$

$f(2) = 2+3-2 \Rightarrow f(2) = 3$,

$n=2$

$f(3) + 3 = 2(2)+3$

$f(3) = 4$

$n=3$

$f(4)+4=2(3)+3$

$f(4)=5$

$n=4$

$f(5)+5=8+3$

$f(5)=6$

Silly $f(2012)=2013$

Percentages:

percentage Comparision

A is 20% higher than B then B is ____ % less than A

$A=120\%\ B=\frac{120}{100}B$

$\Rightarrow B=\frac{5}{6}A$

$B=\left(1-\frac{1}{6}\right)A$

i.e. $\frac{1}{6}\times 100=16\frac{2}{3}\%$

Shortcut:

$$\frac{x}{y}\uparrow \Longrightarrow \frac{x}{x+y}\downarrow$$

(Q1) $n_1=85\%\ (n_3)$ $n_2=80\%\ (n_3)$

$\frac{n_1}{n_2}=\frac{85}{80}$

$\Rightarrow n_1=\frac{85}{80}n_2$

$\Rightarrow \frac{85}{80}\times 100=106.25\%$

(Q2) Say $n = 100$

60M 40F

80 came to party

? 40F

∴ 40 M attended

∴ 1 : 1 ratio

(Q3)

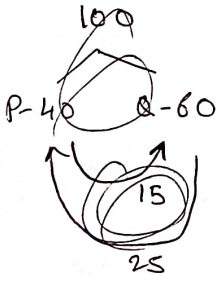
X	Y
300	100
↓	↓
1% (300) = 3	2% (100) = 2

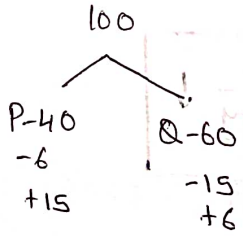
$$\frac{5}{400} \times 100 = 1.25\%$$

Method 2 :

$$\frac{3\left(\frac{1}{100}\right) + 1\left(\frac{2}{100}\right)}{3+1} = 1.25\%$$

(Q4)





15% (40) = 6

25% (60) = 15

P - 49 Q - 51

51 − 49 = 2 votes

100 — 2

? — 6

∴ ₹300

(Q5)

$$\left(\frac{5\%}{100}\right)\left(\frac{7\%}{100}\right) = \frac{35}{100}$$ i.e., 35%

↑ infected ↓ no symptoms

(Q6) $43 + 17 + 12 + 3 = 75\%$ delayed

$\therefore 25\%$ on time

$\frac{25}{100} \times 1200 = 300$

$75 - 1200$

$25 - ?$

$\frac{1200}{75} \times 25 = 400$

(Q7) $7\% - 6\% \longrightarrow 80$

$1\% \longrightarrow 80$

$\Rightarrow 100\% \longrightarrow 8000$

(Q8) 1400 M

Mobile $\longrightarrow 70\% (1400\ M)$

980 M

294 M access internet

$\frac{1}{2}(294M) =$ 147 M buyers

$\therefore \frac{147}{1400} \times 100 = 10.5\%$

(Q9) $45\% - 22\% \longrightarrow 40 + 52$

$23\% \longrightarrow 92$

$\Rightarrow 1\% \longrightarrow 4$

$\Rightarrow 100\% \longrightarrow 400$

(Q10) $x + y = 95 \Rightarrow y = 95 - x$

$0.9x + 1.2y = 90$

$0.9x + 1.2(95 - x) = 90$

$0.9x + 114 - 1.2x = 90$

$0.3x = 24 \Rightarrow x = \frac{240}{3} = 80$

Q11

enrolled members — n

casted members — $\frac{90}{100}n$

valid votes — $\left(1-\frac{10}{100}\right)\frac{90}{100}n = \frac{90}{100}\frac{90}{100}n$

~~won won by 54%~~ ⇒ 1620 ma

54% ⇒ won by 1620

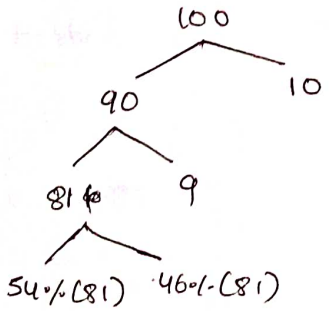
i.e., 54% − 46% = 1620

8% = 1620

$\Rightarrow \frac{8}{100}\frac{90}{100}\frac{90}{100}n = 1620$

$\Rightarrow n = 25000$

Method2 :



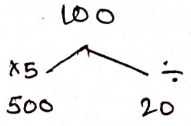
⇒ 8%(81) = 6.49

100 — 6.49

? ← 1620

$\frac{100}{6.49} \times 1620 = 25000$

Q12

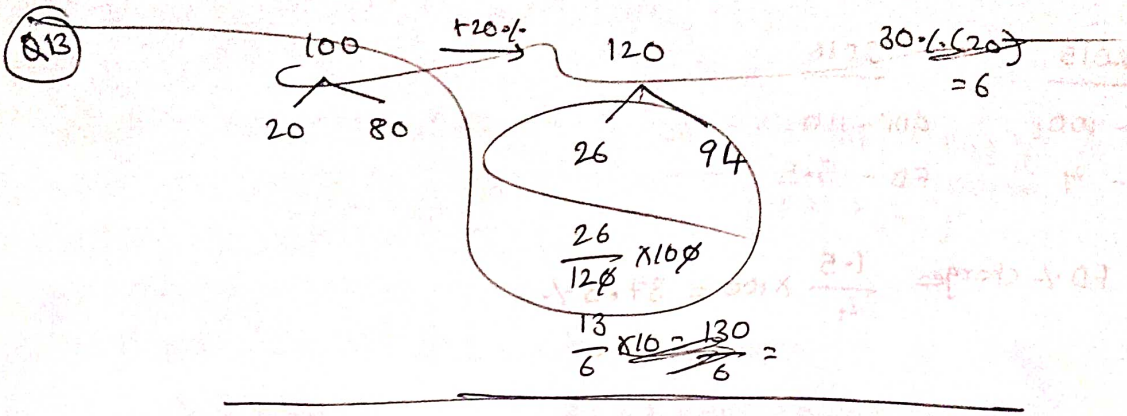


error = 500 − 20 = 480

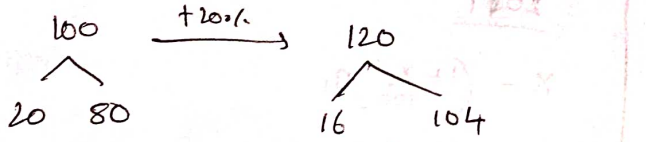
% = $\frac{480}{500} \times 100 = 96\%$

error % = $\frac{\text{Change}}{\text{Corret val}} \times 100$

Q13



Q13



30% (80)
=24

~~% saving = 16/120 ×100~~
=

% change in saving = $\frac{20-16}{20} \times 100$ = ~~40%~~ 20% fall.

Q14 $V = \frac{1}{3}\pi r^2 h$

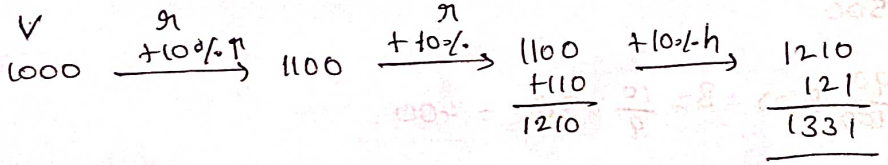
$= \frac{1}{3}\pi \left(\frac{110}{100}\right)^2 r^2 \frac{110}{100} h$

$= \frac{1}{3}\pi r^2 h \left(\frac{1331}{1000}\right)$

$= V + \frac{331}{1000} V$

$\Rightarrow 33.1\%$ ↑

Method 2:



$\Rightarrow$ 331 raise

i.e., 33.1% ↑

Q.15

2015	2016
GDP - 100	GDP - 110
FD - 4	FD - 5.5

FD % change $= \frac{1.5}{4} \times 100 = 37.5\%$

Q.16

2001	2001
Population of X $- n_1$	$X - \left(1+\frac{x}{100}\right)n_1$
population of Y $- n_2$	$Y - \left(1+\frac{y}{100}\right)n_2$
$P_1 = \frac{n_1}{n_2}$	$P_2 = \frac{\left(1+\frac{x}{100}\right)n_1}{\left(1+\frac{y}{100}\right)n_2}$

$$\Rightarrow \%\text{ change of } P = \frac{P_2 - P_1}{P_1} \times 100$$

$$= \frac{\frac{\frac{100+x}{100}\cdot n_1}{\frac{100+y}{100}\cdot n_2} - \frac{n_1}{n_2}}{\frac{n_1}{n_2}} \times 100$$

$$= \frac{\frac{100+x}{100}}{\frac{100+y}{100}} - 1 \times 100 \Rightarrow \left(\frac{100+x}{100+y} - 1\right)100$$

$$\Rightarrow \frac{(x-y)\,100}{100+y}$$

Q.17

$A - \frac{360}{500}$

$A = \frac{90}{100} B \Rightarrow B = \frac{10}{9} \times 360 = 400$

$B = \frac{125}{100} C \Rightarrow C = \frac{100}{125}\,\frac{80}{8}\,(400) = 320$

$C = \frac{80}{100} D \Rightarrow D = \frac{10}{8}(320) = 400$

$D\% = \frac{400}{500} \times 100 = 80\%$

09/08/20
day 7

Q07

Simplify

$$\frac{77!(77!-2*54!)^3}{(77!+54!)^3} + \frac{54!*(2*77!-54!)^3}{(77!+54!)^3}$$

a) $2*77!+2*54!$ b) $77!-54!$

c) $77!+54!$ d) $2*77!-2*54!$

Sol:

The exp is of form

$$\frac{a(a-2b)^3}{(a+b)^3} + \frac{b(2a-b)^3}{(a+b)^3}$$

Put $a=4$ $b=1$

$$\frac{4(4-2)^3}{(4+1)^3} + \frac{1(8-1)^3}{(4+1)^3} = \frac{32+243}{125} = \frac{375}{125} = 3$$

option verify e

a) $2a+2b = 2(4)+2(1) = 10 \neq 3$

b) $a-b = 4-1 = 3$ ✓

c) $a+b = 4+1 = 5$

d) $2a-2b = 8-2 = 6$

∴ opt (b)

Q1

$$10000\left(\frac{110}{100}\right)\left(\frac{88}{100}\right)\left(\frac{130}{100}\right)$$

$(880)(130) = 114400$

Q2

100

20 E — 50-(-(80) = 40 H — 40 Other language

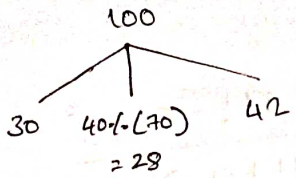
40 — 900

100 — ?

225
900
40

$\times 100 = 2250$

Q3



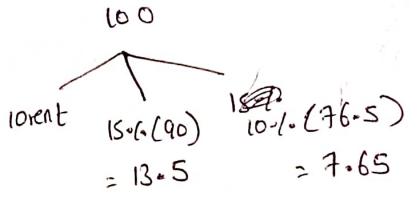
remaining = 100 - 30 - 28

= 42

Saving = 50% (42) = 21%

$\therefore \frac{21}{100} \times 18400 =$ ~~3684~~ 3864

Q4



100 - 10 - 13.5 - 7.65 = 68.85

68.85 —— 1377

100 —— ?

$\frac{1377}{68.85} \times 100 = 2000$

Q5

~~(Price) (con) = x~~

$P_1 C_1 = x$

$P_2 C_2 = x$

$\frac{125}{100} P_1 \cdot C_2 = P_1 C_1$

$C_2 = \frac{100}{125} C_1$

$C_2 = \frac{4}{5} C_1 \Rightarrow C_2 = (1 - 1/5) C_1$

$\therefore C_2$ must decrese by 20%

Method 2:

P ↑ 25% $\Rightarrow$ E ↑ 25%

now · C ↓ = ? % $\frac{1}{4}$ ↑ $\Rightarrow \frac{1}{1+4}$ ↓ $\Rightarrow \frac{1}{5}$ ↓

i.e., 20%

Q6) $\frac{6}{10} \uparrow \Rightarrow \frac{6}{6+10} \downarrow \Rightarrow \frac{6}{16} \downarrow \Rightarrow \frac{3}{8} \downarrow$

$\frac{3}{8} \times 100 = 37.5\% \downarrow$

Q7)

n_1, c_1	$n_1+3,\ 0.9c_1$

$n_1 c_1 = 225 \quad (n_1+3)(0.9c_1) = 225$

$\Rightarrow n_1 c_1 = 0.9 n_1 c_1 + 2.7 c_1$

$\Rightarrow 0.1 n_1 c_1 = 2.7 c_1$

$\Rightarrow n_1 = 27$

$\Rightarrow n_1 + 3 = 30$

reduced price $= \frac{225}{30} = 7.5$

$x(0.1)c = 3(0.9)c$

$\Rightarrow x = 27$

c, x	$0.9c, x+3$

Method 2 :

we can directly for an equation

If n_1 is no of kgs purchased before cost reduction

Since each kg is reduceby $0.1c_1$ we got a chance to by 3 more kgs at reduced price

$n_1(0.1c_1) = 3(0.9c_1)$

$\Rightarrow n_1 = 27 \Rightarrow n_2 = 30$

$\Rightarrow c_2 = \frac{225}{30} = 7.5$

Method 3 :

Initial cost = 225

$\xrightarrow{-10\%}$ 22.5 → Now for this we are getting 3kgs

$\Rightarrow$ reduced price $= \frac{22.5}{3} = 7.5$

Q8

60

40M 20W

1 : 2

$\Rightarrow \frac{40}{x} = \frac{1}{2}$

$x = 80$

$80 - 40 = 40$ lit

$80 - 20 = 60$ lit

Q9

$\frac{36}{x} \times 100 = 80$

$\Rightarrow x = \frac{36}{4} \times 5 = 45$

$\Rightarrow$ water $= 45 - 36 = 9$ lit

Q10

40

36W 4B

80% W 20% B

$\frac{80}{20} = \frac{4}{1}$

$\Rightarrow \frac{36}{B} = \frac{4}{1} \Rightarrow B = 9$

req blue paint $= 9 - 4 = 5$ lit

Ratio, Proportion & Variations:

* $\frac{1}{3} : \frac{1}{4} : 6\frac{1}{6} = \frac{12}{3} : \frac{12}{4} : \frac{12}{6} = 4 : 3 : 2$

Q11

Correct $\Rightarrow$ $4 : 3 : 2$ = 52, 39, 26

Wrong $\Rightarrow$ $\frac{1}{4} : \frac{1}{3} : \frac{1}{2} = \frac{12}{4} : \frac{12}{3} : \frac{12}{2} = 3 : 4 : 6$

$\Rightarrow 27 : 36 : 54$

$\Rightarrow 54 - 26 = 28$

Q12 total = 70

a) 1:4 => 1+4 = 5, 5/70 ✓

b) 4:3, => 4+3 = 7, 7/70 ✓

c) 1:6 => 1+6 = 7, 7/70 ✓

d) 1:3 => 1+3 = 4 and 4/70

∴ opt (d)

Q13 5 : 7 : 8

+40% +50% +75%

↓ ↓ ↓

7 : 10.5 : 14

=> 14 : 21 : 28

=> 2 : 3 : 4

** Joint ratio

Q14 A : B =

Joint Ratio :

If we are given A:B, B:C & C:D then

→ $A:D = \frac{A}{D} = \frac{A}{B} \times \frac{B}{C} \times \frac{C}{D}$

Q14 A : B = 2 : 3 B : C = 4 : 5 C : D = 6 : 7

wkt $\frac{A}{D} = \frac{A}{B} \times \frac{B}{C} \times \frac{C}{D} = \frac{2 \times 4 \times 6}{3 \times 5 \times 7}$

A : D

$2 \times 4 \times 6 : 3 \times 5 \times 7$

A : B : C : D = $2 \times 4 \times 6 : 3 \times 4 \times 6 : 3 \times 5 \times 6 : 3 \times 5 \times 7$

2 : 3 4 : 5 6 : 7

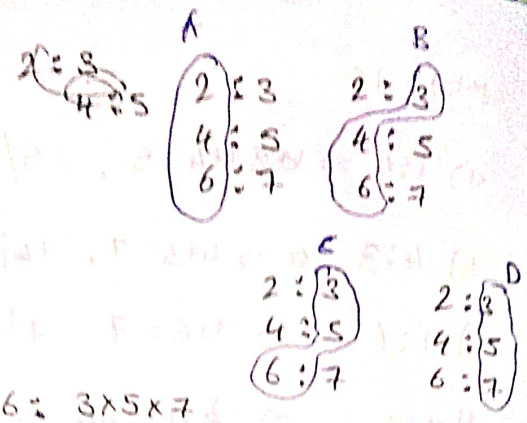
= 48 : 72 : 90 : 105 = 16 : 24 : 30 : 35

Method 2:

$A:B = 2:3$

$B:C = 4:5$

$C:D = 6:7$



$A:B:C:D = 2\times4\times6 : 3\times4\times6 : 3\times5\times6 : 3\times5\times7$

Method 3:

Verify which option hay

$A:B = 2:3$

i.e., only opt (B)

(Q15) Assume we have 'n' coins

$$\Rightarrow \frac{25n}{6} + \frac{10(2n)}{6} + \frac{5(3n)}{6} = 30\times100$$

$$\Rightarrow 25n + 20n + 15n = 18000$$

$$\Rightarrow n = \frac{18000}{60}$$

$$n = 300$$

5 paise $\Rightarrow 300\left(\frac{3}{6}\right) = 150$

(Q16) Income - I Saving - S

$S_1 = \frac{7}{16} I_1$ | $S_2 = \frac{3}{7} I_2$

$\Rightarrow S_1 = S_2$

$\Rightarrow \frac{7}{16} I_1 = \frac{3}{7} I_2$

$\Rightarrow \frac{I_1}{I_2} = \frac{48}{49}$

Q.16 Income - I Expense = E, Saving = S

$I_1 : I_2 = 9 : 7 \Rightarrow I_1 = \frac{9}{16} I \quad I_2 = \frac{7}{16} I$

$E_1 : E_2 = 4 : 3 \Rightarrow E_1 = \frac{4}{7}$

$S_1 = \frac{9}{16} I - \frac{4}{7} E = 2000$

$S_2 = \frac{7}{16} I - \frac{3}{7} E = 2000$

$S_1 = S_2$

$\Rightarrow \frac{9}{16} I - \frac{4}{7} E = \frac{7}{16} I - \frac{3}{7} E$

$\frac{2}{16} I = \frac{1}{7} E$

$\frac{I}{E} = \frac{8}{7}$

Q.16

$A_I : B_I = 9 : 7$

$A_I = 9x, \quad B_I = 7x$

$A_E : B_E = 4 : 3$

$A_E = 4y \quad B_E = 3y$

$\Rightarrow A_S = A_I - A_E \Rightarrow 2000 = 9x - 4y$

$B_S = B_I - B_E \Rightarrow 2000 = 7x - 3y$

$\Rightarrow y = 2x$

$\Rightarrow x = 2000, \quad y = 4000$

$\Rightarrow 9x = 18000, \quad 7x = 14000$

Q.17

70 → 40B, 30G

30G → 6R, 24P

70 → 16R, 54P

$\Rightarrow$ 40B → 10R, 30P

$\Rightarrow 10 : 30$

$= 1 : 3$

(Q18) $2430 = A+B+C$

$(A-5) : (B-10) : (C-15) = 3:4:5$

$3x \quad 4x \quad 5x$

$A-5=3x \Rightarrow A=3x+5$

$\Rightarrow B=4x+10$

$\Rightarrow C=5x+15$

$\Rightarrow A+B+C=2430$

$\Rightarrow 12x+30=2430$

$\Rightarrow x=200$

$\Rightarrow$ A's share $= 3x+5$

$= 605$

$A-5=3x$

$\Rightarrow A=3x+5$

Proportions :

→ a, b, c (3rd proportion) are in proportion

b: mean proportion

$\Rightarrow \boxed{\frac{a}{b}=\frac{b}{c} \Leftrightarrow b^2=ac}$

→ if a, b, c, d (b, c: means; a, d: extremes) are in proportion

$\boxed{\frac{a}{b}=\frac{c}{d} \Leftrightarrow ad=bc}$ (4th proportion.)

i.e., product of extremes = product of means

(Q19)

$12, 30, x$

$9, y, 25$

$\Rightarrow \frac{x}{y} = ?$

$30^2 = 12x \Rightarrow x = \frac{30 \times 30}{12}$

$y^2 = 9 \times 25 \Rightarrow y = 3 \times 5 = 15$

$\Rightarrow \frac{x}{y} = \frac{30 \times 30}{12 \times 15} = 5:1$

Variations

$T \propto \frac{1}{S}$

time inversly varies with speed

$D \propto S$

distance directly varies with speed

* Area of square directly varies with square of size.

Joint variation:

$y = ax + b$

$y = ax^2 + bx + c$

Here y is partially contant and partially varies with x.

(Q20)

$P+3 \propto \frac{1}{\sqrt{q}}$

$\Rightarrow P+3 = \frac{k}{\sqrt{q}}$

$P = -2, q = 4$

$-2+3 = \frac{k}{\sqrt{4}}$

$\Rightarrow k = \pm 2$

$P+3 = \frac{\pm 2}{\sqrt{q}}$

$\Rightarrow P+3 = \frac{\pm 2}{\sqrt{9}}$

$\Rightarrow P+3 = \frac{\pm 2}{3}$

$P = \frac{2}{3} - 3$ | $P = \frac{-2}{3} - 3$

$P = -\frac{7}{3}$ | $P = -\frac{11}{3}$

(Q21)

Let weight be 100 → 675000

4 : 5 : 6

4x 5x 6x

(Q21) Let weight = w

Cost = C

$C \propto w^2$

$C = kw^2$

$675000 = k w^2 \Rightarrow k = \frac{675000}{w^2}$

$4 : 5 : 6$

$\frac{4}{15}w, \frac{5}{15}w, \frac{6}{15}w$

$C_1 \quad C_2 \quad C_3$

$C_1 = k\frac{4^2}{15^2}w^2 \quad C_2 = k\left(\frac{5^2}{15^2}\right)w^2 \quad C_3 = k\left(\frac{6^2}{15^2}\right)w^2$

$C_1 = \frac{675000}{w^2}\frac{4}{15}w^2$ $\quad C_2 = 67500\left(\frac{5}{15}\right)$ $\quad C_3 = 45000(6)$

$C_1 = 45000(4)$ $\quad C_2 = 45000(5)$ $\quad = 270000$

$= 180000$ $\quad = 225000$

$\Rightarrow C_1 + C_2 + C_3 =$

$C_1 = \frac{675000}{w^2}\left(\frac{16}{225}\right)w^2 \quad C_2 = \frac{675000}{w^2}\frac{25}{225}w^2 \quad C_3 = \frac{675000}{w^2}\frac{36}{225}w^2$

$\Rightarrow C_1 + C_2 + C_3 = \frac{3000}{675000}(77)$

$= 231000$

$\therefore \text{loss} = 675000 - 231000$

$= 444000$

11/08/20 (PUB)

days

A drinks machine offers three solutions tea, coffee or one of the two at random but the machine has been wired up wrongly so that each button does not give what it claims. If each drink cost, Rs.50 what is the minimum amount of money that must be spent to determine with certainity the correct labeling

of the button?

a) Rs.100 b) Rs.50 c) Rs.150 d) can't be determined

Sol:

Let the labels be

(C) (T) (C/T)

Every label is shown above is wrong.

we first try (C/T)

if we get coffee then it is (C)
if we get Tea then it is (T)

let us assume we got coffee

then the (C) button must be Tea

and hence (T) button must be coffee/Tea. button.

∴ Rs.50

(P/9) [illegible]

Data Interpretation:

(Q1)

100 -/. —— 360°

40 -/. —— ?

$\frac{360}{100} \times 40 = 144^\circ$

(Q2)

Elegance = (27300 + 25222 + 28976 + 21012) x 48

Smooth = (20009 + 19392 + 22429 + 18229) x 63

Soft = (17602 + 18445 + 19544 + 16595) x 78

Executive = (9999 + 8942 + 10234 + 10109) x 173

∴ Execute

(Q3)

$RM = \frac{1040}{5200} \times 100 = 20\%$

$P\&F = \frac{1450}{7000} \times 100 = 20\frac{5}{7}\%$

$SW = \frac{3600}{9000} \times 100 = 40\%$

$PM = \frac{5000}{20000} \times 100 = 25\%$

$Adver = \frac{4500}{15000} \times 100 = 30\%$

$R\&D = \frac{4400}{22000} \times 100 = 20\%$

$\therefore$ opt (d)

(Q4)

Prime = $75+180+120+90 = 465\$$

Mini = 580

Pool = 895

$Prime\% = \frac{465}{465+580+895} \times 100$

$= \frac{465}{1940} \times 100 = 23.97\%$

(Q5)

$\frac{9000}{\frac{10500}{7}} \times 100 \cong 86\%$ (600)

(Q6)

	km	kwh	km		kwh	kwh/km
M	20	12	12	20	12	12/20
N	45	25	13	25	13	13/25
O	75	45	20	30	20	20/30
P	100	57	12	25	12	(12/25)

$\therefore$ at P

Q7

2008 — $\frac{2.5}{1}$ i.e., 5M : 2F

2009 — $\frac{3}{1}$ i.e., 3M 1F → doubled

? ← 4F

i.e., 12M 4F

5M → 12M

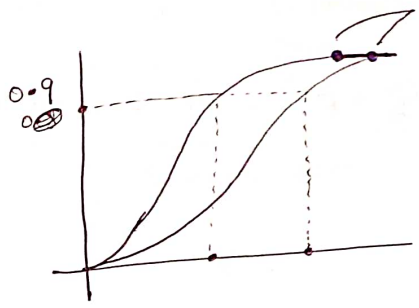
$\Rightarrow \frac{12-5}{5} \times 100 = \frac{7}{5} \times 100 = 140\%$

Q8

2011	2012
100 : 100	? : 100
M F	1.5 : 1
	∴ 150 : 100
	M F

req ratio = $\frac{150}{100}$ i.e., 1.5 : 1

Q9



∴ I is true

we need to check for 0.9 & or any value greater than 0.8 because @ 0.8 is req to form curd, but not yet formed.

So for any val > 0.8 the time of 37°c is not half of time of 25°c.

∴ (ii) is false

∴ opt (a)

Q10

Area = $\frac{1}{2}(1)(1) + (1)(1) + (1)(1) + \frac{1}{2}(1)(1) + \frac{1}{2}(2)(1) + \frac{1}{2}(1)(1) + \frac{1}{2}(1)(1)$

$= \frac{1}{2} + 1 + 1 + \frac{1}{2} + 1 + \frac{1}{2} + \frac{1}{2}$

$= 5$

Q11

	P	Q
2006 :	800	900

2007 : 800 × 106/100 = 848 ; 900 × 104/100 = 936

interest recieve : $\frac{6}{100} \times 800$ $\frac{4}{100} \times 900$

48 36

48 : 36 = 4 : 3

Q12 total rainfall = 300mm

50% (300mm) $50\,m^2$

$= \frac{1}{2}(300)(10^{-3}) \times 50\ m^3$

$= 7500 \times 10^{-3}\ m^3$

= 7500 litres

Q13 Enrolled in P = 23000

difference = 1+2+3+1+1 = 8000

$\therefore \frac{23000}{8000} = \frac{23}{8}$

Q14 $\frac{200 + 300 + 100 - 100}{500 \times 5} \times 100 = \frac{+500}{2500} \times 100$ = 20% profit

Q15 Let 100 be amount invest

	P	Q
2013	110	120
2014	120	130
2015	140	130
2016	140	150
2017	140	160
	850	

P

CP = 100 × 6 = 600

Profit = 200

revenue = 800

Q

CP = 100 × 6 = 600

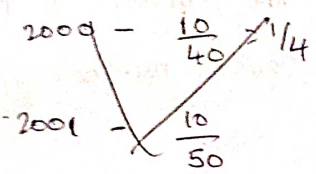
Profit = 250

revenue = 850

$\Rightarrow \frac{800}{850} = 16 : 17$

(Q16) $\frac{280+330+455+240}{500+600+700+400} = \frac{1305}{2200} \times 100 = 59.31\%$

(Q17)



$2003 - \frac{10}{60} = 1/6$

$2006 - \frac{20}{100} = 1/5$

$\therefore$ 2006

(Q18)

	R	E
2015 –	45	35
2014 –	37.5	34.1

$R_{2014} = \frac{10\cancel{0}}{\cancel{120}\ 4} \times 45\ 15$

$= \frac{150}{4} = 37.5$

$E_{2014} = \frac{10\cancel{0}}{11\cancel{0}0} \times 37.5 = \frac{375}{11} \cong 34.1$

(Q19) C_2(beds) = 8 C_3(tables) = 8 ✓

$(2+10+5+2+4) < (\cancel{4}+2+8+3+10)$

$23 < 30$ ✓

$\therefore$ opt (c)

(Q20) Edu — 15% Trans — 10%

$\frac{15-10}{10} \times 100 = 50\%$

(Q21) total in arts = 20%(5000) = 1000

total in Management = 15%(500) = 750

girls in arts = 30%(1500) = 450 $\Rightarrow$ boy in arts = 550

girls in manage. = 15%(150) = 225

boo

$\therefore \frac{550}{225} = \frac{22}{9}$ $\therefore$ opt (b)

12/08/20
day 9

A and B have marble collections. The number in A's collection is a square number (1, 4, 9, 16, etc)

Q9

A says to B. "If you give me all your marbles I'll still have a square number". B replies, "If you gave me the number in my collection, you would still be left with a square number". what is least number of marbles A has?

Sol:

A = 25 B = 24

(Trail & error method)

Q1

	2010	2016
total	600	690
P	120	120
Q	150	150
R	150	150
S	150	210
T	30	?

$\therefore$ 60

Q2

B a) item 2

$$\frac{20\%(250\,cr)}{20\%(54\,r)} \Rightarrow \frac{20\%}{20\%} = 1$$

b) $\frac{23}{19} \cong 1.2$

c) $\frac{19}{16}$

d) $\frac{20}{12} \cong 1.66$

$\therefore$ opt (d)

Q3 $\frac{\frac{1}{2}L^2}{\frac{L}{2} \times \frac{L}{2}} = 4 \Rightarrow 4:1$

Q4 $\frac{3 - 4/10}{15} \times 100 = 3 \times 10^6$

profit = SP − CP

$10^6 = SP - 3 \times 10^6$

$\Rightarrow SP = 4 \times 10^6$

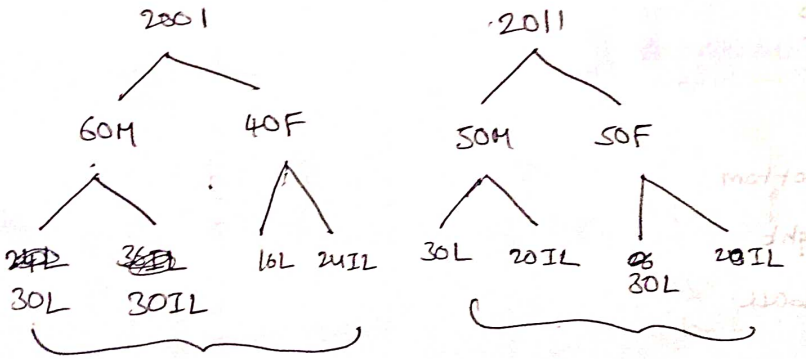
per 1 item $\Rightarrow SP = \frac{4 \times 10^6}{200} = 2 \times 10^4$

Q5

total % = $\frac{20(1.3) + 80(1.2)}{100} \times 100 = \frac{26 + 96}{100} \times 100 = 122$

i.e., 22% ↑

Q6 Let 100 be total population



Total lit = 46 Total lit = 60

60 − 46 = 14

$\frac{14}{46} \times 100 = \frac{7}{23} \times 100 \cong 30.43$

Q7

P — 0.9, 0.95

Q — 0.8, 0.75

S — 0.9, 0.95

R — 0.65, 0.7, 0.75, 0.8, 0.85

Q8

T — > 500, < 525 ✓

S — > 450, < 475 ✓

Q — > 525, < 550

P — 575

R — > 475, < 500 ✓

∴ R, S, T

Q9

575 - 550 - 525 - 500 - 500 - 525 - 550 - 575 - 550 - 525

Down, Up, Down

Q10 opt (d)

16/08/20

Cubes & Dies

6 faces

- Top & bottom
- left & right
- front & back

front —adjacent→ left & right, top & bottom

* For any side or face, we have adjacent 4 faces and one opposite face

Q11) from (ii) & (iii)

adjacent sides to 1 are 2, 4, 5, 6

∴ opposite face to 1 is 3

Q12) $3 \xrightarrow{adj} 1, 2, 4, 6$

$\therefore 3 \xrightarrow{opp} 5$

Method 2:

fig a: 6, 3, 4
fig c: 6, 4, 5

If two faces are common then remaining must be opposite (Think why)

∴ 3-5 is opposite pair

Q13) ★ $c \xrightarrow{adj} a, b, e, f$

$\therefore c \xrightarrow{opp} d$

Method 2:

c is common face

from c go either clockwise or ~~anti~~ clockwise

Clockwise

c a b
c e f

a-e
b-f
c-?

∴ c-d

Anticlockwise

c b a
c f e

a-e
b-f
c-?
c-d

we can take either clockwise or anticlockwise

(Q14) From fig(i) & fig(ii)

$1 \xrightarrow{adj} 2, 3, 5, 6$

$\therefore 1 \xrightarrow{opp} 4$

(Q15) From fig(iii) & fig(iv)

$\left.\begin{matrix} \# & * & ? \\ \# & * & @ \end{matrix}\right\}$ 2 common face

$\therefore ? - @$ is an opposite pair

From fig (i) & (ii)

$\# - !$ is an opposite pair

$\therefore * - \wedge$ must be an opposite pair

Method 2 :

From (i) & (iv)

$* - \wedge$ is an opposite pair

Method 3 :

~~only~~ In (ii) & (iv)

only one face is common

Clockwise from @

$\begin{matrix} @ & \wedge & ! \\ \downarrow & \downarrow & \downarrow \\ @ & * & \# \end{matrix}$

$\therefore \wedge - *$ is an opposite pair

(Q16) From (i) & (iii)

51

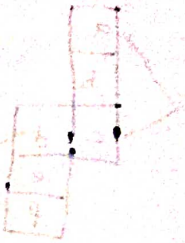
$\therefore$ opt (d)

(Q17) Clockwise from 1:

1 3 4
1 5 6

∴ 6-4 is an oppo. pair

∴ opt (6)



(Q18) from (i) & (ii)

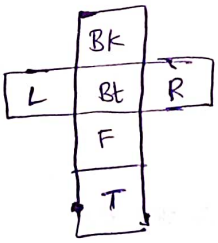
Clockwise from 1:

2 4 3
↓
2 6 1

∴ 6

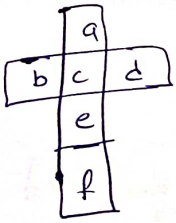
Unfolded Die:

Top, bottom
Front, back
left, right



> Note:
> Row wise / column wise alternate sides are opposite

Eg:

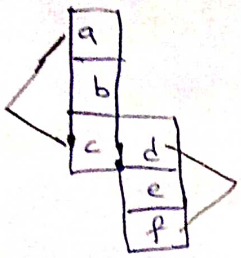


In the above fig, find opposite pairs.

Sol:

b-d
a-e
c-f
} alternate pairs

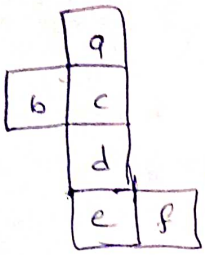
Eg:



a - c
d - f
} alternate pairs

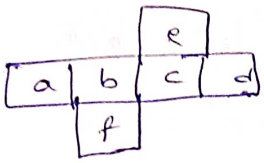
⇒ b - e

Eg:



a - d
c - e
} alternate pairs
b - f

Eg:

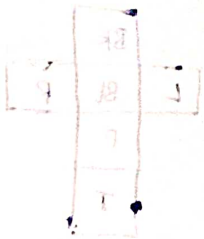


a - c
b - d
e - f

(Q19) a) 3 - 6 (clockwise column wise alternate pairs)

b) 1 - 4
2 - 6

∴ 5 - 3



(Q20) X

2 - 4
1 - 6
5 - 3

a) 1 & 6 are adj ✗

b) 3 - 5 are adj ✗

c) 2 - 4 are adj ✗

d) ✱ 1, 3, 4 ✓

∴ opt (d)

(Q21) (i) & (iv)

Clockwise

6 4 2
6 3 5

⇒ 6 - 1
4 - 3
2 - 5

only opt (c) satisfies the condition

∴ opt (c)

Cubes:

No of smaller cubes in a given cuboid / cube = $\frac{\text{Vol of cuboid/cube}}{\text{Vol of cube}}$

Cube/Cuboid

* 8 corners, 12 edges, 6 faces

Thus if a cube or cuboid is divided into smaller cubes

→ no of cubes with 3 faces painted = 8

→ no of cubes with 2 faces painted = $12(n-2)$ (→ corner)

n is no of cubes in one line of face

~~However if~~ However if it is cuboid we have

~~4 (n-~~ $[4(l-2)] + [4(b-2)] + [4(h-2)]$

→ no of cubes with 1 face painted = $6(n-2)^2$

~~for cuboid~~, $2(l-2)^2 + 2(b-2)^2 + 2(h-2)^2$

for cuboid

$$2(l-2)(h-2) + 2(b-2)(h-2) + 2(l-2)(b-2)$$

→ no of cubes with no face painted

$= (l-2)(b-2)(h-2)$

for cube, $(n-2)^3$

} we remove all outer layers.

	Painted no of faces	Cube	Cuboid
(i)	3	8	8
(ii)	2	$12(n-2)$	$4(l-2)+4(b-2)+4(h-2)$
(iii)	1	$6(n-2)^2$	$2[(l-2)(b-2)+(b-2)(h-2)+(h-2)(l-2)]$
(iv)	0	$(n-2)^3$	$(l-2)(b-2)(h-2)$
(v)	>3	0	0

Q22 i) 64 smaller cubes

$\Rightarrow n=4$ $(\because n^3=64)$

no face painted $= (n-2)^3$

$= (4-2)^3 = 8$

ii) 1 face painted

$6(n-2)^2 = 6(4-2)^2 = 24$

Q23 2 faces painted

$= 12(n-2)$

$= 12(4-2) = 24$

Q24 Q1. 3 faces painted $\Rightarrow$ 8 cubes

Q2. 1 face painted $\Rightarrow 2[(l-2)(b-2)+(b-2)(h-2)+(h-2)(l-2)]$

$= 2[(3)(2)+(2)(1)+(1)(3)]$

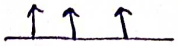
$= 2[6+2+3] = 22$

Day 10

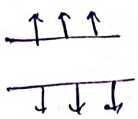
Seating Arrangement: (Analytical Reasoning)

Linear Arrangement:

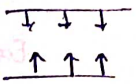
- Single row



- Parallel row
  - facing away from each other



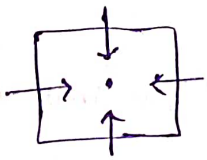
  - facing towards each other



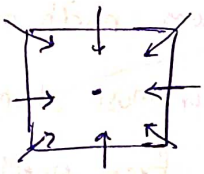
} By default if not mentioned we consider facing towards each other.

Square Arrangement:

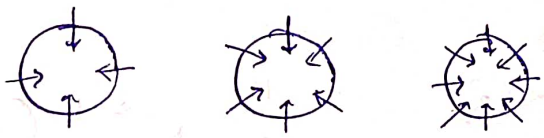
4 people



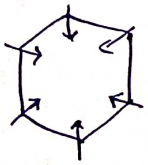
8 people



Circle arrangement:



Hexagonal Arrangement:



Q1)

Manu = 2 + Sravan
Sravan = Trideep - 3
} => Trideep = Manu + 1

Pavan = 1 + Sravan

∴ Trideep is the oldest

(Q2)

V W
X Z V } X Z V W } X Z V W Y
W Y

∴ V is in the middle

(Q3)

North

B
E
G
F
D
C
A

East

South

G is 3rd from north end

∴ G must chang with C, so that C gets 3rd place from North

(Q4)

Left

L M S (3)
Do E

M S L (∵ 3)
E Do

L S M
Do E

S M L (∵ 5)
E

facing

∴ Mathew is Engineer

(Q5)

S Q R U P T Girls ↓

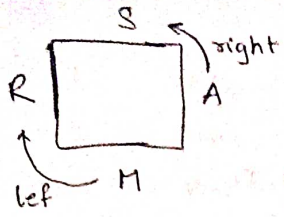
C F A D B E Boys ↑

CFA

opt (d)

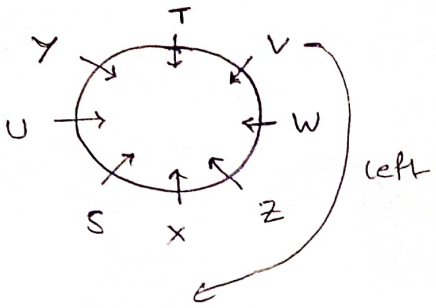
in opt (d) D-U face each other
in other option it is different.

Q6



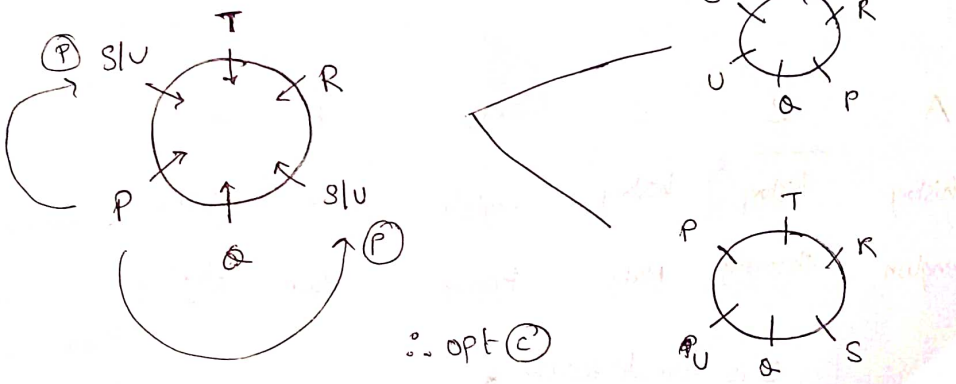
∴ S - M
R - A
∴ opt (c)

Q7



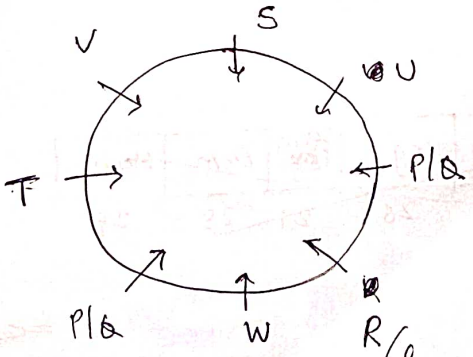
∴ X

Q8

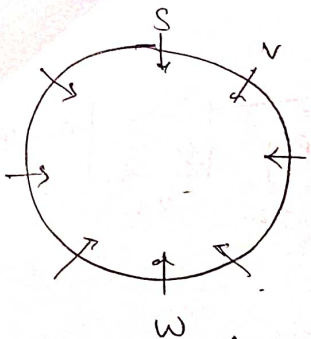


∴ opt (c)

Q9



(from ii & iii)



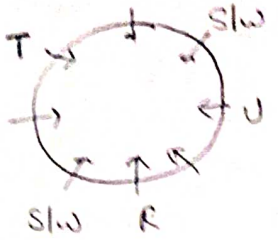
from 2 & 3
no. there no place we can place R

In question it asked which must be true

So opt (a)

c & d can be true but not must

Method 2:

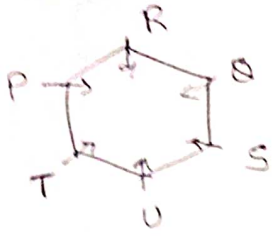


→ first place R, U, T

→ next we have only one opposite pair so fill it with S/W

Hence P & Q can't be opposite no matter where we place them

(Q10)



1 - S

2 - P

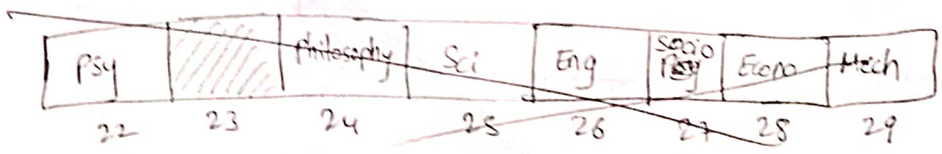
(Q11)

	A	B	C	D	E	F
Compul	history	history	history	english	Phy	Maths
optional	english	Chemistry	Math	History	Math	phy

D is female teachers

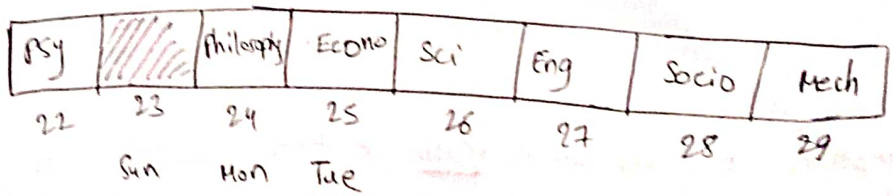
∴ History is the compulsory subject of C

(Q12)



Sci, Eng

(Q12)



Sci, Eng

∴ Economics

Q.13 top

1 - poetry
2 - plays
3 - poetry
4 - composition
5 - plays
6 - plays
7 - composition
8 - literature

bottom

∴ Composition is 4th

Q.14 From option verification

opt (b)

~~R S P T Q~~

Q.15 ~~Pavithar~~ ~~Pavithra's brother~~ >

Shiva > Leela > Pavithra

opt (d)

Q.16

G > R
G > L
L > S
M > G

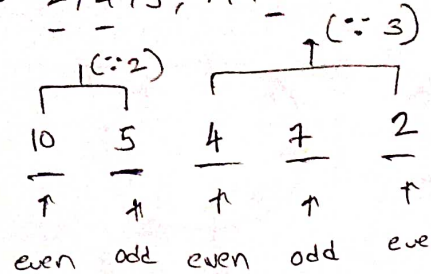
M > G > L > S
M > G ≥ R

1. ~~or~~ Can't determine
2. ~~Can't determine~~ ✓
3. Can't determine
4. ✓

∴ 2 & 4

Q17

2, 4, 5, 7, 10



2nd from right = 7

Day 11

PU10

If $f(x) = 2x^7 + 3x - 5$ which of the following is a factor of $f(x)$?

a) $x^3 + 8$

b) $x - 1$

c) $2x - 5$

d) $x + 1$

Sol:

a) $x^3 + 8 = 0 \Rightarrow x = -2$

$2(-2)^7 + 3(-2) - 5 \neq 0$

b) $x - 1 = 0 \Rightarrow x = 1$

$2(1) + 3(1) - 5 = 0$

c) $2x - 5 = 0 \Rightarrow x = 5/2$

$2(5/2)^7 + 3(5/2) - 5 \neq 0$

d) $x + 1 = 0 \Rightarrow x = -1$

$2(-1)^7 + 3(-1) - 5$

$= -2 - 3 - 5 \neq 0$

$\therefore$ opt (b)

Time & Work

$$\text{Time} = \frac{\text{work}}{\text{efficiency (or) capacity}}$$

Q1 (Poss)

32 in 8 $\Rightarrow$ 4/hr
40 in 5 $\Rightarrow$ 8/hr
$\Big\}$ 12/hr

1 hr — 12
? — 120

$\therefore$ 10 hrs

Q2 (Poss)

A : 100 in 5 hrs $\Rightarrow$ 20/hr

B : x/hr

A & B : 100 per 4 hrs $\Rightarrow$ 25/hr

$20 + x = 25$

$\Rightarrow x = 5$

$\therefore$ for 20 pages, $\frac{20}{5} = 4$ hrs

Q3

A – 10 days

B – 15 days

C – 12 days

A+B+C – ?

~~worde~~ work done per day by A $= \frac{1}{10}$

" " " " " B $= \frac{1}{15}$

" " " " " C $= 1/12$

$$A + B + C = \frac{1}{10} + \frac{1}{15} + \frac{1}{12} = \frac{12+8+10}{120} = \frac{30}{120} = \frac{1}{4}$$

1 day $\rightarrow \frac{1}{4}$ work $\Rightarrow$ 4 days $\rightarrow$ total work $\therefore$ 4 days

(Q4)

work done by A per day $= \frac{1}{15}$

" " " B " " $= \frac{2}{50} = \frac{1}{25}$

" " " A+B " " $= \frac{1}{15} + \frac{1}{25} = \frac{5+3}{75} = \frac{8}{75}$

time for total work $= \frac{1}{\frac{8}{75}} = \frac{75}{8} = 9\frac{3}{8}$ days

(Q5)

work done by P per hr $= \frac{1}{12 \times 8} = \frac{1}{96}$

" " " Q " " $= \frac{1}{10 \times 8} = \frac{1}{80}$

" " " P & Q " " $= \frac{1}{80} + \frac{1}{96}$

work done by P & Q per day working 8 hrs per day

$= 8\left(\frac{1}{80} + \frac{1}{96}\right) = \frac{1}{10} + \frac{1}{12}$

total time req $= \frac{1}{\frac{1}{10} + \frac{1}{12}} = \frac{12}{\frac{1}{5} + \frac{1}{6}} = \frac{2 \times 30}{11}$

$= 5\frac{5}{11}$ days

(Q6)

work done by 2 skilled per day $= \frac{1}{20 \times 5} \times 2$

" " " 6 semi skilled " " $= \frac{1}{8 \times 25} \times 6$

" " " 5 unskilled " " $= \frac{1}{10 \times 30} \times 5$

time req $= \frac{1}{\frac{1}{10 \times 5} + \frac{2}{4 \times 25} + \frac{1}{60}} = \frac{1}{\frac{1}{50} + \frac{3}{100} + \frac{1}{60}}$

$$= \frac{10}{\frac{1}{5}+\frac{3}{10}+\frac{1}{6}} = \frac{10}{\frac{6+9+5}{30}} = \frac{300}{20} = 15 \text{ days}$$

(Q7)

$A+B \longrightarrow \frac{1}{12}$

$B+C \longrightarrow \frac{1}{15}$

$A+C \longrightarrow \frac{1}{20}$

$2(A+B+C) \longrightarrow \frac{1}{12}+\frac{1}{15}+\frac{1}{20}$

$= \frac{25+20+15}{300} = \frac{60}{300} = \frac{1}{5}$

$\Rightarrow A+B+C \Rightarrow \frac{1}{10}$

$\therefore$ 10 days

Work done by A alone:

$A+B \longrightarrow 1/12$

$-A+B \longrightarrow \frac{1}{60}$

$2B \longrightarrow \frac{6}{60} = \frac{1}{10}$

$\Rightarrow B \longrightarrow \frac{1}{20}$

$B+C-A-C \longrightarrow \frac{1}{15}-\frac{1}{20}$

$= \frac{4-3}{60} = \frac{1}{60}$

$\Rightarrow A = \frac{1}{12}-\frac{1}{20} = \frac{5-3}{60} = \frac{2}{60} = \frac{1}{30}$

$\therefore$ A requires 30 days to finish the work

(Q8)

$A - 1/9$

$B - 1/12$

$A+B$ (2 days) $- \frac{1}{9}+\frac{1}{12} = \frac{4+7}{36} = \frac{7}{36}$

First 10 days (5 - 2 days) $\longrightarrow \frac{35}{36}$, and $\frac{1}{36}$ the work is left

A requires $\frac{1/36}{1/9} = 1/4$th day $\therefore$ 10 1/4 days

Join Me

(Q9)

P - $\frac{105}{8}$ per hr

Q - $\frac{105}{10}$ per hr

R - $\frac{105}{12}$ per hr

$$\left(\frac{105}{8}+\frac{105}{10}+\frac{105}{12}\right)(2)+\left(\frac{105}{10}+\frac{105}{12}\right)x = 105$$

$$\frac{1}{4}+\frac{1}{5}+\frac{1}{6}+x\left(\frac{1}{10}+\frac{1}{12}\right)=1$$

$$x\left(\frac{6+5}{60}\right)=1-\left(\frac{15+12+10}{60}\right)$$

$$x\left(\frac{11}{60}\right)=\frac{23}{60}$$

$$x=\frac{23}{11}=2\frac{1}{11}\text{ hrs}$$

$$11+2\frac{1}{11}\cong 1\text{PM}$$

(Q10)

A — $\frac{1}{12}$

B - $\frac{1}{15}$

C - $\frac{1}{30}$

$$3\left(\frac{1}{12}\right)+x\left(\frac{1}{12}+\frac{1}{15}\right)+3\left(\frac{1}{15}+\frac{1}{30}\right)=1$$

$$\frac{1}{4}+x\left(\frac{5+4}{60}\right)+3\left(\frac{2+1}{30}\right)=1$$

$$x\left(\frac{3}{20}\right)=1-\frac{3}{10}-\frac{1}{4}$$

$$x\left(\frac{3}{20}\right)=\frac{40-12-10}{40}=\frac{18}{40}$$

$$x=3$$

total days $= 3+x+3 = 3+3+3 = 9$

Work & Wages

wages ∝ work

Q11 (Pg 55)

$A+B+C \longrightarrow W$

$A+C \longrightarrow \frac{19}{23}W$

$\Rightarrow B \longrightarrow \left(1-\frac{19}{23}\right)W = \frac{4}{23}W$

$\therefore$ B's wo payment $= \frac{4}{23}(575) = 100$

Q12

$A - \frac{1}{10}$

$B - \frac{1}{15}$

$A+B - \frac{1}{10}+\frac{1}{15} = \frac{3+2}{30} = \frac{1}{6}$

A+B for 5 days $\Rightarrow \frac{5}{6}$

payment for A & B $= \frac{5}{6} \times 450 = 5 \times 75 = 375$

$A : B = \frac{\frac{1}{10}}{\frac{1}{15}} = 3:2$

A's payment $= \frac{3}{5} \times 375 = 225$

B's payment $= \frac{2}{5} \times 375 = 150$

C's payment $= 450 - 375 = 75$

$\therefore$ opt (c)

Q13

A B – x

A – $\frac{7}{4}x$

(x is fraction of work that can be done by B in a day)

$\Rightarrow A+B = \frac{11}{4}x \Rightarrow$ time req $= 7 = \frac{1}{\frac{11}{4}x} \Rightarrow \frac{4}{11x} = 7 \Rightarrow x = \frac{4}{77}$

B – $\frac{4}{77} \Rightarrow A - \frac{7}{4}\left(\frac{4}{77}\right) = \frac{1}{11}$ $\therefore$ 11 days

Q14) A - $\frac{1}{18}$

B - $\frac{3}{18}$

C - $\frac{5}{18}$

$A+B+C = \frac{9}{18}$

time req = $\frac{1}{9/18}$ = 2 days

Q15) 

let B takes x days to finish

$\Rightarrow$ A takes x-80

A $\rightarrow \frac{1}{x-80}$

B $\rightarrow \frac{1}{x}$

A is 3 times faster than B

$\frac{1}{x-80} = \frac{3}{x}$

$\Rightarrow x = 3x - 240$

$\Rightarrow x = 120$

A - $\frac{1}{120}$ B - $\frac{1}{120}$

time req = $\frac{1}{\frac{1}{120}+\frac{1}{120}} = \frac{40}{\frac{1}{3}+\frac{1}{3}} = \frac{40}{\frac{4}{3}}$ = 30 days

Q16) P+Q+R $\longrightarrow$ 54 per hr $\Rightarrow$ P+R = 54 - Q

R-Q = Q-P $\Rightarrow$ 2Q = R+P

$\Rightarrow$ 2Q = 54 - Q $\Rightarrow$ Q = 18

P+R = 36

R:P = 7:5

$\therefore$ P = 15

R = 21

86 Day 12 PU 11

There are 3 boxes in a table. One of the box contains gold and the other two are empty. A printed message contains in each box. One of the message is true and the other two are lies.

Box1 says "The gold is not here"

Box 2 says "The gold is not here"

Box3 says "The gold is in the second box"

which box has the ~~gol~~ gold?

Sol:

Assume Box1 is true:

B_1 doesn't contain gold

B_2 is ~~true~~ false $\Rightarrow$ B_2 has gold $\Rightarrow$ B_3 is true

$\therefore \times$

Assume Box2 is true:

B_1 is false $\Rightarrow$ B_1 has gold

B_2 is true ✓

B_3 is false ✓

$\therefore$ ✓

Assume Box3 is true

B_1 is false $\Rightarrow$ B_1 has gold

B_2 is false $\Rightarrow$ B_2 has ~~go~~ gold } not possible

$\therefore \times$

$\therefore$ Gold is in box1

830 days

0

Chain Rule

Work $\propto$ members/machines (M)

W $\propto$ days (d) , work $\propto$ hrs/days (h)

w $\propto$ efficiency (e)

$\therefore$ ~~$w \propto mte$~~ $\boxed{w \propto Mdhe}$

$$\Rightarrow \boxed{\frac{w_1}{w_2} = \frac{M_1 D_1 H_1 e_1}{M_2 D_2 H_2 e_2} \Rightarrow \frac{M_1 D_1 H_1 e_1}{w_1} = \frac{M_2 D_2 H_2 e_2}{w_2}}$$

Silly ~~$M_1 D_1 e_1 T$~~

$$\boxed{\frac{M_1 T_1 e_1}{w_1} = \frac{M_2 T_2 e_2}{w_2}}$$ T is time

Q1

7M → 7min → 7 toys

100M → ? → 100 toys

$$\frac{M_1 T_1}{w_1} = \frac{M_2 T_2}{w_2}$$ (consider same efficiency)

$$\frac{7(7)}{7} = \frac{100(T)}{100}$$

$\Rightarrow T = 7$ min

Q2

$$\frac{M_1 D_1 H_1 E_1}{w_1} = \frac{M_2 D_2 H_2 E_2}{w_2}$$

$$\frac{(2)(8)(12)(0.9)}{9000} = \frac{(3)(6)(x)(0.8)}{12000}$$

$\Rightarrow x = 16$ hrs/day

(53) $\frac{M_1 D_1 H_1 E_1}{W_1} = \frac{M_2 D_2 H_2 E_1}{W_2}$

$\frac{4(30)(2)}{2} = \frac{x(25)(3)}{3}$

$\Rightarrow x = \frac{4 \times 30 \times 8 \times 3}{25 \times 9}$

$\Rightarrow x = 160$

$\therefore$ 96 additional robots.

(54) B - 25×12 hrs

P - 30×12 hrs

$\Rightarrow e_B : e_P = 2:1 \quad (\because E \propto \frac{1}{T})$

$\frac{W_B}{W_P} = \frac{T_B e_B}{T_P e_P} = \frac{5 \times 12 \times 2}{7 \times 18 \times 1} = \frac{20}{21}$

$\Rightarrow 20:21$

(55) 52M — 10 days

40M — ?

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

$\Rightarrow \frac{52(10)}{W} = \frac{40(T)}{W} \Rightarrow T = 13$

$\therefore$ 40M $\rightarrow$ 13 days

$\therefore 13 - 10 = 3$ days more

(Q6) 40M — 48 days

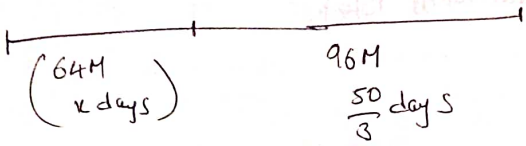
$M_1D_1H_1 = \frac{M_1T_1}{W_1} = \frac{M_2T_2}{W_2}$

$\frac{(40)(48)}{W} =$

★

(Q6) ~~work~~ let ~~work = 40×48=1920~~

Let work = 40M × 48d = 1920 Md



$64x\ Md + 96\left(\frac{50}{3}\right)^{Md} = 1920\ Md$

$\Rightarrow 64x + 32(50) = 1920$

$\Rightarrow x = 5$

(Q7)

1M — $\frac{1}{469\times2}$ $\Rightarrow 7M = \frac{7}{469\times2}$

1W — $\frac{1}{469\times5}$ $\Rightarrow 5W = \frac{5}{469\times5}$

1B — $\frac{1}{469\times7}$ $\Rightarrow 2B = \frac{2}{469\times7}$

time req = $\frac{1}{\frac{1}{469}\left(\frac{7}{2}+1+\frac{2}{7}\right)} = \frac{469}{\frac{49+14+4}{14}}$

$= \frac{469\times14}{67} = 98$ days

(Q8) work done per day

$4M + 6W = \frac{1}{8} \Rightarrow 12M + 18W = \frac{3}{8}$

$3M + 7W = \frac{1}{10} \Rightarrow 12M + 28W = \frac{4}{10}$

$-10W = \frac{3}{8} - \frac{4}{10} = \frac{15-16}{40} = \frac{-1}{40}$

$\Rightarrow W = \frac{1}{400}$

$\therefore 10\omega = \frac{1}{40}$

$\therefore$ 40 days

Pipes & Cisterns

(Q9) $X \rightarrow \frac{1}{5}$ tank per hr

$Y \rightarrow \frac{1}{4}$ tank per hr

Drainage $\rightarrow \frac{-1}{20}$

req $X + Y +$ drainage $\Rightarrow \frac{1}{5} + \frac{1}{4} - \frac{1}{20} = \frac{4+9-1}{20} = \frac{8}{20}$

time req $= \frac{20}{8} = 2.5$ hrs

(Q10) $A \rightarrow \frac{1}{10}$ per min

$B \rightarrow \frac{-1}{6}$

we need to empty $\frac{2}{5}$ th

1 min $\Rightarrow \frac{1}{10} - \frac{1}{6} = \frac{6-10}{60} = \frac{-4}{60} = \frac{-1}{15}$

~~total tank~~ $\rightarrow \frac{-1}{15}$

emptying total tank = 15 min

for $\frac{2}{5} \Rightarrow \frac{2}{5} \times 15 = 6$ min

(Q11) A is filling

B(hole) is emptying

A — 1/8

A + B — 1/10

$\Rightarrow B = \frac{1}{10} - \frac{1}{8} = \frac{4-5}{40} = \frac{-1}{40}$ th tank is emptied per hr

$\therefore$ 40 hrs

Q12

$A \longrightarrow \frac{1}{30}$

$B \longrightarrow \frac{1}{20}$

$C \longrightarrow \frac{1}{10}$

$A : B : C = \frac{60}{30} : \frac{60}{20} : \frac{60}{10}$

$= 2 : 3 : 6$

$\therefore P : Q : R = 2 : 3 : 6$

Proportion of $R = \frac{6}{2+3+6} = \frac{6}{11}$

Q13

$\frac{1}{6}$ of 1 tap $\longrightarrow \frac{1}{6}$

$3\left(\frac{1}{6}\right) + x\left(\frac{4}{6}\right) = 1$

$x\left(\frac{2}{3}\right) = \frac{1}{2}$

$\Rightarrow x = \frac{3}{4}$

total time $= 3\frac{3}{4}$ hrs

i.e., 3 hrs 45 min

Q14

$A - \frac{1}{12}$

$B - \frac{1}{15}$

$C - \frac{1}{20}$

$A+B = \frac{1}{12} + \frac{1}{15} = \frac{5+4}{60} = \frac{9}{60}$

$A+C = \frac{1}{12} + \frac{1}{20} = \frac{5+3}{60} = \frac{8}{60}$

for 2 hrs $\frac{9}{60} + \frac{8}{60} = \frac{17}{60}$ /

in 6 hrs $= \frac{17 \times 3}{60} = \frac{51}{60}$

in 7th hr $\frac{9}{60}$

$\therefore \frac{51}{60} + \frac{9}{60} = 1$ $\therefore$ 7 hrs

Q15

$P \rightarrow \frac{1}{6}$

$Q \rightarrow \frac{1}{9}$

$R \rightarrow \frac{-1}{12}$

$$4\left(\frac{1}{6}-\frac{1}{12}\right)+6\left(\frac{1}{9}-\frac{1}{12}\right)+x\left(\frac{1}{9}\right)=1$$

$$\left(\frac{2}{3}-\frac{1}{3}\right)+\left(\frac{2}{3}-\frac{1}{2}\right)+\frac{x}{9}=1$$

$$\frac{1}{3}+\frac{1}{6}+\frac{x}{9}=1$$

$$\frac{x}{9}=1-\frac{1}{3}-\frac{1}{6}=\frac{18-6-3}{18}=\frac{9}{18}$$

$$\Rightarrow x=\frac{9}{2}=4.5 \text{ hrs}$$

Total time $= 4+6+4.5=14.5$ hrs

Q16

let capacity $= l$

$A \longrightarrow \frac{l}{20}$ gallons per min

$B \rightarrow \frac{l}{24}$

$C \rightarrow -6$

$$15\left(\frac{l}{20}+\frac{l}{24}-6\right)=l$$

$$\frac{l}{20}+\frac{l}{24}=\frac{1}{15}+6=\frac{91}{15}$$

$$44l=\frac{91}{15}\times 20\times 24$$

$$\frac{l}{20}+\frac{l}{24}-\frac{l}{15}=6 \Rightarrow \frac{20l+24l-32l}{20\times 24}=6$$

$$\Rightarrow 12l=6\times 20\times 24$$

$$l=240 \text{ gallon}$$

05/20/21

Q17

capacity = 2400 m^3

filling → x m^3/min

emptying → $x+10$ m^3/min

$t_f = t$ $\quad t_e = t_f - 8$

$t_f = \frac{2400}{x}$ $\quad t_e = \frac{2400}{x+10}$

$t = \frac{2400}{x}$ $\quad t - 8 = \frac{2400}{x+10}$

$\Rightarrow \frac{2400}{x} = \frac{2400}{x+10} + 8$

$\rightarrow \frac{2400}{x} = \frac{2400+80+8x}{x+10}$

$2400x + 24000 = 2400x + 80x + 8x^2$

$8x^2 + 80x - 24000 = 0$

$x^2 + 10x - 3000 = 0$

$x^2 + 60x - 50x - 3000 = 0$

$x(x+60) - 50(x+60) = 0$

$\Rightarrow (x-50)(x+60) = 0$

$\Rightarrow x = 50\ m^3/min$

18/08/20
day 13

PU12 If ABCD × 9 = DCBA where A, B, C, D are unique integers from 0 to 9. Find A = ? & D = ?

Sol:

$A \neq 0$ ∵ 4 digit number

if $A \geq 2$ then

ABCD × 9 will be 5 digit number

1BCD × 9 = 9CB1

∴ A = 1 D = 9

$$\begin{array}{r} 1BC9 \times 9 \\ \hline 9CB1 \end{array}$$

$\Rightarrow 9(1000 + 100B + 10C + 9) = 9000 + 100C + 10B + 1$

$9000 + 900B + 90C + 81 = 9000 + 100C + 10B + 1$

$890B + 80 = 10C$

$\Rightarrow 89B + 8 = C$

Since C ranges from 0 to 9

value of B must be 0

$\therefore C = 8$

$\therefore 1089 \times 9 = 9801$

Coding & Decoding

1	2	3	4	5	6	7	8		10	11		13
A	B	C	D	E	F	G	H	I	J	K	L	M

Z	Y	X	W	V	U	T	S	R	Q	P	O	N
26	25	24	23			20		18		16	15	14

Height $\Rightarrow$ H 8 , Right to vote $\Rightarrow$ 18

KXIP $\Rightarrow$ 11 T20 $\Rightarrow$ 20 7/G movie $\Rightarrow$ 7

EJOTY
5 10 15 20 25

MJ 3 (13)

WJ 3 (23)

MNOP
13 14 15 16

→ Sometimes reverse coding may be use

i.e, 1 for Z
2 for Y
⋮
26 for A

for any letter **reverse code + forward code = 27**

(Q1) D=4

COVER = 63

3 + 15 + 22 + 5 + 18

63

∴ BASIS

2 + 1 + 19 + 9 + 19

50

(Q2) AT = 20 $1 \times 20 = 20$

1 20

BAT = 40 $2 \times 1 \times 20 = 40$

2 1 20

⇒ CAT ⇒ $3 \times 1 \times 20 = 60$

3 1 20

(Q3)

13	1	3	8	9	14	5
M	A	C	H	I	N	E
19	7	9	14	15	20	11

6 difference

4	1	14	7	5	18
D	A	N	G	E	R
10	7	20	13	16	24

∴ opt (a)

(Q4) E = 10 J = 20 O = 30 T = 40

(5) (10) (15) (20)

P + E + S + T

(16×2) (5×2) (19×2) (20×2)

32 + 10 + 38 + 40 = 120

(85) Z = 52 (26×2)

A C T = 48

(1) (3) (20)

(20+3+1)×2 = 48

BAT ⇒ (20+1+2)×2 = 46

(2) (1) (20)

(86) WELCOME — 422152412142 2

1 1 1 1 1 1 1

23 5 12 5 15 13 5

reverse code : 4 21 15 27 12 14 22

F O R M U L A

6 15 18 13 21 12 1

21 12 9 14 6 15 26

∴ 21129146 1526

(87) A R O M A = 24

1 18 15 13 1

$\frac{1+18+15+13+1}{2} = 24$

G R A N D = 22

7 18 1 14 4

$\frac{7+18+1+14+4}{2} = 22$

⇒ K W A L I T Y

11 23 1 12 9 20 25

$\frac{101}{2} = 50.5$

Q8 (i)

1	2	3	...	26	27	28
A	B	C	...	Z	A	B

A B L E

1 2 12 5

~~Par : 26 25 15 22~~

27 28 12 5

23 24 8 1 (-4)

∴ ~~D A B~~ R D A R K

30 27 18 11

26 23 14 7 (-4)

(ii) M E A N D E R

13 14 18

+1 +1 +1

4 5 1 5 4 5 9

M A T H E M A T I C S

13 20 8 13 20 19 ⇒ 1+9 ⇒ 10 = 1+0 = 1

2+0

4 1 2 8 5 4 1 -2 9 3 1

Q9

BARS - 10.00

1 1 1 1

2 1 18 19

40/4 = 10

DEEZ

4+5+5+26 = 40

$\frac{40}{4} = 10$

PLANT

16 12 1 14 20 ⇒ $\frac{63}{5} = 12.6$

LEAVES

12 5 1 22 5 19 ⇒ $\frac{64}{6} = 10.66$

Q10 C A R = 19
3 + 1 + 18 = 22 } diff ③ (no of letters)

T R U C K = 68
20 + 18 + 21 + 3 + 11 = 73 } diff ⑤ (no of letters)

T A X P
20 + 1 + 24 + 16 = 61
⇒ 61 − 4 = 57

→ Sometime coding can be done only on no of letters present in the word rather than the letters in the word.

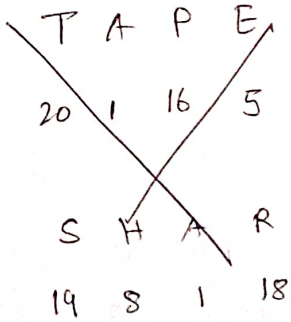
Q11

LUXOR − 30
(5×6)
↳ no of letters

TAIL − 24
(4×6)

∴ GUILDS
6×6 = 36

Q12



TAPE − 4825
SHART − 93814

Q12 observing in the question they only mapped a value to each letter

TAPE	SHART	TUBE
4825	93814	4675

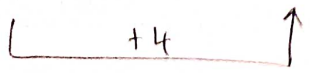
∴ BASERA
789518

Letter Coding :

Here one letter is encoded into another letter

(Q13) A M C F → E Q G J

1 13 3 6 → 5 17 7 10



N K U F → R O Y J

14 11 21,6 → 18 15 25 10

∴ D H L P

4 8 12 16

+4 ⇒ 8 12 16 20

H L P T

(Q14) S E A S O N A L → E S S A N O L A

Adjacent letters are swapped

S E P A R A T E

E S A P A R E T

(Q15) (i) ~~Sugi~~ S W I T C H

T V J S D G

+1 −1 +1 −1 +1 −1

B R ~~D~~E A D

C Q F Z E

∴ BREAD

(ii) I D C

+1 ⇒ J E D

Q16

$$\begin{matrix} & & & & & & & 6 & & 4 \\ & & & & & & & F & & D \\ 33 & \Big[& & & & & & & & & \Big] & +3 \\ & & I & U & L & H & Q & & G & & \\ & & 9 & & & & & & 7 & & \end{matrix}$$

E N E M Y

H Q H P B

Q17 (i)

T	O	G	E	T	H	E	R
20	15	7	5	20	8	5	18

R	E	G	R	J	C	T
18	17	5	7	18	10	3	20

(-2) (+2) (-2) (+2) - - - - -

P	A	R	O	L	E
16	1	18	15	12	5
14	3	16	17	10	7
N	C	P	Q	J	G

(ii)

M	O	N	K	E	Y
13	15	14	11	5	25
X	D	J	M	N	L
24	4	10	13	14	12

↓ -1

T	I	G	E	R
20	9	7	5	18
17	4	6	8	19
Q	D	F	H	S

Q18

R	O	M	E
18	15	13	5

S	U	N	I
19	21	14	9

B	O	M	B	A	Y
2	15	13	2	1	25

C	U	N	C	E	Z
3	21	14	3	5	26

~~A = E S~~ I -

Here for consonants +1 is done

for vowels next vowel is substituted (i.e., +4)

A S I A

E T O E

(Q19)

D E L H I
4 5 12 8 9

C C I D D
3 3 9 4 4
(-1) (-2) (-3) (-4) (-5)

∴ B O M B A Y
2 15 13 2 1 25

1 13 10 24 22 19
A M J X V S

(Q20)

E D U C A T I O N
5 4 21 3 1 20 9 15 14

Reverse coding →

W V X F Z R G M L
23 22 24 6 26 18 7 13 12

Sum = 27

C H A L L E N G E
3 12
24 15
X O

∴ opt (c)

(Q21)

F R A G R A N C E
6 18 1 7 18 1 14 3 5

(No SS) +2 →

I C T H R G E P C
9 3 20 8 18 7 5 16 3

S O P H I S T I C A T E D

U K J R Q U T

∴ opt (c)

Q22 (i) 0, 1, 2 ... 7 8 9

O P Q ... V W X

0 1 2 3 4 5 ...

O P Q R S T ...

$\therefore 45 = ST$

(ii)

$P = 3$

Q

$R = 27 = 3^3$

S

$T = 243 = 3^5$

$\Rightarrow Q = 3^2 = 9 \quad S = 3^4 = 81$

$Q + S = 9 + 81 = 90$

Mixed Coding

Q23

851 - g s f — ①

783 - g r ro — ②

341 - ro a f — ③

①&③ ⇒ f - 1

①&② ⇒ g - 8

From ① $\therefore$ sweet = 5

Q24

sti nro kti - do po do } nro-do

nro bsi mit - do he go

bsi sro zpi - di bl he } bsi-he

$\therefore$ goes-mit

Q25 gorblflur - (fan) belt
pixngorbl - ceiling (fan)
⇒ fan - gorbl
ceiling - pixn
arthtusl - tile roof

ceiling tile - ?
pixn ___

from options opt (a)

Substitution Coding

Q26 In that coding well is called island

∴ island

Q27 BED is called WINDOW

∴ WINDOW

Q28 KCLFTSB ← - ~~best of luck~~ (skip vowel & write ~~from~~ in reverse)

SHSWDG - good wishes

ace the exam - ?

MXHTC

Day 14 PU13 IR 12 + 13 + 14 = 345

23 + 52 + 45 = 579 then

22 + 33 + 44 = ?

add digits $\frac{12}{3} + \frac{13}{4} + \frac{14}{5} = 345$

$\frac{23}{5} + \frac{52}{7} + \frac{45}{9} = 579$

$\frac{22}{4} + \frac{33}{6} + \frac{44}{8} = 468$

(PU14) If $11@12 = 133$

$13@14 = 183$

$17@18 = 307$

$21@22 = ?$

$11@12 = 11\times12+1 = 133$

$a@b = a\times b+1 = a^2+b = b^2-a$

$\therefore 21@22 = 462+1 = 463$

(****)

Series, analogy & Classification

↳ no question from analogy in gate till now

Number Series

* Slowly increasing ↑ ; slowly ↓
* fast ↑ , fast ↓ (combination of multiplication & addition)
* Mixed series (↑↓ , ↓↑) (fast ↓ - division & add (or) sub)
  ↳ (two seperate series ~~given~~ may be given with alternation)
* prime numbers
* ~~pp~~ squares,
* cubes
* $\times1.5$, $\times2$, $\times2.5$, $\times3$, $\times3.5$ .... (numbers may end with 0.25, 0.5, 0.125 .. etc)

(Q1)

10, 100, 200, 310, 430

90, 100, 110, 120

(Q2)

125, 80, 45, 20, 5

-45, -35, -25, -15

Q3 198, 194, 185, 169, 144

4 (2²) 9 (3²) 16 (4²) 25 (5²)

Q4 15, 33, 104, ____, 2124, 12755, 89298

The series is fast ↑

15 33 104 423 2124

15×2+3 33×3+5 104×4+7 423×5+9

∴ 423

Q5 5760, 960, ____, 48, 16, 8

fast ↓

we can even write it in reverse to see as fast ↑

8, 16, 48, 192, 960, 5760

×2 ×3 ×4 ×5

∴ 192

Q6 1, 4, 27, 16, ____, 36, 343

(1³) (2²) (3³) (4²) (5³) (6²) (7³)

} This is a kind of mixed series

∴ $5^3 = 125$

Q7 8, 31, 122, 485, 1936, 7739, ____

8×4−1 = 31

31×4−2 = 122

⋮

7739×4−6 = 30950

Q8 (i) 10, 5, 13, 10, 16, 20, 19 ____ } Mixed series

×2 ×2 ×2

+3 +3 +3

∴ 20×2 = 40

(ii) 8, 2, 16, 7, 3, 21, 6, 4, 24, 5, ____, 25

8×2 7×3 6×4 5×5 = 25

∴ 5

(iii) 5, 14, 9, 10 14, 4, 6, 13, 7, 8, 11, 3

Q9 0, 6, 24, 60, 120, 210 ____

each ith term is of form $i^3 - i$

$1^3 - 1 = 0$

$2^3 - 2 = 6$

$3^3 - 3 = 24$

⋮

$7^3 - 7 = 336$

Method 2 :

0 6 24 60 120 210 336

6 18 36 60 90 126

12 18 24 30 36

6 6 6 6

When we have conflicts with to the order of priority is

(i) prime number

(ii) square, cubes, square roots ...

(iii) ÷

(iv) ×

(v) +, −

Eg: 5, 10, 20 ____

This can be seen in 2 ways

5 10 20 (35)

5 10 15

(or)

5 10 20 (40)

×2 ×2 ×2

Multiplication has more priority

∴ 40 is answer

Q10 589654237, 89654237, 8965423, 965423, ____

589654237 — 89654237 — 8965423 — 965423 — 96542

Q11) 90, 180, 12, 50, 100, 200, 8 150, 3, 50, 4, 25, 2, 6, 20, 3

180 ÷ 6 = 30 ÷ 5 = 6

90 ÷ 3 = 30

12 ÷ 6 = 2

50 ÷ 2 = 25

100 ÷ 25 = 4

200 ÷ 4 = 50

— ÷ 50 = 3

∴ 150

Q12) $11\frac{1}{9}$, $12\frac{1}{2}$, $14\frac{2}{7}$, $16\frac{2}{3}$, ——

$\frac{100}{9}$, $\frac{25}{2}$, $\frac{100}{7}$, $\frac{50}{3}$

$\frac{100}{9}$, $\frac{100}{8}$, $\frac{100}{7}$, $\frac{100}{6}$, $\frac{100}{5}$

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

Q13) (i) 343, 1331, —— 4913

(7^3) (11^3) $(13)^3$ (17^3) [Cube of prime numbers]

$13^3 = 2197$

Q14) 2, 12, 60, 240, 720, 1440, ——, 0

×6 ×5 ×4 ×3 ×2 ×1 ×0

∴ 1440

Q15) 81, 54, 36, 24, 16

(9^2) (6^2) 42

9×6 (6×4)

Method 2 :

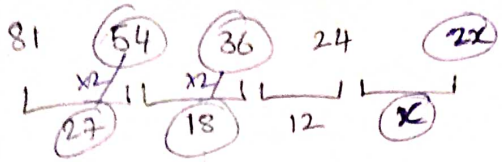
$81 \times \frac{2}{3} = 54$

$54 \times \frac{2}{3} = 36$

$\vdots$

$24 \times \frac{2}{3} = 16$

Method 3 :



$2x + x = 24$

$\Rightarrow x = 8$

$\Rightarrow 2x = \underline{16}$

Q16 i) 12, 35, 81, 173, 357, 725

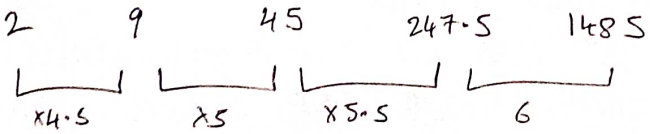
23, 46, 92, 184, 184×2 = 368

ii) 2, 3, 6, 15, 45, 157.5, 630

×1.5, ×2, ×2.5, ×3, 3.5

$\therefore 45$

Q17

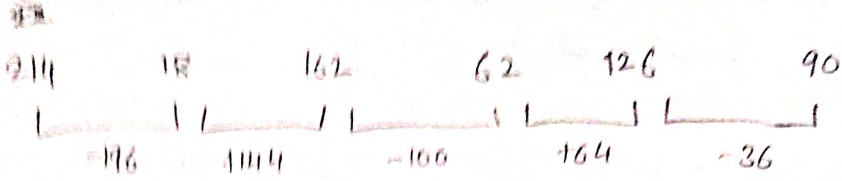


Silly $3 \times 4.5 = 13.5 = A$

$13.5 \times 5 = 67.5 = B$

$\vdots$

Q17



Ans: 221 − 196 = 25 = A

25 + 144 = 169 = B

169 − 100 = 69 = C

69 + 64 = 133 = D

133 − 36 = 97 = E

∴ E = 97

Q19

10, 12, 28, 90, 368, 1840, 11112

10 × 1 + 2 = 12

12 × 2 + 4 = 28

28 × 3 + 6 = 90

90 × 4 + 8 = 368

368 × 5 + 10 = 1850

∴ 1840 is wrong

If it is mentioned one term wrong, and If we ever find 2 wrong numbers, then we should change the logic

Q20

4, 6, 12, 30, 90, 312.50, 1260

4 × 1.5 = 6

6 × 2 = 12

12 × 2.5 = 30

30 × 3 = 90

90 × 3.5 = 315

∴ 312.5

Q21

2, 3, 10, 40, 172, 885, 5346

2 × 1 + 1 = 3

3 × 2 + 4 = 10

10 × 3 + 9 = 39

39 × 4 + 16 = 172

$(xn + n^2)$

Q22 1500, 1581, 1664, 1749, 1833, 1925, 2016

+81 +83 +85 +87 +89 +91

∴ 18363 (should have been 1836)

Q23 5, 55, 495, 3465, 17325, 34650, 51975

×11 ×9 ×7 ×5 ×3 ×1

17325 × 3 = 51975

∴ 34650

Q24 46080, 3840, 384, 48, 24, 2, 1

rev: 1, 2, 24, 48, 384, 3840, 46080

×2 ×4 ×6 ×8 ×10 ×12

2 × 4 = 8, 8 × 6 = 48

∴ 24

Q25 5, 27, 61, 122, 213, 340, 509

2^3-3 3^3-3 4^3-3 5^3-3 6^3-3 7^3-3 8^3-3

$3^3-3 = 24$

∴ 27

Q26 (i) +2 +3 +4 +5

AD, CG, FK, JP, OV

3 4 5 6

(ii) 7G, 11K, 13M, ____

prime numbers ⇒ 17

G K M Q

7 11 13 17

∴ 17Q

(iii) 13M, 17R, 19S ____

primes & corresponding letter

∴ 23W

Q27 (i) A, CD, GHI, MNOP

B EF JKL

(ii) Z, WV, RQP, KJIH

YX UTS ONML

(iii) BC, FGH, LMNO, TUVWX

AB IJK PQRST

DE

Q28 (i) B, FH, LNP ____ T V X Z

2 4 6 8 12 14 16 18 20 22 24 26

10

Q (ii) ADVENTURE

DVENTURE

DVENTUR

VENTUR ∴ VENTUR

VENTU

Q29 D11, H13, L17, P19, _ 23, X29

primes

11, 13, 17, 19, 23, 29

D H L P T X

4 8 12 16 20

∴ 17, T

(030) (i) kMS, IP8, GS11, EV14, ——

5, 8, 11, 14 (17)
(+3)

K	I	G	E	C	M	P	S	V	Y
11	9	7	5	3	13	16	19	22	25

∴ C Y 17

(ii) 2, 7, 12, 17, 22

5, 7, 9, 11, 13

Z	X	V	T	R
26	24	22	20	18

∴ 17 T 11

(031) (i) bca a b c aabc a a b caa

(bcaa) is repeated

∴ acab

(ii) b aab ba a bb a abb aab

(baab) is repeated

∴ bbaab

(iii) ab a d n aab a d na a bad na a b

(abadna) is repeated

∴ and aa

(832) (i) ccc bb b a a a cc c bbb aa c

↳ be baca

(ii) abc d d a bc cd a b cd a

∴ dacab

(iii) abc d d a bc c d a b b c d a

∴ dacab

(833) Odd one out :

* cubes, square
* primes
* divisible by n
* sum of digits
* even, odd

(833) sum of digit is 9 for all except for opt (b)

(834) Except 81, all are primes

(835) abc

↳ b = a+c

(or) all are divisible by 11

only opt (a) doesn't satisfy

(836) (i) E V

5 + 22 = 27

Z A

26 + 1 = 27

∴ opt (d)

(iii) A L R V X E P V Z B
1 12 5 16

I T Z D F O Y F I K
9 20 15 25

∴ opt (c)

(iii) B W Z B
↓
A

B H K M
↓
L

W C G S
↓
H I

M S V X
↓
W

∴ opt (c)

Q37 (i) Except 97 rest are perfect square

(ii) 137 91 136 78
13×7=91 13×6

∴ opt (d)

Q38 (i) N F H M K

N (3 lines) F (3 lines) H (3 line) M (4 lines) K (3 lines)

∴ M

(ii) WEKO IQWA FATX NVBD
11 15 23 27 20 24 2 4

∴ opt (d)

Q39 Except 33 rest are primes

Q40

T Y N	B F D	M Q O	L P N	Q U S
20 25	2 6 4	13 17	12 16	17 21

∴ opt a

Q41 Except Man rest are blood relations

Q42 bridge

20/08/20
day 15

Q1 (i) 6/48
3/24
7/56

$\frac{48}{6} = 8$

$\frac{24}{3} = 8$

$\frac{56}{7} = 8$

but $\frac{21}{7} = 3$

∴ opt (b)

(ii) $13 \times 3 + 1 = 40$

$15 \times 3 + 1 = 46$

∴ opt (b)

(iii) $\left(\frac{14}{2}\right)^2 = 49$

$\left(\frac{16}{2}\right)^2 = 64$

∴ opt (d)

Analogy

Numbers letters words

(Q2) $4 : 16 : 36 : \underline{\quad 64 \quad}$

$2^2 \quad 4^2 \quad 6^2 \quad 8^2$

(Q3) (i) $42 : 56 :: 110 : \underline{132}$

$6\times7 \quad 7\times8 \quad 10\times11 \quad 11\times12$

(ii) $68 : 130 :: \underline{\quad 222 \quad} : 350$

$4^3+4 \quad 5^3+5 \quad 6^3+6 \quad 7^3+7$

(Q4) (i) $11529 : 72135$

$72135 - 11529$

$= 60606$

$\therefore 152943 + 60606$

$= 213549$

Here based on the options we may need to choose the logic

(ii) $27 : 9\,(\quad) :: \_\_ : \_\_$

$(\sqrt{9})^3 = 27$

silly ~~$(\sqrt{8})^3 = 64$~~

$\therefore (\sqrt{81})^3 = 729$

(Q5) (i) $(48, 24, 12)$

$\div 2 \quad \div 2$

$\therefore$ opt (c)

(ii) MO : 13120

rev. code

forward code

∴ opt (b)

Q6 (i) MARINE : AIENRM

Shuffle

DISGUISE → forward

→ reverse

~~S U S D I G U I E~~

I G I E S U S D

∴ opt (c)

(ii) ACEG : IKMO

1 3 5 7 9 11 13 15

add 8

9 11 13 15 17 19 21 23

Q S U W : Y A C E

17 25

Q7 (i) FILM : ADGH

6 9 12 1 4 7

-5

MILK : HDGF

∴ opt (c)

(ii) QPRS : TUWV

+5

+5

+3

+3

∴ JIKL : MNPO

Qs (i) ADE : FGJ
+5 +3 +5

KNO : PQT

(ii) WIDELY : HVCDXK

HVCDXK : WIDELY

H V C D X K
X | | X
W I D E L Y (next letters)

∴ S E H M D E
X | | X
F R I N G E

Blood Relations

great grand parents

1st gen – grand parents

2nd gen – parents, Aunt, uncle, father-in-law, Mother-in-law

3rd gen – You, siblings, spouse, cousin, brother-in-law, sister-in-law

4th gen – child, nephew, Niece, son-in-law, Daughter-in-law,

5th gen – grand child

great ~~great~~ grand child

Siblings → brother & sister from same parents

Cousins → Aunt/uncle. child

~~Brother-in-law~~

Spouse → wife / husband

Brother-in-law → spouse's brother (or) Sisters's husband

Sister-in-law → spouse's sister (or) Brother's wife

Father-in-law → spouse's father

Mother-in-law → spouse's mother

Nephew → sibling's son

Niece → Sibling's Daughter

Daughter-in-law → Son's wife

Son-in-law → Daughter's wife

Aunt → parent's sister

Uncle → parent's Broter

paternal uncle → Father's brother

Maternal uncle → Mother's brother

~~Father's mother~~ → pat

paternal grandmother → Father's mother

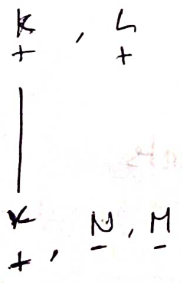
Maternal grandmother → Mother's mother

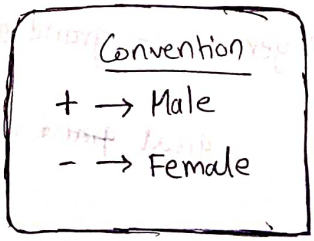
Cousin-in-law → Cousin's wife / husband

first cousin → ~~Cous~~ Cousin's child

second cousin → Cousin's grand child

Q9



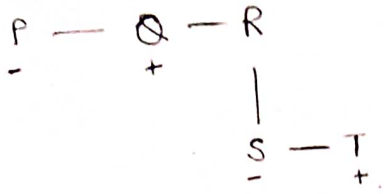


L is father's brother to M

∴ L is uncle of M

M is niece of L

Q10

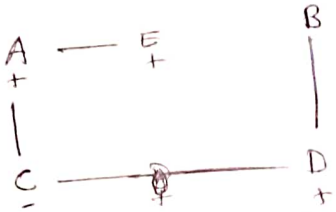


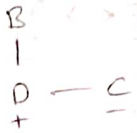
Q is parent's brother to T

∴ Q is uncle to T ✓

Also T is nephew to Q

Q11





A & B are parents of B

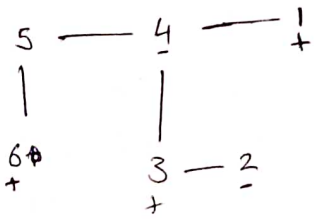
∴ B is female

B is brother's wife to E

i.e., sister-in-law ✓

E is brother-in-law to B

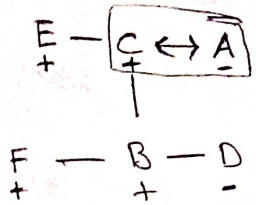
Q12 (i)



(i) 6 is cousin to 3

(ii) I have 2 nephew (i.e., 3, 6)

Q13

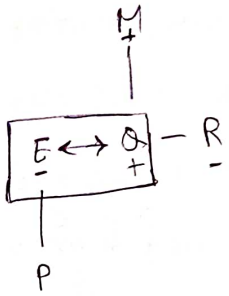


(i) males — 4

(ii) A

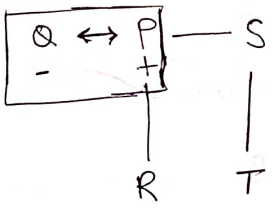
(iii) 3

Q14



∴ ~~grandchi~~ grandchild

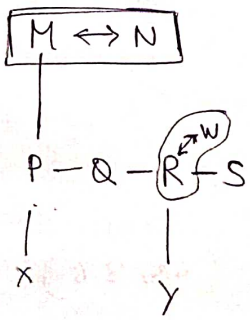
Q15



∴ opt (c)

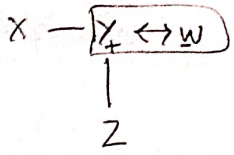
Q16

(a)



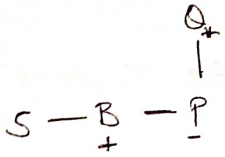
∴ opt (a)

Q17 (i) X # Y * Z $ W



∴ opt (a)

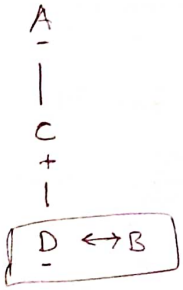
(ii)



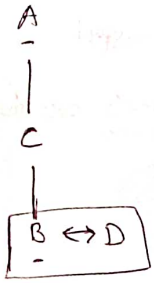
∴ opt (c)

Q18

a)

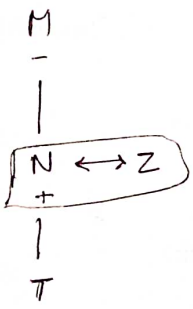


b)



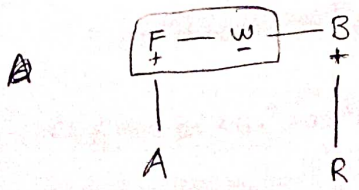
∴ opt (b)

Q19



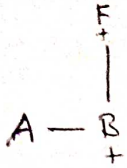
∴ opt (c)

Q20



∴ cousin

Q21



∴ brother

∴ opt (d)

Q22

only child of grandmother

↳ parent

~~∵ given is woman~~

~~∴ parent~~

parent's daughter = sister

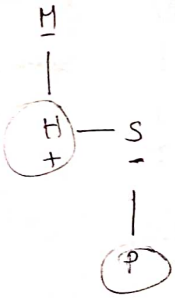
Q23

wife of my husband

herself

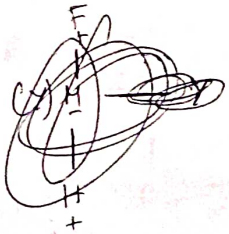
daughter's brother — son

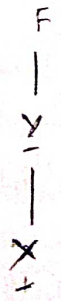
Q24



∴ Niece

Q25





X speaking to Y

(man) (woman)

∴ Mother

22/05/20
Day 16

Progressions

Arithmetic progression

$a, a+d, a+2d, \cdots a+(n-1)d$

a — 1st term; $a+(n-1)d$ — n^{th} term

d = common difference.

Sum of 'n' terms in AP $= \frac{n}{2}$ (1st term + last term)

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

Sum of 'n' terms $= \frac{n}{2}\left(2a+(n-1)d\right)$

If last term 'l' and first term 'a' and common diff 'd' are given, then

no of terms, $n = \frac{l-a}{d} + 1$

Geometric Progression :

$a, ar, ar^2 \cdots ar^{n-1}$

r — common ratio

Sum of n terms in GP

$$S_n = a + ar + ar^2 + \cdots + ar^{n-1} \quad -(1)$$

$$rS_n = ar + ar^2 + ar^3 + \cdots + ar^n \quad -(2)$$

$(1) - (2) \Rightarrow S_n(1-r) = a - ar^n$

$\Rightarrow$ **$S_n = \frac{a(1-r^n)}{1-r}$** → no of terms

Y (woman)

In GP

$a, ar, ar^2, \ldots \infty, \quad r<1$

$$S_n = \frac{a(1-r^n)}{1-r} \qquad n \to \infty \Rightarrow r^n \to 0$$

$$\therefore S_n = a\,\frac{1}{1-r}$$

$$\therefore \quad S_\infty = \frac{a}{1-r}$$

24/08/20

(Q1)

$$\frac{-54-11}{5}+1$$

$$= 13+1 = 14$$

(Q2)

$1+2+3+\cdots+365$

$$= \frac{365}{2}\left(2(1)+364(1)\right)$$

$$\frac{n}{2}(a+l)$$

$$= \frac{365}{2}(366) = 356 \times 183 = 66795$$

(Q3)

$100, 95, 90, \ldots 100+(n-1)5$

$$975 = \frac{n}{2}\left(100+100+(n-5)(-5)\right)$$

$$200n - 5n^2 + 25n = 1950$$

$$5n^2 - 175n + 1950 = 0$$

$$n^2 - 35n + 390 = 0$$

$$\Rightarrow n = 15$$

$$5n^2 - 225n + 1950 = 0 \Rightarrow n^2 - 45n + 370 = 0$$

$$\Rightarrow n = 15$$

Q4) 11 to 381

12, 14 ··· 380

no of terms = $\frac{380-12}{2}+1 = \frac{368}{2}+1 = 185$

Sum = $\frac{185}{2}(11+381) = \frac{185}{2}(392) = 185 \times 196$

$= 36260$

Q5) 201, ···· 498

no of terms = $\frac{498-201}{3}+1$

$= \frac{297}{3}+1$

$= 99+1 = 100$

Q6) 203, 210 · · · · 399

no of terms = $\frac{196}{7}+1 = 29$

Sum = $\frac{29}{2}(203+399) = 29 \times 301$

$= 8729$

Q7)

LCM(3, 4 8) = 24

72, 96, ···, 288

$n = \frac{288-72}{24}+1 = 9+1 = 10$

Sum = $\frac{10}{2}(72+288) = \frac{10}{5}(360) = 1800$

Q8)

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

$= N(4)+N(5)-N(20)$

(blue is mentioned ∴ exclusive)

$= \left(\frac{248-104}{4}+1\right)+\left(\frac{245-105}{5}+1\right)-\left(\frac{240-120}{20}+1\right) = 59$

(Q9) either 4 or 5 but not both

$= (\text{either 4 or 5}) - (\text{both})$

$= N(4) + N(5) - 2N(4 \cap 5) - N(4 \cap 5)$

$= N(4) + N(5) - 2N(4 \cap 5)$

(Q10) $4(1+2+\cdots+12)$

$4 \cdot \frac{12(13)}{2} = 312$

(Q11) $a+16d = 33$

$S_{33} = \frac{33}{2}(a + a+32d)$

$= \frac{33}{2}(a+16d)$

$= 33 \times 33 = 1089$

(Q12) $7(a+6d) = 11(a+10d) \Rightarrow a+17d = ?$

$7a+42d = 11a+110d$

$\Rightarrow 4a+68d = 0$

$\Rightarrow a+17d = 0$

Silly if p time p^{th} term is equal to q times q^{th} term then $(p+q)^{th}$ term is 0

(S13) $\frac{18}{2}(2a+15d) = \frac{9}{18}(2a+17d)$

$16a + 120d = 18a + 153d$

$\Rightarrow 2a + 33d = 0$

$S_{34} = \frac{34}{2}(2a+33d)$

$= 0$

(S14) $44, 42, 40, \ldots 2$

(to get max sum we must take only positive numbers)

no of terms $= \frac{44-2}{2} + 1 = 22$

$\frac{22}{2}(2+44) = 11 \times 46$

(S15) $17, (21), 25, 29, 33, 37, (41)$

$16, (21), 26, 31, 36, (41)$

$LCM(4,5) = 20$

difference

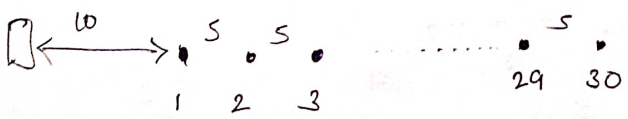
$21, 41, \ldots$ $\therefore$ for every 20 ~~elements~~ we well have common element

$\Rightarrow \frac{100}{2}(21(2) + 99(20)) = \frac{100}{2}(42 + 1980)$

$= \frac{100}{2}(2022) = 101100$

term is equal then $(p+2)^{th}$

(S16)



$\therefore 5 \times 29 + 10$

$20 + 30 + 40 + \ldots + \left[(20 + 29(20)) - 155\right]$ → no need to return back to the well

$S = \frac{30}{2}(20(2) + 29(20)) = 15(31(20)) = 15 \times 620 - 155$

$= 4950 - 155 = 4795$

-155

Q17 $1*2^2 + 2*3^2 + 3*4^2 + 4*5^2 + \dots + 10*11^2$

$+2^2 \quad +3^2 \quad +4^2 \quad +5^2 \quad \dots \quad +11^2$

$= 2^3 + 3^3 + 4^3 + \dots + 11^3 - (2^2 + 3^2 + \dots + 11^2)$

$= 1^3 + 2^3 + \dots + 11^3 - (1^2 + 2^2 + \dots + 11^2)$

$= \frac{11^2(12)^2}{4} - \frac{11(12)(23)}{6}$

$= 11^2 \cdot 6^2 - 11(2)(23)$

$= 11[11 \times 36 - 2 \times 23]$

$= 11[396 - 46]$

$= 11(350)$

$= 3850$

36
36
396

350
350
3850

Math Method 2:

$$\sum_{n=1}^{10} n(n+1)^2$$

$\Rightarrow \sum (n^3 + 2n^2 + n)$

$= \sum n^3 + 2\sum n^2 + \sum n$

$= 3850$

Q18 $1 + \frac{1}{2} + \frac{1}{4} + \dots$

$a_1 = 1/2$

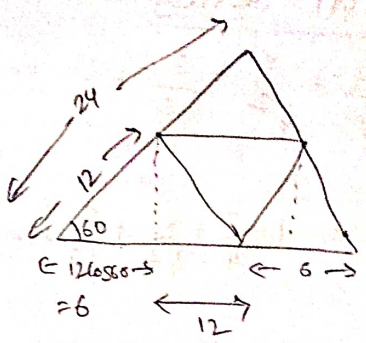
$S_n = \frac{a_1(1 - 1/2^\infty)}{1 - 1/2} = \frac{1}{1/2} = 2$

Q19 $S_n = \frac{a}{1-a} = \frac{1}{1 - 1/4} = 4/3$

(Q20) T_1 = perimeter $= 3a = 72$

T_2 = perimeter $= 3\frac{a}{2} =$

T_3 - - - - - $3\frac{a}{4}$



$$3a + 3\frac{a}{2} + 3\frac{a}{4} + \cdots$$

$$= 3\left(a + \frac{a}{2} + \frac{a}{4} + \cdots\right)$$

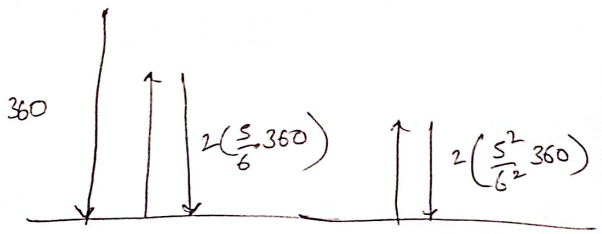
$$= 3\,\frac{a}{1 - 1/2} \Rightarrow 3(2a) = 6(24) = 144$$

(Q21)

$$B = \frac{a(r^n - 1)}{r - 1} = \frac{1(2^{55} - 1)}{2 - 1} = 2^{55} - 1$$

$\therefore A > B$ by 1

(Q22)



$$\Rightarrow 2\left\{2\cdot 360 + 2(360)\frac{5}{6} + 2(360)\left(\frac{5}{6}\right)^2 + \cdots\right\} - 360$$

$$= 2\left(\frac{360}{1 - 5/6}\right) - 360$$

$$= 2(360)(6) - 360$$

$$= 11(360) = \underline{3960}$$

36
36
396

AGP Series

(Q23) ★★★

$$1+\frac{3}{4}+\frac{5}{4^2}+\frac{7}{4^3}+\cdots$$

Let $S_\infty = 1+\frac{3}{4}+\frac{5}{4^2}+\frac{7}{4^3}+\cdots$

$$\frac{1}{4}S_\infty = \frac{1}{4}+\frac{3}{4^2}+\frac{5}{4^3}+\frac{7}{4^4}+\cdots$$

$$S_\infty - \frac{1}{4}S_\infty = 1+\frac{2}{4}+\frac{2}{4^2}+\frac{2}{4^3}+\cdots$$

$$\frac{3}{4}S_\infty = 1+2\left(\frac{1}{4}+\frac{1}{4^2}+\frac{1}{4^3}+\cdots\right)$$

$$\frac{3}{4}S_\infty = 1+2\,\frac{1/4}{1-1/4}$$

$$= 1+2\,\frac{1/4}{3/4}$$

$$\frac{3}{4}S_\infty = 1+\frac{2}{3}$$

$$S_\infty = \frac{5}{3}\,\frac{4}{3} = \frac{20}{9}$$