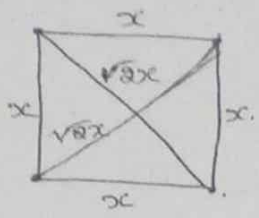
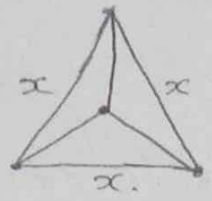
08/03/2021

Face To Face Puzzle.

1) How to keep 4 Points equal distance from one another?

Ans.





Triangular Pyramid

2) Color of Bear Puzzle (IMP)

A Bear falls from 10m height in $\sqrt{2}$ Seconds.

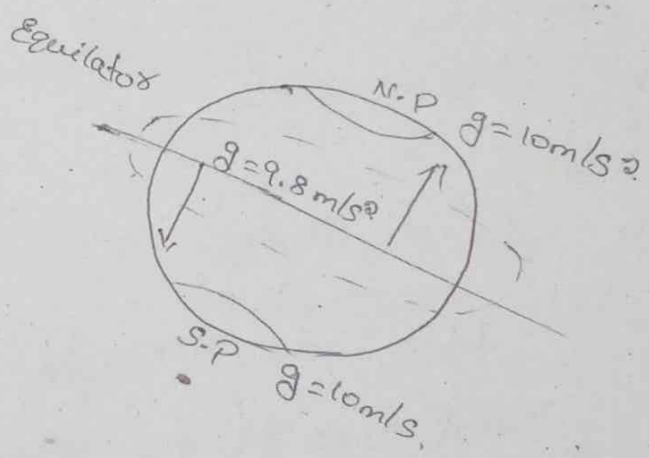
$h = ut + \frac{1}{2}gt^2$

$10 = (0)t + \frac{1}{2}g(\sqrt{2})^2$

$10 = 0 + \frac{1}{2}g(2)$

$10 = g.$

$\boxed{g = 10 m/s^2}$



Polar Bear white

Work and Time

A can do a work = n days

1 day work of 'A' = $\frac{1}{n}$

5 day work of 'A' = $\frac{5}{n}$

work remain = $\left(1-\frac{5}{n}\right) = \left(\frac{n-5}{n}\right)$

B can completed full work = x days.

Time taken by B to complete Remaining work = $\left(\frac{n-5}{n}\right)x$,

$\left(\frac{n-5}{n}\right)\times\frac{1}{x}$, $\left(\frac{n}{n-5}\right)\times n$, $\left(\frac{n}{n-5}\right)\times\frac{1}{x}$.

A = 32days

$\frac{1}{2}$ work.

Time = $\frac{1}{2}\times 32 = 16$ days

$\frac{1}{4}$ work

Time = $\frac{1}{4}\times 32 = 8$days.

$\frac{3}{4}$ work

Time = $\frac{3}{4}\times 32 = 24$ days.

1day work of A = $\frac{1}{48}$
Total time by A = 48days.

if 7 days. work of B = $\frac{42}{240}$

1 days work of B = $\frac{42}{240\times 7} = \frac{1}{40}$

Total time by B = 40 days

eg:- $\frac{2}{3}$ work by C is Completed in 60 day's

1 work by C is completed = $\frac{60}{2/3} = \frac{60\times 3}{2} = 90$ days

Total time by C = 90day's

* A, B and C can do a work in 36 days, 48days and 96days respectively. A and B starts working together but 'A' left after 3-days and 'B' left after another 9days so, In w.r.t time 'C' can complited remaining work..

given

A = 36days, B = 48days, C = 96days.

work done by (A+B) = $\frac{3}{36}+\frac{12}{48} = \frac{1}{12}+\frac{1}{4} = \frac{1}{3}$,

work Remain = $1-\frac{1}{3} = \frac{2}{3}$

Time taken by C to complited Remain work

$= \frac{2}{3}\times 96 = 64$ days

Method-2

$\frac{3}{36}+\frac{12}{48}+\frac{x}{96} = 1$

$\frac{1}{12}+\frac{1}{4}+\frac{x}{96} = 1$

$\frac{4+12}{48}+\frac{x}{96} = 1$

$\frac{x}{96} = \frac{16}{48}$

$\frac{x}{96} = \frac{1}{3}$

$= \frac{96}{3}$

$\boxed{x = 64 \text{ days}}$

1) A and B can do a work in 10 days and 15 days respectively. In how many days they will complete it together.

Method :-

1 day work of A $= \frac{1}{10}$

1 day work B $= \frac{1}{15}$

1 day work (A+B) $= \frac{1}{10} + \frac{1}{15} = \frac{1}{6}$

Total time (A+B) = 6 days

Method :-

A = 10 days = x days

B = 15 days = x days

$$\frac{x}{10} + \frac{x}{15} = 1$$

$$\frac{3x+2x}{30} = 1$$

$$\frac{5x}{30} = 1$$

$$5x = 30$$

$$x = \frac{30}{5} = 6 \text{ days}$$

2) A and B can complete a work in 24 days and 56 days respectively. A works alone for 3 days and left so in how many days B will compliting the remaining work.

Method-1

work done by A $= \frac{3}{24} = \frac{1}{8}$

work Remain $= 1 - \frac{1}{8} = \frac{7}{8}$

Time taken by 'B' to compliting the Remaining work

$$= \frac{7}{8} \times 56 = 49 \text{ days}$$

Method-2

A = 24 days = 3 day's.

B = 56 days = x day's

$$\frac{3}{24} + \frac{x}{56} = 1$$

$$\frac{x}{56} = 1 - \frac{1}{8} = \frac{7}{8}$$

$$x = \frac{7}{8} \times 56$$

$$\boxed{x = 49 \text{ days}}$$

3) A & B can complete a work in 48 days and 72 day's respectivly both start working together but 'A' left after 7-day's in How many day's work for complited.

A = 48 days = 7 days.

B = 72 days = x days

$$\frac{7}{48} + \frac{x}{72} = 1$$

$$\frac{1}{6} + \frac{x}{72} = 1$$

$$\frac{x}{72} = \left(1 - \frac{1}{6}\right)$$

$$= \frac{5}{6} \times 72$$

$$\boxed{x = 60 \text{ days}}$$

4) A, B, and C can complete a work in 80 days, 30 days and 60 days respectively. A & B starts working together but 'A' left after 5 days and 'C' joined the work after 6 days from starting. find

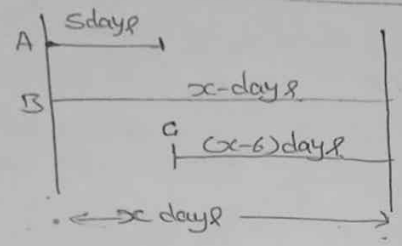
a) work over how many days

b) C work for how many days

A = 80 days = 5 days

B = 30 days = x days

C = 60 days = $(x-6)$ days



a)

$$\frac{5}{80} + \frac{x}{30} + \frac{x-6}{60} = 1$$

$$\frac{15+8x+x-6}{60} = 1$$

$$3x + 9 = 60$$

$$3x = 51$$

$$\boxed{x = 17 \text{ days}}$$

b)

$$C = (x-6)$$

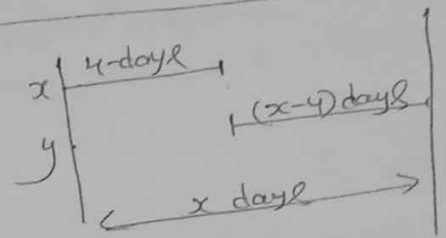
$$= 17-6$$

$$C = 11 \text{ days}$$

10) X and Y can do a piece of work in 80 days and 18 days respectivly. 'X' started the work alone and then after 4 days Y joined him till the completion of the work. How long did the work last.

$x = 80$ days

$y = 18$ days



$$\frac{x}{80} + \frac{x-4}{18} = 1$$

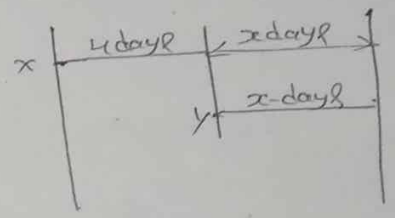
$$\frac{3x+5x-80}{60} = 1$$

$$8x - 80 = 60$$

$$8x = 80$$

$$\boxed{x = 10 \text{ days}}$$

Method-2



$$\frac{x+4}{80} + \frac{x}{18} = 1$$

$$\frac{3x+12+5x}{60} = 1$$

$$8x + 12 = 60$$

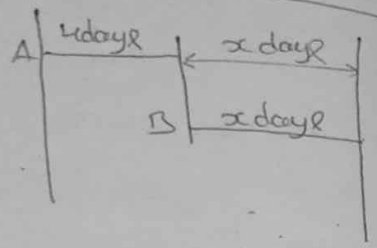
$$8x = 48$$

$$x = 6 \text{ days}$$

$$(4+x) = (4+6)$$

$$x = 10 \text{ days}$$

Q) A can finish a work in 16 days & B can finish the same work in 20 days. After 'A' had worked for 4 days, 'B' also joined with 'A' to finish the remaining work. In how many days will the remaining work be finished.



$$\frac{x+4}{16} + \frac{x}{20} = 1$$

$$\frac{5x+20+4x}{80} = 1$$

$$9x+20 = 80$$

$$9x = 60$$

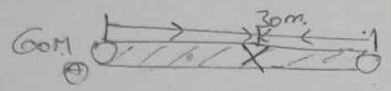
$$x = \frac{60}{9} = \frac{20}{3}$$

$$\boxed{x = 6\frac{2}{3} \text{ days}}$$

Puzzel

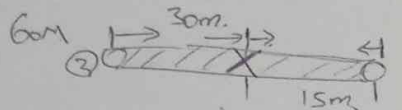
09/03/2021

* ③ Time by using two ropes [IMP]



ⓐ 90m

ⓑ 45m.



→ Ⓐ will burn completely they Ⓑ other side get fire.

Distribution of money

→ A, B and 'C' can complete a work in 20 day, 30 days and 60 days respectively. they completed work together and received 6600 Rs. So what will be the amount that each will receive.

Solution

	A	B	C
No of days	20	30	60

Efficiency $\frac{1}{20} : \frac{1}{30} : \frac{1}{60}$ → take LCM

$$\frac{1}{20}\times 60 : \frac{1}{30}\times 60 : \frac{1}{60}\times 60$$

$$3 : 2 : 1$$

$$A = \frac{3}{6} \times 6600 = 3300$$

$$B = \frac{2}{6} \times 6600 = 2200$$

$$C = \frac{1}{6} \times 6600 = 1100$$

2) P and Q were assigned to do a work for an amount of 1200. 'P' alone can do it in 15 days while 'Q' can do it in 12 days. with the help of R they finish the work in 6 days. Find the share of R.

	P	Q	R
No of days	15	12	x

P, Q, R } 6 days

$$\frac{1}{15} + \frac{1}{12} + \frac{1}{x} = \frac{1}{6}$$

$$\cancel{\frac{1}{15}+\frac{1}{12}-\frac{1}{6}=\frac{1}{x}}$$

$$\frac{1}{x} = \frac{1}{6} - \frac{1}{15} - \frac{1}{12} = \frac{10-4-5}{60} = \frac{1}{60}$$

$$x = 60 \text{ days}$$

Efficiency

P Q R

$\frac{1}{15} : \frac{1}{12} : \frac{1}{60}$

$\frac{1}{15}\times 60 : \frac{1}{12}\times 60 : \frac{1}{60}\times 60$

$4 : 5 : 1$

$R = \frac{1}{10}\times 18000 = 180$ Rs

Q) A & B undertake a piece of work for Rs. 730. A alone can do it in 12 days while B alone in 16 days. If they get 'C' to help them & finish the work in 6 days, what should be C's share of the money earned

A = 12 days
B = 16 days
C = x

$\frac{1}{12} + \frac{1}{16} + \frac{1}{x} = \frac{1}{6}$

$\frac{1}{x} = \frac{1}{6} - \frac{1}{12} - \frac{1}{16}$

$\frac{1}{x} = \frac{8-4-3}{48}$

$\frac{1}{x} = \frac{1}{48}$

$x = 48$ days

6 | 6, 12, 16
2, 16
16×6
96

P Q R

$\frac{1}{12}$ $\frac{1}{16}$ $\frac{1}{48}$

$\frac{1}{12}\times 48$ $\frac{1}{16}\times 48$ $\frac{1}{48}\times 48$

$4 : 3 : 1 = 8$

$C = \frac{1}{8}\times 730 = 90$

$C = 90$

* when two person work together

Q) A and B can do a piece of work in 24 days. B & C can do it in 40 days, while A & C can do it in 30 day. In how many days can A alone do it?

Find :- (a) Time taken by A, B, C to complete it working together.

A = 1 day work (A+B) = $\frac{1}{24}$ — (1)

1 day work (B+C) = $\frac{1}{40}$ — (2)

1 day work (C+A) = $\frac{1}{30}$ — (3)

(1)+(2)+(3)

1 day work 2(A+B+C) = $\frac{1}{24} + \frac{1}{40} + \frac{1}{30}$

$= \frac{5+3+4}{120} = \frac{12}{120} = \frac{1}{10}$

1 day work (A+B+C) = $\frac{1}{2\times 10} = \frac{1}{20}$

Total time (A+B+C) = 20 days

(b) 1 day work A = 1 day work (A+B+C) − 1 day work (B+C)

$= \frac{1}{20} - \frac{1}{40} = \frac{2-1}{40} = \frac{1}{40}$

Total time = 40 days

(c)

Q) 10 men can do a work in 12 days (or) 15 women can do for work in 16 days. So in how many days 15 men & 20 women can do it together?

10 men = 12 day

15 women = 16 day.

15 men = ?

20 women = ?

1 men will take $10 \times 12 = 120$ days

1 women will take $15 \times 16 = 240$ days

1 day work (15M + 20W)

$= \frac{15}{120} + \frac{20}{240}$

$= \frac{1}{8} + \frac{1}{12} = \frac{3+2}{24} = \frac{5}{24}$

Total time $= \frac{24}{5}$ days

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

Q) 2 men and 5 women can do a work in 10 days

$2m + 5w = \frac{1}{10}$

Q) If 6 men & 8 boys can do a piece of work in 10 days while 26 men & 48 boys can do the same in 2 days, the time taken by 15 men & 20 boys in doing the same type of work will be.

$6m + 8B = \frac{1}{10}$, $26m + 48B = \frac{1}{2}$.

$15m + 20B = \frac{1}{x}$

$6m + 8B = \frac{1}{10} \Rightarrow 60m + 80B = 1$ —— (1)

$26m + 48B = \frac{1}{2} \Rightarrow 52m + 96B = 1$ —— (2)

$15m + 20B = \frac{1}{x}$

from (1) & (2)

$60m + 80B = 52m + 96B$

$18m = 16B$

$m = 2B$

Taking eqn (2)

$52(2B) + 96B = 1$

$200B = 1$

$B = \frac{1}{200}$ Time taken by 1 boy $\Rightarrow$ 200 days

$m = 2 \times \frac{1}{200} = \frac{1}{100}$ Time taken by 1 men = 100 days

1 day work of (15m + 20B)

$= 15 \times \frac{1}{100} + 20 \times \frac{1}{200} = \frac{1}{4}$

Total time = 4 days

Q) If 3 men & 4 women can finish the work in 24 days, 4 men & 8 women can finish the same work in 15 days, in how many days will it take for 1 man alone to finish the same work

$3m + 4w = \frac{1}{24} \Rightarrow 72M + 96W = 1$ — (1)

$4m + 8w = \frac{1}{15} \Rightarrow 60M + 180W = 1$ → (2).

$72M + 96W = 60M + 180W$.

$12M = 24W$

$M = 2W$

$\boxed{W = \frac{M}{2}}$

cost time 1 man will complete the work,

$60M + 180 \times \frac{M}{2} = 1$

$60M + 60M = 1$

$120M = 1$

$M = \frac{1}{120}$.

$\boxed{\text{Time} = 120 \text{ days}}$

Q) 4 men & 3 women finish a job in 6 days & 5 men & 7 women can do the same job in 4 days. If one man and one woman start working together on the same task then on which day will they finish their work.

$4M + 3W = 6 \Rightarrow 24M + 18W = 1$ — (1)

$5M + 7W = 4 \Rightarrow 20M + 28W = 1$ — (2)

$1M + 1W = x$

$24M + 18W = 20M + 28W$.

$4M = 10W$

$2M = 5W$

$\boxed{M = \frac{5W}{2}}$

Eqn (2).

$\overset{10}{\cancel{20}} \times \frac{5W}{\cancel{2}} + 28W = 1$

$78W = 1$

$\boxed{W = \frac{1}{78}}$

Eqn (2)

$M = \frac{5W}{2} = \frac{5 \times 1}{2 \times 78} = \frac{5}{156}$

1 day work $(1M + 1W)$

$= \frac{5}{156} + \frac{1}{78}$

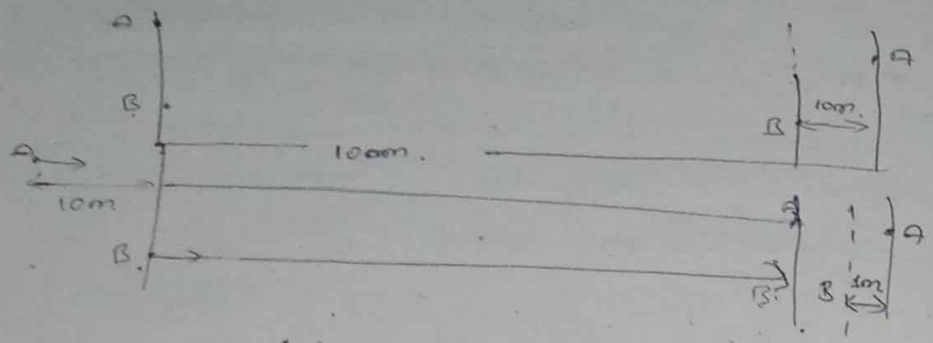
$= \frac{5+2}{156} = \frac{7}{156}$

Time $= \frac{156}{7} = 22\frac{2}{7}$ days.

work will finish 23rd day

Puzzle 10/03/2021

* Race between A and B:-

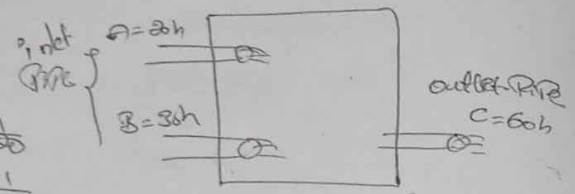


∵ 100m m of A = 90m of B

∴ 10m of A = 9m of B

Pipes and Cistern

Q) A = 20h
B = 30h
C = 60h



work done by A in 1hr = $\frac{1}{20}$

B in 1hr = $\frac{1}{30}$

C in 1Hr = $\frac{1}{60}$

work done in 1hr (A+B+C) = $\frac{1}{20} + \frac{1}{30} - \frac{1}{60}$

Total time = $\frac{3+2-1}{60} = \frac{1}{15}$

method-2

A = 20h = x h
B = 30h = x h
C = 60h = x h

$\frac{x}{20} + \frac{x}{30} - \frac{x}{60} = 1$

$\frac{3x+2x-x}{60} = 1$

$4x = 60$

$x = 15$ hr

Q) Pipe A & B running together can fill a cistern in 6 minutes. If B takes 5 minutes more than A to fill the cistern then the times in which A and B will fill the cistern seperately will be respectively.

A = 6min x min
B = 11 min (x+5) min. } 6min.

$\frac{1}{x} + \frac{1}{(x+5)} = \frac{1}{6}$

$\frac{x+5+x}{x(x+5)} = \frac{1}{6}$

$\frac{2x+5}{x^2+5x} = \frac{1}{6}$

$12x+30 = x^2+5x$

$x^2-7x-30=0$

$x^2-10x+3x-30=0$

$x(x-10)+3(x-10)=0$

$x=10$ min

-7x
-10x 3x
-30

A = 10min
~~B = 3C~~
& B = 10+5 = 15min

Q) One pipe can fill a tank 3 times as fast as another pipe. If together the 2 pipes can fill the tank in 36 minutes, then time taken by slower pipe to fill the tank is.

~~Pipe = 3x~~ let time taken by fast pipe = x min & slow pipe = 3x min } 36m
~~= 36m~~

$\frac{1}{x} + \frac{1}{3x} = \frac{1}{36}$

$\frac{3+1}{3x} = \frac{1}{36}$

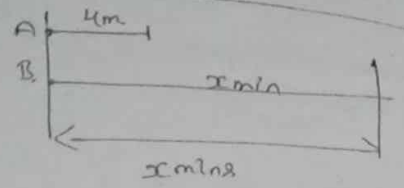
$\frac{4}{3x} = \frac{1}{36}$

$3x = 144$ min

slow pipe line

Q) Two Pipes A & B can fill a tank in 15minutes & 30 minutes respectively. Both the Pipes are opened together but after 4 minutes, Pipe A is turned off. what is the total time required to fill the tank

A = 15m
B = 30m.



$$\frac{4}{15} + \frac{x}{30} = 1$$

$$\frac{x}{30} = 1 - \frac{4}{15} = \frac{11}{15}$$

$$x = \frac{11 \times 30}{15} = \frac{44}{3} h$$

$$= 14\frac{2}{3} \times 60 \text{ sec}$$

$$\boxed{x = 14m\ 40sec}$$

Q) Pipe A can fill a tank in 12hr. Due to a leak at the bottom it takes 30 hr to fill the tank in what time the leak alone can empty the full tank.

A = 12hr.
leak = x hr.
30hr.

$$\frac{1}{12} - \frac{1}{x} = \frac{1}{30}$$

$$\frac{1}{12} - \frac{1}{30} = \frac{1}{x}$$

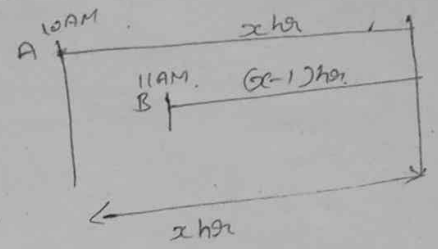
$$\frac{5-3}{60} = \frac{1}{x}$$

$$\frac{1}{x} = \frac{2}{60} = \frac{1}{30}$$

$$\boxed{x = 30}$$

Q) A tank can be filled A in 8hr & Pipe B in 6hr, at 10am pipe A was opened. At what time will be the tank be filled if pipe 'B' is opened at 11 A.M

A = 8hr.
B = 6hr.



$$\frac{x}{8} + \frac{x-1}{6} = 1$$

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

$$4x - 1 = 6.$$

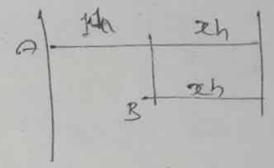
$$4x = 6+1$$

$$x = \frac{7}{4} hr.$$

$$x = 1\frac{3}{4} \times 60M$$

$$\boxed{x = 1h\ 45Min}$$

method-2



$$\frac{x+1}{8} + \frac{x}{6} = 1$$

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

$$4x+3 = 6$$

$$4x = 6-3$$

$$4x = 3$$

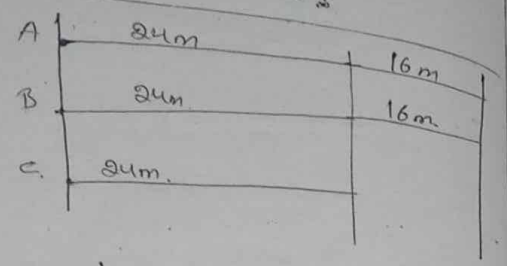
$$x = \frac{3}{4} \times 60m$$

$$x = 45m$$

$$x+1 = 1hr\ 45m$$

Q) Pipe A & B can fill an empty ~~tank~~ tank in 40 min & 60 min, respectively & Pipe C takes empty full tank in x min. All the 3 pipes are opened for 24 min & then C is closed together fill the tank in another 16 min. what is the value of x?

A = 40 min
B = 60 min
C = x min.



$$\frac{40}{40} + \frac{40}{60} - \frac{24}{x} = 1$$

$$1 + \frac{4}{6} - \frac{24}{x} = 1$$

$$\frac{2}{3} = \frac{24}{x}$$

$$\frac{1}{3} = \frac{12}{x}$$

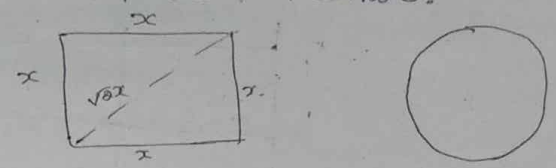
$$\boxed{x = 36\,m}$$

11/03/2021

Puzzle :-

* why manhole is made circular? [IMP]

=> manhole made square or rectangular then if slab will fall inside the manhole if it is place vertically along with diagonal but not possible in the case of circular manhole.



* circular slab can easily be rotated, one place to other place & transport.

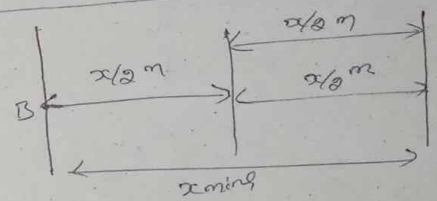
* Pressure in the case of circular manhole is uniformally & equally distribute it survive long duration and not broken by earth quick at all.

* no allignment needed if manhole in circular?

* The cost of making circular shape slap less than other shape.

Q) A large tanker can be filled by two pipes A & B in 60 minutes and 40 minutes respectively. How many minutes will it take to fill the tanker from empty state if B is used for half the time & A & B fill it together for the other half?

A = 60 min
B = 40 min.



$$\frac{\frac{x}{2}}{60} + \frac{\frac{x}{2}}{40} = 1$$

$$\frac{x}{120} + \frac{x}{80} = 1$$

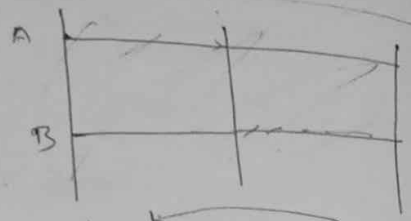
$$\frac{x+3x}{120} = 1$$

$$4x = 120$$

$$\boxed{x = 30\,m.}$$

Q) A large tanker can be filled by two pipes A & B in 60 min and 40 min respectively. How many minutes will it take to fill the tanker from empty state if pipe 'A' is used for half the tank & pipes A & B fill the tank together for the other half.

A = 60 min
B = 40 min.

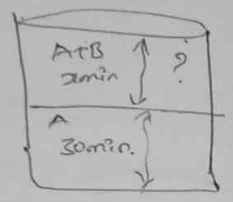


$\frac{x}{60} + \frac{x}{40} = \frac{1}{2}$

$\frac{5x}{120} = \frac{1}{2}$

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

$x = 12m$



A+B = ?

$30 + x = ?$

$30 + 12 = 42m$

(17) A tap can fill a tank in 6 hr. After half the tank is filled, three more similar taps are opened. what is the total time taken to fill the tank completely

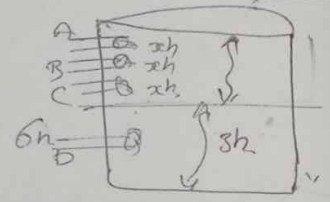
$\frac{x}{6} + \frac{x}{6} + \frac{x}{6} + \frac{x}{6} = \frac{1}{2}$

$\frac{4x}{6} = \frac{1}{2}$

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

$= \frac{3}{4} \times 60$ m

$x = 45$ min



Clock

* angle made in each sector of a clock =

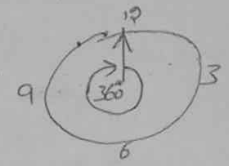
$= \frac{360°}{12} = 30°$

* Angle made by minute hand in 1 min

$60m = 360°$

$m = \frac{360°}{60}$

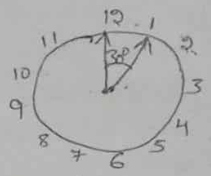
$m = 6°$



* Angle made by hour hand in 1 min

$60m = 30°$

$1m = \frac{30°}{60} = (\frac{1}{2})°$



24 minutes

1) minute angle $= 24 \times 6° = 144°$

2) hour angle $= 24 \times \frac{1}{2} = 12°$

* Angle made between hands at any point of time.

Q) what angle will made by hands of a clock at 18 min pas 7.

7:18.

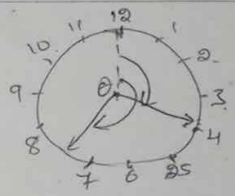
$18 \times 6° = 108°$

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

$\text{Angle} = 30H - \frac{11M}{2}$

$\text{Angle} = 30 \times 7 - \frac{11 \times 18}{2}$

$\text{Angle} = 210 - 99 = 111°$



method-2

Angle made by minute hand $= 18 \times 6° = 108°$

Angle made by hour hand $= 30 \times 7 + 18 \times \frac{1}{2}$

$= 219°$

Angle b/n $= H - M$

$= 219 - 108°$

$= 111°$

Q) 2:10 angle

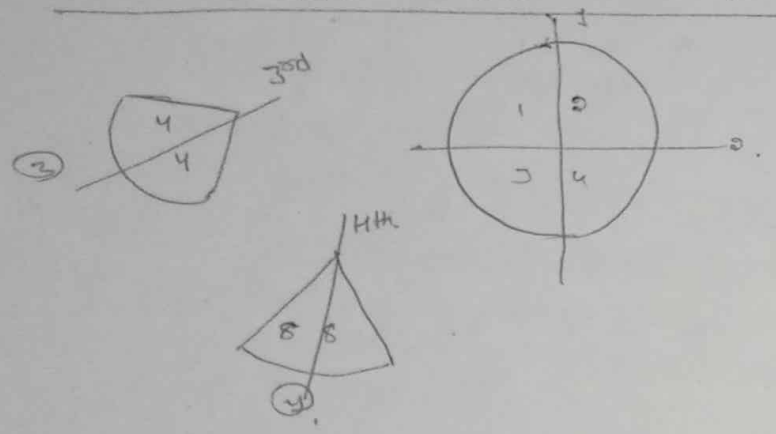
$$\text{Angle} = 30 \times 2 - \frac{11 \times 10}{2}$$
$$= 60 - 55$$
$$\boxed{\text{Angle} = 5^\circ}$$

* 16 min to 7 (Past)
  ⇒ 6:44

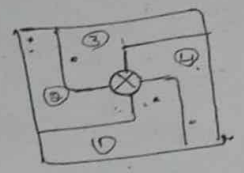
* 16 min Past 7
  ⇒ 7:16

Puzzle :- 12/03/2021

Q) Divide a cake into 16 sections in 4 cuts.



* Time of which
* Divide a plot among 4 persons



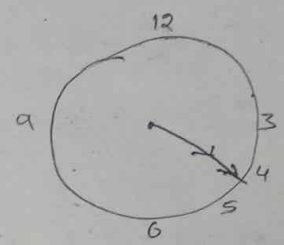
clock Angle = $30H - \frac{11M}{2}$.

* Time of which both hands are straight line in same direction / coinside

Q. At what time with 4 & 5 hands (both) are co-inside

$$\text{Angle} = 30H - \frac{11M}{2}$$
$$0 = 30H - \frac{11M}{2}$$
$$\frac{11M}{2} = 30(4)$$
$$11M = 120$$
$$M = \frac{120}{11} = 10$$

$$30 \times 4 - \frac{11 \times x}{2} = 0$$
$$120 = \frac{11x}{2}$$
$$x = \frac{240}{11}$$
$$x = 21\frac{9}{11}$$



$$4:21:\frac{9}{11} \times 60\,s.$$
$$= 4:21:49\,sec$$

Q) At what time b/n 2 & 3 clock will the hands of a clock be together

$$\text{Angle} = 30H - \frac{11M}{2}$$

$$0 = 30\times 2 - \frac{11x}{2}$$

$$= 60 - \frac{11x}{2}$$

$$= \cancel{\frac{120-22x}{2}}$$

$$\frac{11x}{2} = 60$$

$$11x = 120$$

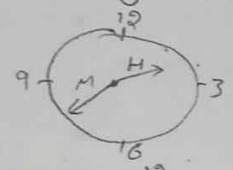
$$x = \frac{120}{11}$$

$$\boxed{x = 10\frac{10}{11}}$$

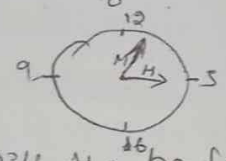
Post 2.

* Time at which both hands are straight line in opposite direction

a) $\frac{11m}{2} - 30H = 180$ [Time < 6] ←



b) $30H - \frac{11m}{2} = 180$ [Time > 6] ←



Q) At what time b/w 4 & 5 clock will the hands of a watch point in opposite direction

$$\frac{11m}{2} - 30H = 180^\circ$$

$$\frac{11(x)}{2} - 30(4) = 180^\circ$$

$$\frac{11(x)}{2} - 120 = 180^\circ$$

$$\frac{11x}{2} = 180 - 120$$

$$11x = 300\times 2$$

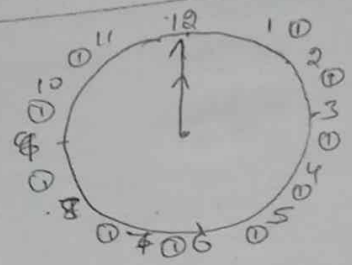
$$x = \frac{600}{11} = 54\frac{6}{11}\ M$$

$\boxed{54\frac{6}{11} \text{ min Post } 4}$ $\boxed{4:54:\frac{6}{11}}$

Q) In a day how many times both hands of a clock makes.

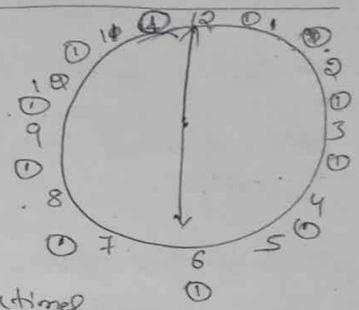
a) Straight line in same direction.

Ans :- 22.



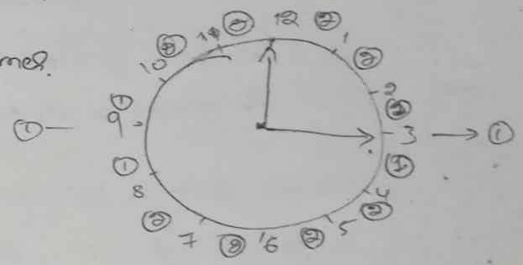
b) A straight line in opposite direction.

Ans :- 22



c) Straight line ⇒ 44 times

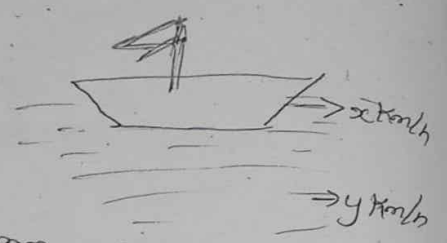
d) Perpendicular line ⇒ 44 times.
(wise in 1 hr)



Boats and Stream

- Distance = Speed × Time
- Speed = $\frac{\text{Distance}}{\text{time}}$
- Time = $\frac{\text{Distance}}{\text{Speed}}$
- $a \times m/s = a \times \frac{18}{5}$ km/h.
- $a \times km/h \Rightarrow a \times \frac{5}{18}$ m/s

- Let the speed of Boat in still water = x km/h
- and speed of stream (water) = y km/h.



- So, speed of Boat in down stream = (x+y) km/h [same dire.]
- and speed of Boat in upstream = (x−y) km/h [opp. direction]
- Let the speed of Boat in down stream = a km/h and speed of Boat in upstream = b km/h

So, Speed of Boat in still water = $x = \frac{1}{2}[a+b]$ km/h
and speed of stream (water) = $y = \frac{1}{2}[a-b]$ km/h

$$\begin{aligned} x + \cancel{y} &= a \\ x - \cancel{y} &= b \\ (+) \quad (+) \quad (+) \end{aligned}$$
$$2x = a+b$$
$$x = \frac{1}{2}[a+b]$$

$$\begin{aligned} \cancel{x} + y &= a \\ \cancel{x} - y &= b \\ (-) \quad (-) \quad (-) \end{aligned}$$
$$2y = a-b$$
$$y = \frac{1}{2}[a-b]$$

- Time Taken in Down stream
$$= \frac{\text{Distance of Down stream}}{\text{Speed of down stream } (x+y)}$$

- Time taken in upstream
$$= \frac{\text{Distance of upstream}}{\text{Speed of upstream } (x-y)}$$

Q) A boat can row upstream at 7 kmph & down stream at 10 kmph. And the speed of boat in still water.

$= \frac{1}{2}[10+7]$

$= \frac{1}{2}[17] = 8.5$ km/h.

Q) A boat can travel with a speed of 13 km/hr in still water. If the speed of the st

$T = \frac{68}{13+4} = \frac{68}{17} = 4$ hrs

Q) If a boat goes 7 km upstream in 42 min & speed of the current is 3 kmph, then the speed of the boat in still water.

$\frac{42}{60} = \frac{7 \text{ km}}{x-3}$

$10 = x-3$

$x = 10+3$

$x = 13$ km/h

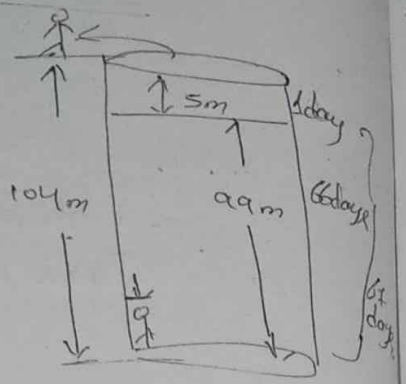
Puzzle

15/03/2021

* A Person into a 104m deep well

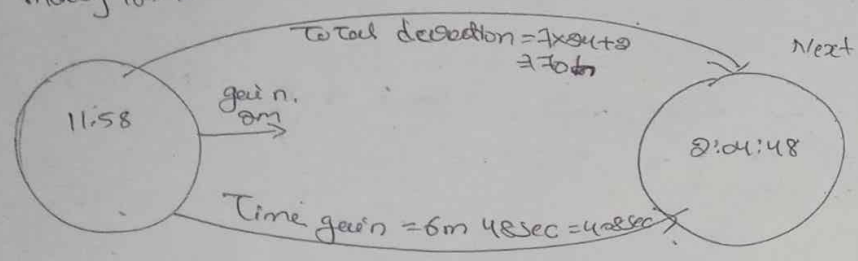
one day 5m upward
Every next day 2m downward

∵ 3m dist. = 2 days
1m dist = $\frac{2}{3}$ days
∴ 89m dist = $\frac{2}{3} \times 99$ days
= 66 days



Q) A watch which gains uniformly is 2 minutes loss at noon on monday & is 4 min. 48 sec fast at 2 pm. on the following monday. when was it correct.

monday 12:00pm



408 sec is time gain = 170h
1 sec is time gain = $\frac{170h}{408}$
100 sec is time gain = $\frac{170h}{408} \times 100 = 50h$

monday 12:00
48h
wed 12:00
2h

$\boxed{\text{wed : 2:00PM}}$ Ans

Q) How much does a watch loose per day, if it's hands coincide every 64 minute? [IMP]

Loss = Fast
gain = Slow.

Question watch
coincide = 64 min.

Compare with normal watch

22 times = 24 hr.
1 time = $\frac{24}{22}$ hr.
= $\frac{24}{22} \times 60m = \frac{720}{11} M = 65\frac{5}{11} m$

Difference of time

= $(65\frac{5}{11} M - 64)$
= $1\frac{5}{11} m$
= $\frac{16}{11} m$

64m watch caused = $\frac{16}{11} m$
1 m watch caused = $\frac{16}{11 \times 64 m}$
60 m watch caused = $\frac{16}{11 \times 64} \times 60$ hr
= $\frac{16}{11 \times 64} \times 60 \times 24$ day
= $\frac{360}{11} M$
= $32\frac{8}{11}$ min / day

Boat & stream

S.P of Boat in still water = $\frac{1}{2}[a+b]$ km/h

S.P of stream = $\frac{1}{2}[a-b]$ km/h

Q) A boat covers 56 km upstream in 7 hr & 48 km downstream in four hr. what is the speed in still water?

S.P of Boat in still water = $\frac{1}{2}(a+b)$ km/h

(a → upstream, b → down)

a = Speed in downstream = $\frac{\text{dist. of downstream}}{\text{time of down stream}}$

$= \frac{48}{4} = 12$ km/h

b = Speed in upstream = $\frac{56}{7} = 8$ km/h

$= \frac{1}{2}[a+b]$ km/h

$= \frac{1}{2}[12+8]$ km/h

$= \frac{1}{2}[20]$ 10 km/h

$= 10$ km/h

Speed of Boat in still water.

Q)

$a = \frac{16}{2} = 8$ km/h

$b = \frac{16}{4} = 4$ km/h

$\frac{1}{2}[a+b] = \frac{1}{2}[8+4]$

$= \frac{1}{2}[12]^6 =$

Speed in still water $= 6$ km/h

Q) A boat running upstream taken 8 hr 48 minutes to cover a certain distance, while it taken 4 hr to cover the same distance running downstream. what is the ratio b/n the speed of the boat & speed of the water current respectively?

Solution

Distance in upstream = Distance in downstream

$(x-y) \times 8 \frac{48}{60} \frac{4}{5}$ $= (x+y) \times 4$

$\frac{44}{5}(x-y)$ $= 4(x+y)$

$\frac{11}{5} = \frac{(x+y)}{1}$

$\frac{11x}{5} - \frac{11y}{5}$ $11(x-y) = 5(x+y)$

$11x - 11y = 5x + 5y$

$11x - 5x = 11y + 5y$

$6x = 16y$

$\frac{x}{y} = \frac{16}{6} = \frac{8}{3}$

$= 8:3$

Q) A man rows at the speed of 5kmph in still water an water is flowing at the rate of 1kmph. if it takes a person to go a place and return in 75min then how far is the place

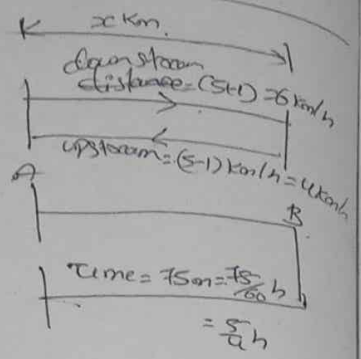
Total time = time of AB + time of BA

$\frac{5}{4} = \frac{x}{6} + \frac{x}{4}$

$\frac{5}{4} = \frac{2x+3x}{12} = \frac{5x}{12}$

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

$x = 3km.$



Q) A motorboat, whose speed in 15km/hr. in still water goes 30km downstream & comes back in a total of 4 hr 30 minutes. The speed of the stream (in km/hr)

Total time = time of AB + time of BA

$\frac{9}{2} = \frac{30}{15+y} + \frac{30}{15-y}$

$\frac{9}{2} = \frac{450-30y+450+30y}{(15+y)(15-y)}$

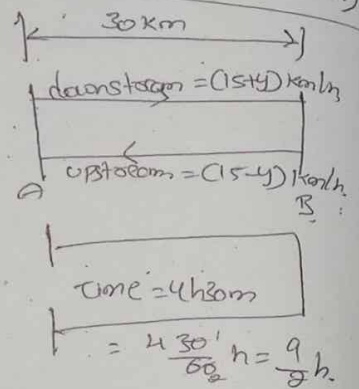
$\frac{9}{2}(225-y^2) = 900$ 100

$225-y^2 = 200$

$y^2 = 25$

$y = \sqrt{25}$

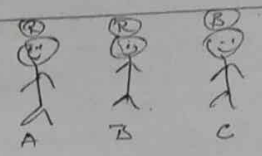
$y = 5km/h$



16/03/2021

Problems on Train

Q) 3 criminals and 4 hats



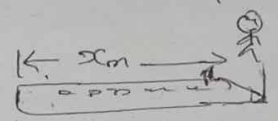
2 Red
2 Blue.

Ans : B

- B&C are same hat color, A will answer early.
- B&C are different hat color. A will difficult to answer, then B will answer.

Problems on Train

Case 1) when a train crosses a standing person or a pole.



Speed → y m/s.

Time to cross = $\frac{\text{length of train}}{\text{Speed of train}}$

Time to cross = $\frac{x}{y}$ sec

Q) A train running at the speed of 60 km/hr crosses a pole in 9 seconds. what is the length of the train

$L = ?$

Time to cross $= \frac{x}{y}$ sec

$$9 = \frac{x}{60 \times \frac{5}{18}}$$

$$x = 9 \times 60 \times \frac{5}{18} = 150m$$

Q) A train 132 m long passes a telegraph pole in 6 seconds. The speed of the train is

$$T = \frac{x}{y} \text{ sec}$$

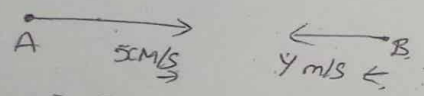
$$6 = \frac{132 \text{ m}}{y}$$

$$y = \frac{132}{6} \times \frac{18}{5} \text{ km/h}$$

$$y = 79.2 \text{ km ph}$$

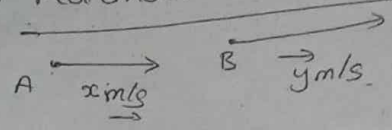
* Relative Speed :

(a) movement in opposite direction



$\Rightarrow$ Relative speed $= (x+y)$ m/s.

(b) movement in same distance

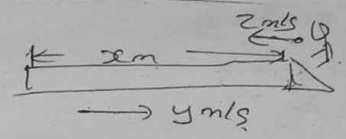


$(x > y)$

$\Rightarrow$ Relative speed $= (x-y)$ m/s.

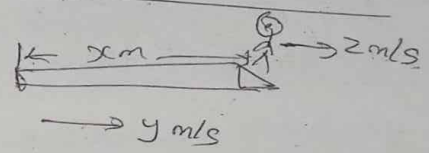
case (i) when a train crosses a standing person/pole

(a) movement in opp. direction



Time to cross $= \left(\frac{x}{y+z}\right)$ sec

(b) movement in same direction



Time to cross $= \left(\frac{x}{y-z}\right)$ sec.

Q) A train 110m long is running with a speed of 60kmph. In what time will it pass a man who is running at 6kmph in the direction opposite to that in which train is going.

Time to cross $= \left(\frac{x}{y+z}\right)$ sec.

$= \frac{110}{60\times\frac{5}{18}+6\times\frac{5}{18}}$

$= \frac{\cancel{110}^{5} \times \cancel{18}^{6}}{\cancel{5}\times \cancel{66}_{3}}$

$= 6$ sec

5) a) A train travelling at 250 km/h overtakes a cyclist who is moving in same direction at 10km/h in 45 seconds. Find the length of train in meters.

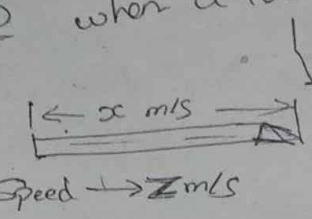
Time to cross $= \left(\frac{x}{y-z}\right)$ sec

$45 = \frac{x}{250\times\frac{5}{18} - 10\times\frac{5}{18}}$

$x = 45\times 250\frac{5}{18}\ (240)$

$\boxed{x = 3000M}$

Case iii) when a train crosses a platform/bridge



$\Rightarrow$ Time to cross $= \frac{x_{train} + y_{platform}}{Z_{speed\ of\ train}}$

Q) The length of a bridge, which a train 130m long & travelling at 45 km/hr can cross in 30 seconds is

$= 130$

Time to cross $= \frac{x_{train} + y_{platform}}{Z_{speed\ of\ train}}$

$30 = \frac{130+y}{45\times\frac{5}{18}}$

$130+y = \cancel{30}^{15}\times\cancel{45}^{5}\times\frac{5}{\cancel{18}_{2}}$

$130+y = 375$

$y = 375-130 = 245m$

Q) A train 240m long passed a pole in 24 seconds. How long will it take to pass a platform 650m long

Case(i)

$$24 = \frac{240 + 650}{\text{Speed of train}}$$

Speed of train = 10 m/s.

Time to cross platform

$$= \frac{240+650}{10} = \frac{890}{10} = 89 \text{ sec}$$

Q) A train takes 18 seconds to pass completely through a station 162m long & 15 seconds through another station 180m long. The length of the train is

$$18 = \frac{x+162}{y}$$

$$y = \frac{x+162}{18} \quad \text{—(1)}$$

$$15 = \frac{x+180}{y}$$

$$y = \frac{x+180}{15} \quad \text{—(2)}$$

from eqn (1) & (2)

$$\frac{x+162}{18} = \frac{x+180}{15}$$

$$5x + 810 = 6x + 720$$

$$\boxed{x = 90m}$$

Q) A train passes a station platform in 36 sec. & a man standing on the platform in 20 sec. If the speed of the train is 54kmph, what is the length of the platform

$$36 = \frac{x+y}{54 \times \frac{5}{18}}$$

$$x+y = 36 \times 54 \times \frac{5}{18}$$

$$x+y = 540 \quad \text{—(1)}$$

$$20 = \frac{x}{54 \times \frac{5}{18}}$$

$$x = 20 \times 54 \times \frac{5}{18}$$

$$x = 300m \quad \text{—(2)}$$

Substitute eqn (2) in eqn (1).

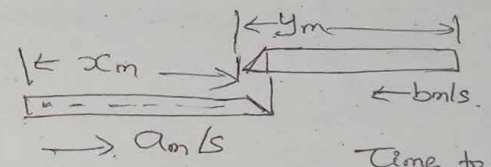
$$300 + y = 540$$

$$y = 540 - 300$$

$$\boxed{y = 240 m}$$

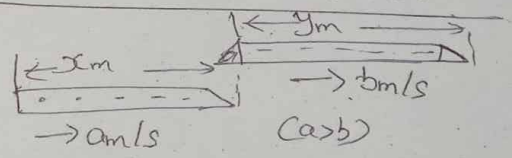
Case v) :- when two trains crosses each other :-

a) movement in opposite direction



Time to cross $= \left(\frac{x+y}{a+b}\right)$ sec

b) Movement in same direction



(a>b)

Time to cross $= \left(\frac{x+y}{a-b}\right)$ sec

Q) Two trains each 100m long moving in opposite directions, cross each other in 8 seconds, if one is moving twice as fast as other, then speed of the faster train is.

~~test~~ Speed of slow train $= x$ m/s
fast train $= 2x$ m/s.

Time to cross $= \left(\frac{x+y}{a+b}\right)$ sec

$$8 = \frac{100+100}{x+2x}$$

$$3x = \frac{200}{8}$$

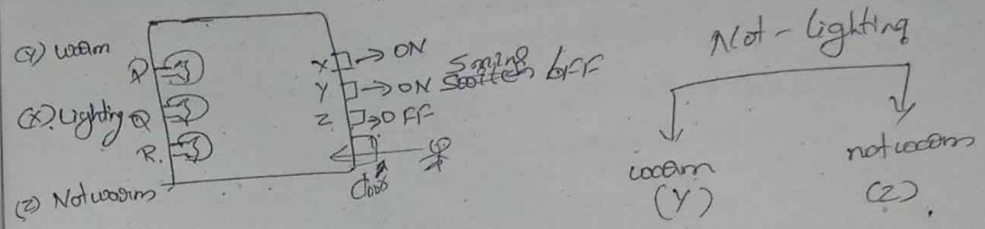
$$x = \frac{200}{24} \text{ m/s}$$

Speed of fast train $= 2 \times \frac{\cancel{200}^{50}}{\cancel{24}_{4}} \times \frac{\cancel{18}^{3}}{\cancel{5}_{1}}$ km/h $= 60$ km/h

17/03/2021

Puzzel

* Bulb and Switch puzzle



Q) A train travelling at 87km/h takes 16 seconds to cross completely another train of half its length & travelling in opposite direction at 75km/h. It also passes a bridge in 72 seconds. what is the length (in m) of the bridge.

$a = 87$ km/h
$b = 75$ km/s
$x = 16$ sec.
$y = 72$ sec.

$$16 = \frac{x + \frac{x}{2}}{87 \times \frac{5}{18} + 75 \times \frac{5}{18}}$$

$$\frac{3x}{2} = 16 \times \frac{5}{8} \left(\frac{\cancel{9}^{3}}{\cancel{162}}\right)$$

$$\frac{x}{2} = 16 \times 15$$

$$x = 480\text{m}$$

∴ Platform

$$72 = \frac{480 + y}{87 \times 5/8}$$

$$480 + y = \cancel{72}^{4} \times 87 \times \frac{5}{\cancel{8}_{1}}$$

$$480 + y = 1740$$

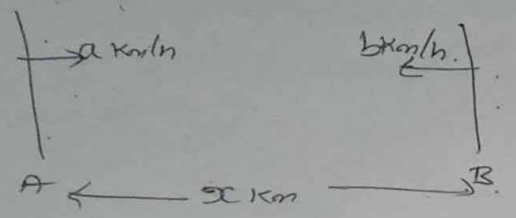
$$y = 1740 - 480 = 1260\text{m}$$

Case v) ~~IMP~~

when two train starts from two station

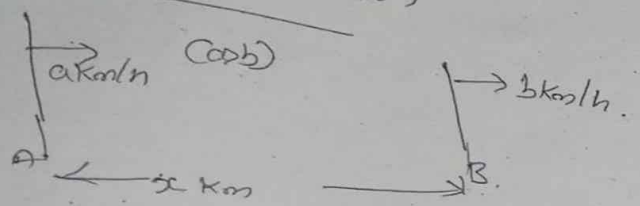
a) Move in opposite direction.

a)



Time to meet $= \left(\frac{x}{a+b}\right)$ hour

b) Move in same direction



Time to meet $= \left(\frac{x}{a-b}\right)$ hr.

Q) Two cars A & B, which are 280 km apart, start travelling at the same time. If they travel in opposite direction. They meet after 2 hr. If they travell in the same direction, A meet B after 14 hr. what is the speed of car B.

~~where~~

Time to meet $= \left(\frac{x}{a+b}\right)$ hrs.

$2 = \frac{280}{a+b}$ 140.

$a+b = 140$ — ①

Time to meet $= \left(\frac{x}{a-b}\right)$ hrs

$14 = \frac{280}{a-b}$ 20.

$a-b = 20$ — ⑩

$a+b = 140$

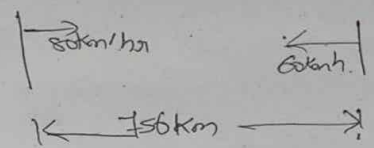
$a-b = +20$

$2b = 120$

$a = 80$ km/h

$b = 60$ km/h.

Q)



(a) After what time do they meet?

Time $= \left(\frac{x}{a+b}\right)$ hr.

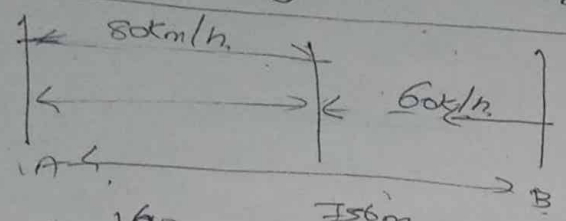
$= \frac{156}{80+60}$.

$= \frac{156}{140}$ ~~108~~ 27 / 20 5

$= \frac{27}{5}$ hour

$= 5\frac{2}{5} \times 60 = 5$ h 24 m

b) Distance of meeting Point from Starting A



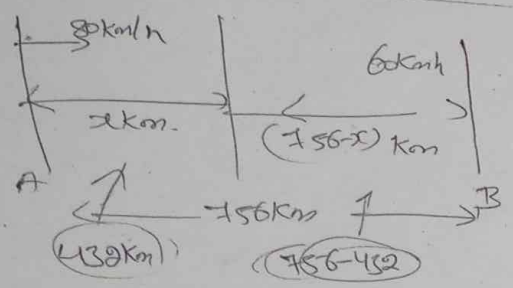
$= \cancel{80}^{16} \times \frac{27}{\cancel{5}} = 432$ km.

c) Distance ~~from~~ of meeting Point from ~~A.B~~ State to

$= \cancel{60}^{12} \times \frac{27}{\cancel{5}}$

$= 324$ km

[756 − 432 = 324]



Time of train A = Time of train B

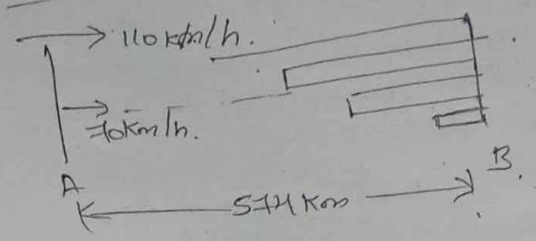
$\frac{x}{\cancel{80}_4} = \frac{756-x}{\cancel{60}_3}$

$3x = 756 \times 4 - 4x$

$7x = \cancel{756}^{108} \times 4$

$x = 432$ km

d) Train and Bird [TCS] IMP

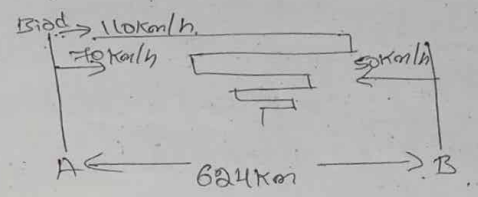


Time of train = Time of Bird.

$\frac{82\ 574}{\cancel{70}_1} = \frac{x}{110}$

$x = 82 \times 11 = 902$ Km

e)



~~Time of train~~ = Time of Bird.

Time taken by train to meet = Time of flight of Bird

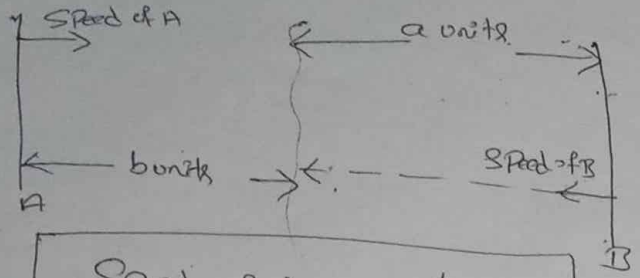
$\frac{624\ 52}{\cancel{120}_1} = \frac{x}{\cancel{110}}$

$x = 52 \times 11 = 572$ Km

Case-6

18/03/2021

With 2 trains a start from a station. Running in opposite direction, meets in b/n have a Point, and after meeting if there take a units & b units take time to reach destination then.



$$\boxed{\frac{\text{Speed of A}}{\text{Speed of B}} = \sqrt{\frac{b}{a}}}$$

Q) Two trains one from Mumbai to Delhi & other from Delhi to mumbai start simultaneously. after they meet, the trains reach there destination after 9 hr & 16 hr respectively. The ratio of their speed is.

$$\text{Ratio} = \sqrt{\frac{16}{9}} = \frac{4}{3}$$

43

Q) Two trains A & B starting from two Point & travelling in opposite directions, reach their destinations 9 hr & 80 hr

$$\frac{80}{\text{Speed of B}} = \sqrt{\frac{4}{9}}$$

$$\frac{\cancel{80}\ 40}{\text{Speed of B}} = \frac{2}{3}$$

Speed of B = 120 kmph

Q) Trains A & B start moving at the same time from station X & Y, respectively towards each other on parallel tracks. after passing each other, A & B take x hr & 8 hr to reach Y & X, respectively. If the speed of B is 25% more than that of A, then what is the value of x?

$$\frac{\text{Speed of A}}{\text{Speed of B}} = \sqrt{\frac{B}{a}}$$

$$\frac{}{25\%} = \sqrt{\frac{8}{x}}$$

Let speed of A = a km/h

— " — B $= \left(a + \frac{25a}{100}\right)$ km/h

$= \frac{125a}{100} = \frac{5a}{4}$ km/h

$$\frac{a}{\frac{5a}{4}} = \sqrt{\frac{8}{x}}$$

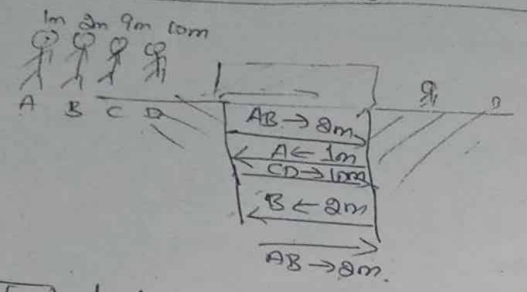
$$\frac{4}{5} = \sqrt{\frac{8}{x}}$$

$$\frac{16}{25} = \frac{8}{x}$$

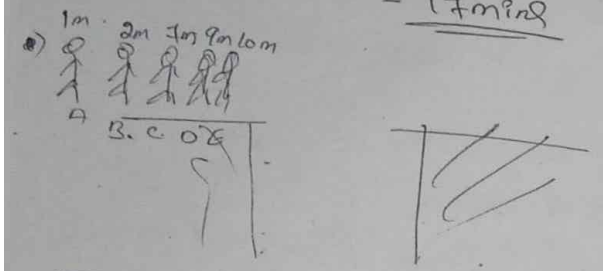
$x = \frac{25}{2} = 12\frac{1}{2}$ hr

Puzzle

*) 4 person crossing a bridge puzzle



Total time = 2+1+10+2+2
= 17 mins

*) 

AB = 2m.
A = 1m
DE = 10m
B = 2m
AC = 7m
A → 1m
AB - 2m.

Time = 25 m

Speed and time

Inputs
D no of person.

* Average Speed :-

$$\text{Avg Speed} = \frac{\text{Total distance travelled}}{\text{Total time taken}}$$

Q) A bus travels first 400km with 80km/h, next 300 km with 100km/hr, on final 500km with 50km/hr what is avg. speed of whole journey.

Total time $\frac{\cancel{400}^{10}}{\cancel{80}_{2}} + \frac{\cancel{300}^{3}}{\cancel{100}} + \frac{\cancel{500}^{10}}{\cancel{50}}$

$\cancel{10}$
5+3+10 = 18

$$\text{Avg Speed} = \frac{\text{Total distance travelled}}{\text{Total time taken}}$$

$$= \frac{400+300+500}{\left[\frac{400}{80} + \frac{300}{100} + \frac{500}{50}\right]} = \frac{1200}{8}$$

Avg Speed = 66.6 km/h

6)

$$\frac{800+800}{\frac{800}{150}+\frac{800}{180}}$$

$$= \frac{800+800}{\frac{80}{15}+\frac{40}{6}}$$

$$= \frac{1600}{\frac{240+300}{45}}$$

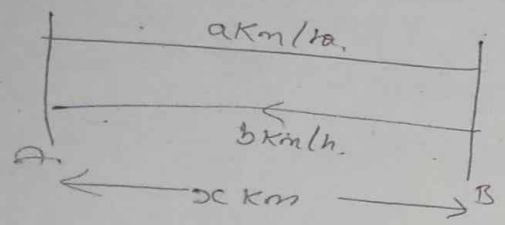
$$SP = 133.3 \text{ Km/h}$$

method - 2

$$\text{Avg. SP} = \frac{2\times150\times180}{270} = \frac{400}{3} = 133.3 \text{ Km/h}$$

Case 2)

If an object travels equal distance with a speed a km/h & b km/h and avg. speed $= \frac{2ab}{a+b}$ km/h



$$\text{Avg Speed} = \frac{x+x}{\frac{x}{a}+\frac{x}{b}} = \frac{2x}{\frac{bx+ax}{ab}}$$

$$= \frac{2x\,ab}{x(a+b)} = \frac{2ab}{a+b} \text{ km/h}$$

Case ii)

if an object travels equal distance with the speed a km/hr, b km/hr, c km/hr then Avg Speed

is $\frac{x+x+x+x}{\frac{x}{a}+\frac{x}{b}+\frac{x}{c}}$

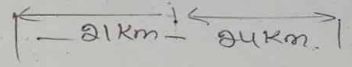
$$= \frac{3x}{\frac{bx+acx+abx}{abc}}$$

$$= \frac{3x\,abc}{x(bc+ac+ab)}$$

$$= \frac{3abc}{ab+bc+ac} \text{ km/h}$$

8) A can complete a journey in 10 hr. He travels first half of the journey at the rate of 21 km/hr and second half at the rate of 24 km/hr. the total journey in km

A = 10 hr



$$\text{Avg speed} = \frac{\text{Total distance travelled}}{\text{Total time taken}}$$

$$= \frac{x+x}{\frac{x}{a}+\frac{x}{b}}$$

Total distance travelled = Avg. speed × Total time

$$= \frac{2\times21\times24}{45}\times10$$

$$= 224 \text{ km}$$

Q) A Person travels equal distance with 3km/hr, 4km/hr & 5km/hr and takes a total time of 47min. The total distance is

$$= \frac{3\times3\times4\times5}{12+20+15} \times \frac{47}{60}$$

$$= \frac{180}{47} \times \frac{47}{60}$$

$$= 3\,km$$

Q) Samira completed a journey in 15 hr. She travels first & 3rd quarter of the total distance with the speed of 24km/h, and second & fourth quarter of the total distance with the speed of 16km/h. The total distance (in km) covered in this journey is

24km/h 16km 24km 16km

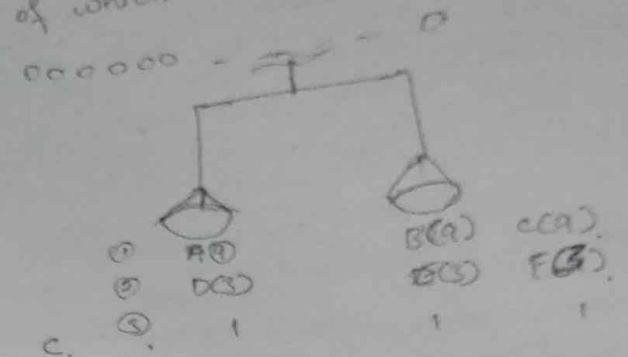
$$= \frac{2\times24\times16}{24+16} \times 15 = \frac{2\times24\times16}{40} \times 15$$

$$= 288\,km$$

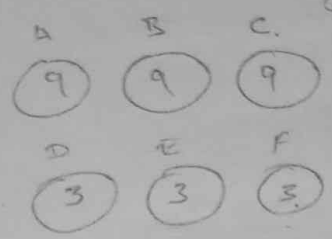
19/03/2021

Puzzle

* 27 Ball of which one is different weight:



Ans



no of balls $= 3^n$

$3^n = 27 = 3^3$

$n = 3$ times

$3^n = 243 = (3)^5$

$n = 5$ times

Q) A man completed a journey in 10hr, He travels first half of the journey at the rate of 21km/hr & Second half at the rate of 24.

Q) If a man rides at 20kmph, he will reach office 10 minutes late. If he rides at 30 kmph, he will reach office 10 min early. what is the distance travelled by Person.

a) $\frac{20}{\cancel{7}0} \times \frac{5}{13}$

Let actual time = t hours.

Distance with 20km/h = Distance with 30km/h

$$20\left(t+\frac{10}{60}\right) = 30\left(t-\frac{10}{60}\right)$$

$$20t+\frac{2}{6} = 3t-\frac{3}{6}$$

$$t = \frac{5}{6}h = \frac{5}{6}\times 60m = \cancel{60m}\ 50m$$

b) Distance

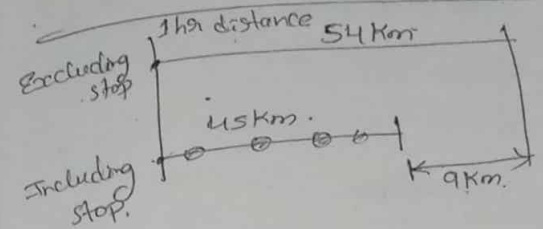
$$= 20\left(t+\frac{1}{6}\right)$$

$$= 20\left(\frac{5}{6}+\frac{1}{6}\right)$$

$$= 20\left(\frac{6}{6}\right)$$

$$= 20\ km.$$

Q) Excluding stoppages, the speed of a bus is 54kmph & including stoppages, it is 45kmph. For how many minutes does the bus stop per hour?

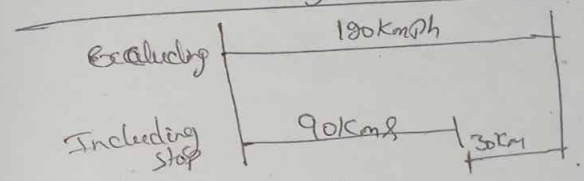


Time to stoppages = Time taken by bus to go 9km

$$= \frac{9}{54}h = \frac{1}{6}hr$$

$$= \frac{1}{6}\times 60^{m} = 10m$$

Q) Excluding stoppages, the speed of a bus is 120kmph & including stoppages, it is 90kmph. For how many minutes does the bus stop at each stop if there are 5 stops every hr

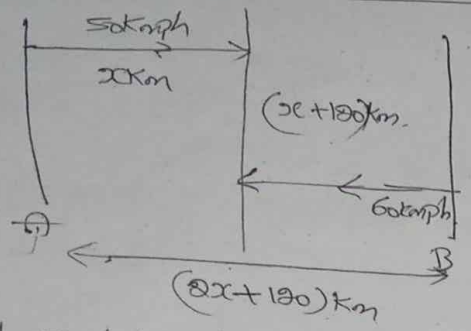


Total Time to stoppages = Time taken by bus to 30km

$$= \frac{30}{120}hr = \frac{1}{4}hr = \frac{1}{4}\times 60\,m = 15m$$

Duration of each stop $= \frac{15}{5} = 3m/stop$

Q) Two cars start from a&b and travel towards each other at speeds of 50kmph & 60kmph respectively at the time of their meeting the second car has travelled 120km more than the first the distance b/n a&b in km is.



Time of Car 'A' = Time of Car 'B'

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

$$6x = 5x + 600$$

$$x = 600km$$

$(2x+120)$ km

$= (2\times600 + 120)$ km

$= (1200 + 120)$ km

$= 1320$ km

Q) Rishab starts for a wedding venue at 6pm & drives at a speed of

(17)
(18)
(19)
(20)

Chain Rule

* 100 typiste type 100 pages in 100 days from how many typiste will type 24 pages in 24 days?

a) 12 b) 100 c) 24 d) 48

Calculation

100 typiste 100 days 100 pages
100 —"— 1 day 1 page
⋮
100 —"— 100 day 100 pages

* 60 typiste type 400 pages in 80 days from how many

Chain Rule

1) Direct proportion

Two Quantity are related such that if one increase other Quantity will increase.

DP

$A_1 \longrightarrow B_1$

$A_2 \longrightarrow B_2$

2) Indirect proportion

2 Quantity are related such that if one will increase other will Decrease

IP

$A_1 \longrightarrow B_1$

$A_2 \longrightarrow B_2$

* If 15 men make 234 m long wall, then what is the length of wall made by 35 men

DP

No. of men	length of wall
15	234
35	x

$15x = 35 \times 234$

$x = 546\,m$

* If 16 men can do a work in 8 days then 1 man will do the same work in how many days

IP

No. of men	No. of days
16	8
1	x

$16 \times 8 = x$

$x = 128$ days

Q) If 20 men can build a wall 56 meters long in 6 days, what length of a similar wall can be built by 35 men in 3 day.

No. of men		Length of wall		No. of days
20	DP	56		6
35		x		3
		DP		DP

$20 \times x \times 6 = 35 \times 56 \times 3$

$\boxed{x = 49m}$

method using formula

No. of men (DP)	No. of days (DP)	Length of wall
20	6	56
35	3	x

$20 \times 6 \times x = 35 \times 3 \times 56$

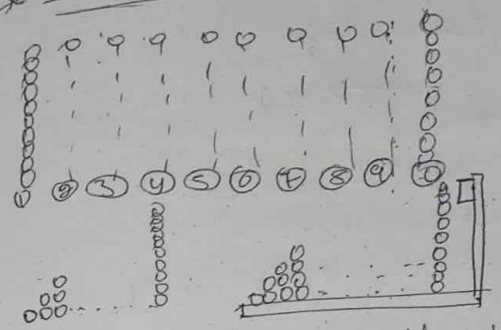
$\boxed{x = 49m}$

22/03/2021

Rules :-

Puzzle :-

* 10 stacks of 10 coins in each stack



Electric weight machine.

No. of coins $= 1+2+3+4+ \dots +10$

$= \frac{n(n+1)}{2} = \frac{10(10+1)}{2} = \frac{10 \times 11}{2} = 55$ coins

If every coins $= 10gm$

weight $= 55 \times 10gm = 550gm$

Actual weight

$550 + n$

n^{th} stack

551 gm => 1st stack
552 gm => 2nd stack
553 gm => 3rd stack
⋮
560gm => 10th stack

Chain Rule

Rules :

i) No of men $\xrightarrow{IP}$ No of days.

ii) No of men $\xrightarrow{IP}$ No of hours

iii) No of Days $\xrightarrow{IP}$ No of hours

iv) No of Men (or) No of Days (or) No of Hours $\xrightarrow{DP}$ Length of wall / bridge, work done, wages / salary

v) No of machines $\xrightarrow{DP}$ Items produced.

vi) No of Taps $\xrightarrow{IP}$ Time to Fill / empty a tank

Formula

No. of Men — No. of Days — No. of Hours — work done

$M_1 \xrightarrow{IP} D_1 \xrightarrow{IP} H_1$ DP W_1

$M_2 \longrightarrow D_2 \longrightarrow H_2$ W_2

$$M_1 D_1 H_1 W_2 = M_2 D_2 H_2 W_1$$

$$\boxed{\frac{M_1 D_1 H_1}{W_1} = \frac{M_2 D_2 H_2}{W_2}}$$

Q) If 30 men working 7 hrs a day can do a piece of work in 18 days. In how many days will 21 men working 8 hrs a day do the same piece of work

Method-1

No. of men	IP	No. of hours	IP	No. of day.
30	→	7	→	18
21	→	8	→	x

$30 \times 7 \times 18 = 21 \times 8 \times x$

$x = 22.5$ days

Method-2

$M_1 H_1 D_1 = M_2 H_2 D_2$

$30 \times 7 \times 18 = 21 \times 8 \times x$

$x = 22.5$ days

Q) 3 pumps working 8 hr a day, can empty a tank in 8 days. How many hrs a day must 4 pumps work to empty the tank in 1 day

$3 \times 8 \times 8 = 4 \times 1 \times x$

$x = 18$ hrs

Q) Running at the same constant rate, 6 identical machines can produce a total of 270 bottles per minute. At this rate, how many bottles could 10 such machines produce in 4 minutes

$\frac{6 \times 1 \times 8}{270} = \frac{10 \times 4}{x}$

$\frac{6}{270} = \frac{40}{x}$

$x = \frac{40 \times 45}{6} = 1800$

Q) 15 women can do $\frac{1}{3}$ work in 30 days. how many days will 20 women do the full work

$$\frac{15 \times 30}{\frac{1}{3}} = \frac{20 \times D}{1}$$

$$30 \times 30 = 20 \times D$$

$$\boxed{D = 30} \text{ days}$$

Q) If 54 persons can complete $\frac{3}{8}$th part of a task in 36 days, then how many more persons are required to complete $\frac{2}{3}$rd part of the same task in 48 days

$$\frac{8 \times 45 \times 36}{3} = \frac{M \times 48 \times 3}{8}$$

$$8 \times 15 = M \times 2$$

$$180 = M \times 2$$

$$\frac{180}{2} = M$$

$$\boxed{M = 66}$$

$$\frac{54 \times 36}{\frac{3}{8}} = \frac{x \times 48}{\frac{2}{3}}$$

$$54 \times 36 \times \frac{8}{3} = x \times 48 \times \frac{3}{8}$$

$$54 \times 36 \times \frac{2}{3} = x \times 48 \times \frac{3}{8}$$

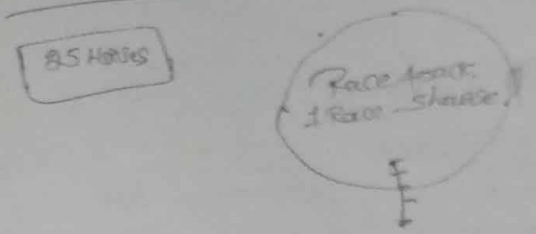
$$x = 72 \text{ men}$$

72 − 54 = 18 more men are required

23/12/2021

Puzzel:

+ Race finding best 3 horses out of 25 horses (max 5)



Solution

1	A	B	C	D	E
2	F	G	H	I	J
3	K	L	M	N	O
4	P	Q	R	S	T
5	U	V	W	X	Y
6	A	F	K	P	U
7	B	C	F	G	K

maintaing 2 & 3 position.
and more the 5th position are neglected.

Total Race taken by 7 Races

Reasoning:-

Coded Inequality

statement $\boxed{A \geq B > C > D \geq E > F < G \leq H \leq I < J > K = L}$

Conclusion:-

i) $A > C$ ✗
ii) $A \geq C$ ✓
iii) $B \geq E$ ✗
iv) $B > E$ ✓
v) $F < B$ ✓
vi) $C < I$ ✗
vii) $C > I$ ✗
viii) $F \leq I$ ✗
ix) $G \leq I$ ✓
x) $J > G$ ✓
xi) $J \geq L$ (✗)

Symbol meaning

% = equal (=)
@ = neither smaller than nor equal (>)
* neither ~~smaller than nor greater than~~ equal (=)
? not greater then. equal (≤)
$ ~~greater~~ less then (<)

Q) statement

I. L@T (L>T)
II. P?T (P≥D)
III K$L (K<L)

K<L>T≥P

Conclusion

I. L@P (L>P) ✓
II K@T (K>T) ✗

Q) M*N neither greater than nor equal (<)
M!!N either greater than or equal to (≥)
M#N greater then (>)
M&N neither small than nor equal (>)
M?N smaller than (<)

statement

I W*Q (W<Q)
II Q&P (Q>P)
III P?F (P<F)

$\boxed{W<Q>P<F}$

Conclusion

I. F&Q (F<Q) ✗
II. W?Q (W<Q) ✓
III P#W (P>W) ✗

Q) % Denotes "greater than" >
> denotes equal to =
= not less than ≥
@ not equal to ≠
# less than <
* not greater than ≤

statements

A%B, C=E, D*B
A≯B, C<E, B≤D≥B.

$\boxed{A>B\geq D \quad C\geq E}$

Conclusions

i) A#D (A<D) (✗)
ii) C*E (C≤E) (✗)

Coded Blood Relationship

Grand Father, Grand Mother.

Father, mother, uncle, Aunty

Brothers, sisters, cousins

Son, daughters, nephew, niece

* A is Father of B. B is Son of C,
B is brother of D. D is Father of E.
E is Sister of F.

And

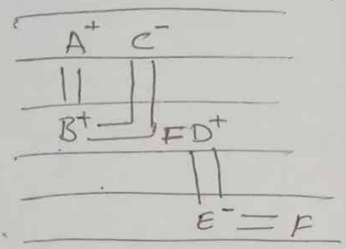
a) who is B of F? Ans :- uncle

b) who is B of E? Ans :- uncle

c) who is F of A? Ans:- Grand ~~Father~~ child (can't be said)

d) who is A of F? Grand Father

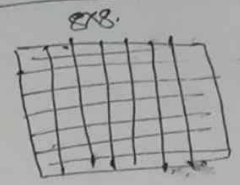
Ans

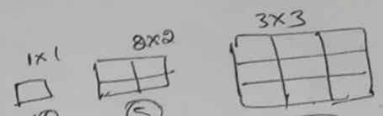


24/03/2021

Puzzle

Q) No of square in a chess board





8x8

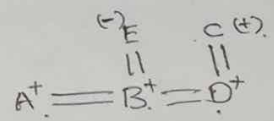
$= 1^2 + 2^2 + 3^2 + \cdots + 8^2$

$= 204$

Q) How many cubes are hidden in rubik's cube?

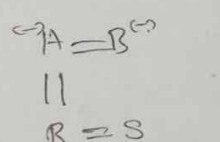
1 In the middle in rubik's cube.

Q) A is B's brother, C is D's father, E is B's mother. A & D are brothers. How is E related to C.



Ans E is wife of C

Q) B is the ~~brother~~ of A, whole A & B are sisters, R & S are brothers. A's daughter is R's sister. what is B's relation to S?



$R^+ = S^+$

Aunty

Q) E is the Sister of B, A is the father of C, B is the Son of C. How is A related to E.

A^+
||
C
||
$E^- = B^+$

Grandfater (A to E)

Q) / => Father
+ => mother.
— = brother
* = Sister.

* If A+B / C-D, then A is D's ____ ?

(A mother of B is Father of C is bother of D)

A^-
||
B^+
||
$C^+ = D$

Ans:- A is D's grandmother

* If A*B / C-D+E, then A is E's

$A^- = B^+$
||
$C^{+} = B^{-}$
||
E

∴ A is E's is Grand Aunt

Q) which of the following shows the relation that E is the maternal uncle of D?

+ = sister
— = brother
x = daughter

Using statement :-

$B^{+} = (x)^-$
||
E

Ans:-

(i) D — F
||
E — E

$F^- = E^+ = C$
||
D^-

Q) which of the following shows that A is aunt of E.

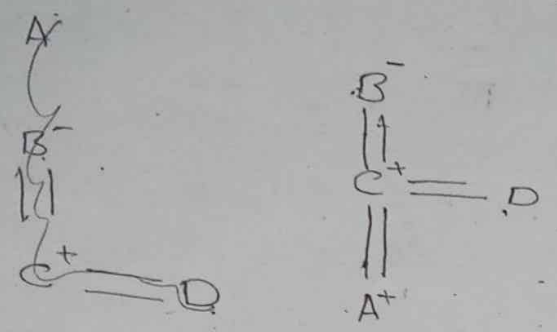
i) A-B+C/D*E
ii) A*B/C*D-E
iii) A/B*C+D-E
iv) A+B-C*D/E

C^+
||
$A^- = B$

Ans:- $A^- = B$
||
$C^- = D^+ = E$

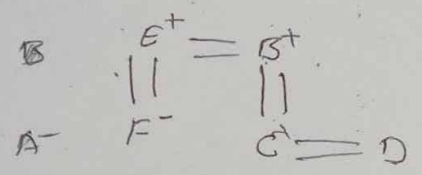
Q) In a certain code, P@R means P is the grandson of R; P$R means P is the brother of R. P#R means P is the mother.

If A@B#C$D then how is B is related to D



Ans 'B' is Mother of 'D'

Q) If A×B means 'A' is the daughter of 'B', 'A-B' means 'A' is the mother of 'B', A÷B means 'A' is the wife of 'B', 'A+B' means 'A' is the father of 'B' and 'A*B' means 'A' is the brother of 'B' then how 'F' related to 'B' in F×E*B+C*D.

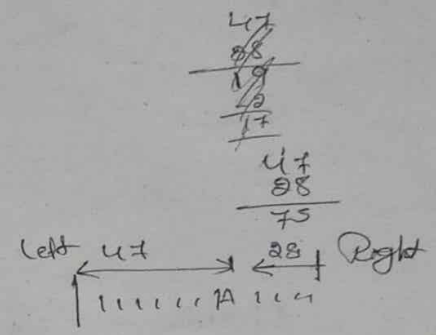


Ans :- Cousine Sister

Ranking

Q) In a line 'A' is 47th from left and 28th from Right, then How many People are in these line

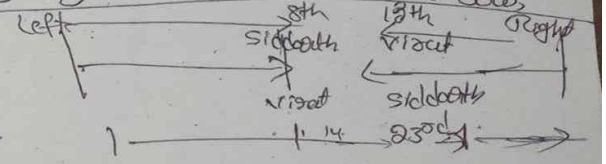
Total = L+R-1
= 47+28-1
= 75-1
= 74



Q) In a line of 85 people 'A' is 38th from left then what is the Position from Right Side

Total = L+R-1
R = Total+1 - L
= 85+1 - 38
= 86-38
R = 48

Q) In a row of boys, Sidhath is eight from the left & Virat is thirteenth from the right. If they interchange their positions, Sidhath becomes twenty third from the left. How many boys are there in the row,



~~L=8, R=13~~

Total = L+R-1
= 23+13-1 = 35

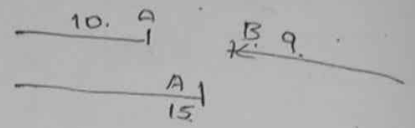
method-2

Total = 8+14+13
= 35

Q) In a row of boys, if 'A' who is tenth from the left & B who is ninth from the right interchange their positions, A becomes fifteenth from the left. How many boys are there in the row

$= 15 + 9 - 1$

$= 23$



Q).

Nivedita → 15th from left

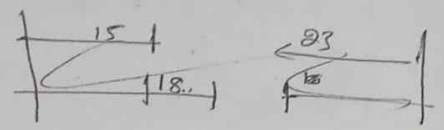
Vimala → 23rd → right

Interchange their positions,

Nivedita → 18th → left

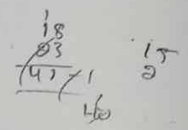
Vimla → right = ?

$= 18 + 23 - 1$

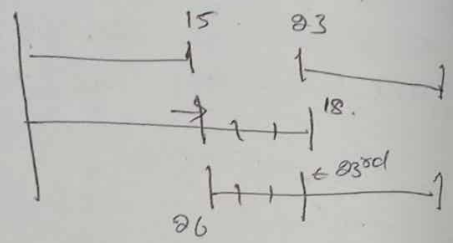


$= (18 - 15) - 1$

$= 3 - 1 = 2$



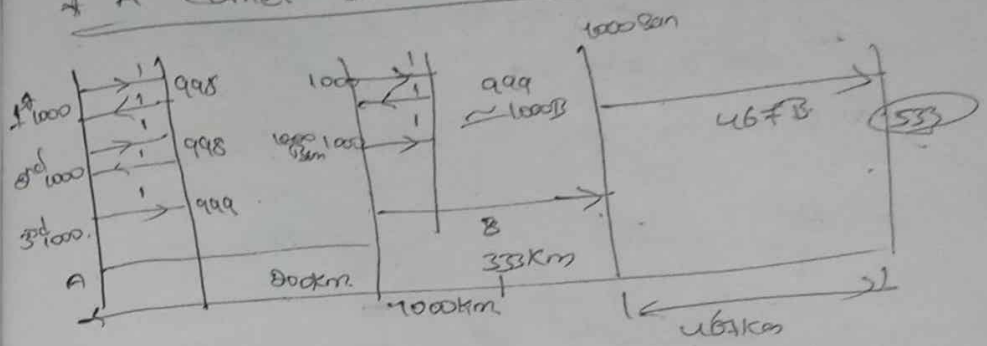
26



25/03/2021

Puzzles

A Camel and 3000 banana



- 1Km = 5 banana

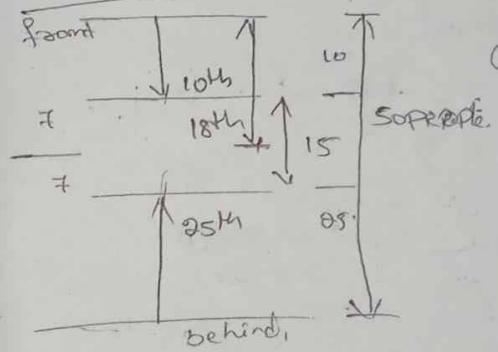
  200Km = 200 × 5 ban

  = 1000 ban

- 1Km = 3 Ban.

  333Km = 999B ≈ 1000 Banana

Q) In a queue, Amrita is 10th from the front while Mokul is 25th from behind & mamta is just in the middle of the two. If there be 50 people in the queue, what position does mamta occupy from the front.



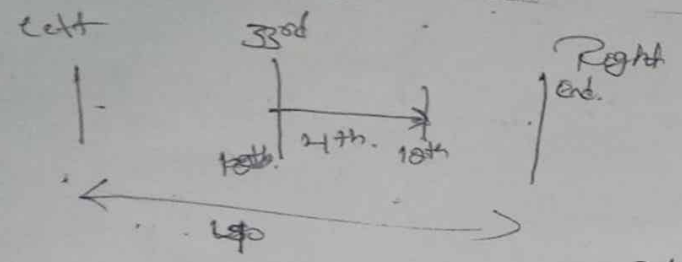
$(10 + 25) - 1$

Q)

40 girls

latha was shifted by 4 towards right. 18th from left end

earlier position from the right end of the row.

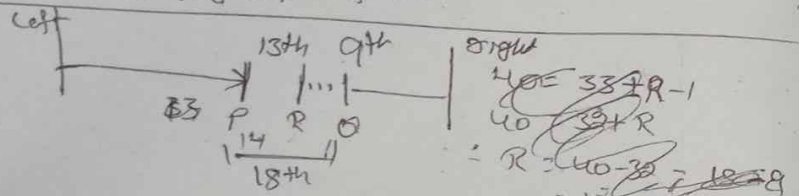


$= 40 - 16$
$= 34.$

Total $= L + R - 1$
$40 = 18 + R - 1$
$40 = 17 + R$
$R = 40 - 17 = 23$

$23 + 4 = 33rd$ Position from Right

Q) 40 children,
P = 13 from left end.
Q = 9 from the right end.
How many children are there b/n P & R if is fourth to the left of Q.



$40 = 33 + R - 1$
$40 = 32 + R$
$R = 40 - 32 = 8$

Ans: 14

Profits and ~~losse~~ Loss

Formula

1) If Selling Price > Cost Price
Profit = SP − CP
% Profit $= \frac{\text{Profit}}{CP} \times 100\%$

2) If CP > S.P
Loss = CP − SP
% loss $= \frac{\text{loss}}{CP} \times 100\%$

06/03/2021

Q) Some apples are bought at a rate of 8 for 10 Rs, sold at a rate of 10 for 12 Rs. what is the profit (or) loss % in transaction.

$\frac{10}{8} = \frac{12}{10}$

$1.2 - 0.8 = 0.4 \times 100 = 40.$

$\frac{40}{0.8} \times 100 = \frac{4000}{0.8}$

1 apple CP = 10 Rs $= \frac{10}{8} = \frac{5}{4} = 1.25$ Rs
1 apple SP = 12 Rs $= \frac{12}{10} = \frac{6}{5} = 1.20$ Rs

loss = CP − S.P
$= \frac{5}{4} - \frac{6}{5} = \frac{1}{20}$

% loss = loss $= \frac{\text{loss}}{SP} \times 100\%$

$= \frac{\frac{1}{20}}{\frac{5}{4}} \times 100$

$= \frac{1}{20} \times \frac{4}{5} \times 100 = 4\%$

Q)

100 oranges for 350 Rs
Sold at for 48 per dozen
find % loss

$\text{for orange} = \frac{350}{100} = 3.5$ Rs

$\text{for orange} \quad \frac{48}{12} = 4$ Rs

~~loss = C.P − S.P~~

~~= 3.5 − 0.48~~

~~= 3.02~~

~~% loss = $\frac{3.02}{0.48} \times 100$~~

~~=~~

Profit = 4 − 3.5 = 0.5

$\% P = \frac{0.5}{3.5} \times 100$

$\frac{3.5}{3.02}$

$= \frac{100}{7}\% = 14\frac{2}{7}\%$

Q) The ratio of C.P & S.P is 4:5. The Profit Percent is

$\text{Profit/Loss} = \frac{4}{5} = \frac{C.P}{S.P} = \frac{4}{5}$

Let CP = 4x
SP = 5x

Profit = 5x − 4x = x

$\% P = \frac{x}{4x} \times 100 = 25\%$

$4 \times 5 + 5$
$20 + 5$
$= 25$

Q) CP of 19 articles is equal to the selling price of 16 articles. Gain % is

---

CP of 19 articles =
SP of 16 articles.
Gain % = ?

Solution

$CP \times 19 = SP \times 16$

$\frac{CP}{SP} = \frac{16}{19}$

Let CP = 16x
SP = 19x

Profit = 19x − 16x = 3x

$\text{Profit \%} = \frac{3x}{16x} \times 100 = \frac{75}{4}\% = 18\frac{3}{4}\%$

Q) The cost price of 30 boxes is the same as the selling price of x boxes. If the profit is 20%, the value of x will be

---

$CP \times 30 = SP \times x$

$\frac{CP}{SP} = \frac{x}{30}$

Let CP = x y
SP = 30 y

Profit = 30y − xy = y(30 − x)

$\text{Profit \%} = \frac{\text{Profit}}{CP} \times 100$

$20 = \frac{y(30-x)}{x \cdot y} \times 100$

$x \cdot 1 = (30 - x) 5$

$x = 150 - 5x$

$x + 5x = 150$

$6x = 150$

$x = \frac{150}{6} = 25$

formula

* S.P

a) with profit %.

$$S.P = \left(\frac{100+\%P}{100}\right) \times CP$$

b) with loss %.

$$S.P = \left(\frac{100-\%loss}{100}\right) \times CP$$

* CP

a) with profit %.

$$C.P = \frac{SP \times 100}{100+\%P}$$

b) with loss %.

$$CP = \frac{SP \times 100}{100-\%loss}$$

Q) shopkeeper offers 'Buy 1, Get 1 Free' offer on a T-shirt marked at Rs. 2400. if after a sale, the shopkeeper earns a profit of 33.33% then what is the actual price of the T-shirt.

1 t-shirt S.P = $\frac{2400}{2}$ = 1200

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

1 t-shirts CP = $\frac{1200 \times 100}{100+\frac{100}{3}} = \frac{1200 \times 100 \times 3}{400}$

= 900

Q) Two articles were sold at 24,000 each, one at 20% profit and other at 20% loss. what is overall profit % & loss % in transaction.

2 for 24,000 each.

one at 20% profit
and
one at 20% loss.

overall profit % & loss % = ?

1 article S.P = $\frac{24000}{2}$ = 12,000

1 article ✓ %.

1st article	2nd article	Total
S.P = 24000/-	S.P = 24000/-	Total SP = 48000/-
%P = 20%	% loss = 20%	Total CP = 50,000/-
C.P = $\frac{24000 \times 100}{120}$	C.P = $\frac{24000 \times 100}{80}$	Loss = 50,000 − 48000 = 2000/-
C.P = 20,000/-	C.P = 30,000/-	% loss = $\frac{2000}{50,000} \times 100 = 4\%$

Note

if 2 article is sold by equal price and equal profit & loss %, always they will be a loss in the transaction & % loss = $\frac{\text{profit (or) loss\%}}{10}^2$

$$\% loss = \left(\frac{\text{Common profit (or) loss\%}}{10}\right)^2$$

$$\% loss = \left(\frac{20}{10}\right)^2 = 4\%$$

Note:-
When article bought at equal price & sold 1 at profit % and other at equal loss %, then there will be no profit and loss in the transaction

Q) A bought a radio selling to B at 20% profit, B selling to C at 30% loss and 'C' selling to D at 40% profit. If 'D' paid 2352 Rs then 'A' bought the radio in how many Rupees.

$= \frac{2352 \times 40}{100} =$

$= 840$

A ⇒ B 20% Profit
B ⇒ C. 30% Loss
C ⇒ D 40% Profit.

D Rs 2352 Rs.

(A)

$x \times \frac{120}{100} \times \frac{70}{100} \times \frac{140}{100}$ (D) $= 2352$

$x = 2000$

Q) A sells an article to B at a profit of 15% 'B' then sells it to C, making a profit of 20%, if 'C' paid Rs. 690, what is the original price of the article

$x \times \frac{115}{100} \times \frac{120}{100} = 690$

$x = 500$

* Successive profit

Manufact. Price (or) Initial Price

$\times \frac{100+P_1\%}{100} \times \frac{100+P_2\%}{100} \times \frac{100+P_3\%}{100} =$ Final selling price

* Successive Discount

Marked Price (or) List price

$\times \frac{100-D_1\%}{100} \times \frac{100-D_2\%}{100} =$ Final Selling Price

Eg

$720 \times \frac{(100-10)}{100} \times \frac{100-x}{100} = 550.80$

$720 \times \frac{90}{100} \times \frac{(100-x)}{100} = 550.80$

Puzzle

29/03/2021

* 1000 Bottles of wine:-

Eg:- 7 Bottles; (3 People)

	$2^2(4)$	$2^1(2)$	$2^0(1)$
	C	B	A
1)	0	0	1
2)	0	0	0
3)	0	1	1
4)	1	1	0
5)	1	0	1
6)	1	0	0
7)	1	1	1

Eg:-

Dead	Alive	Dead
C	B	A
1	0	1

Bottle No :- $4+0+1 = 5^{th}$.

Eg) 100 Bottles :- 2^0 2^1 2^2 2^3 2^4 2^5 2^6
(1) (2) (4) (8) (16) (32) (64) ⇒ 7 People

1000 Bottles = 2^0 2^1 2^2 2^3 2^4 2^5 2^6 2^7 2^8 2^9
(1) (2) (4) (8) (16) (32) (64) (128) (256) (512) ⇒ 10 People

* Profit made by using false weight

$$\% \text{ Profit} = \frac{\text{Error Value}}{1000 - \text{Error Value}} \times 100\%$$

Q) A shopkeeper professes to sell his goods at price but uses a weight of 800gm instead of kg weight, Thus, he makes a profit of.

$$\% \text{ Profit} = \frac{200}{1000-200} \times 100\%$$

$$\% P = \frac{200}{800} \times 100\%$$

$$= \frac{1}{4} \times 100\%$$

$$\% P = 25\%$$

Q) A shopkeeper increased his goods prices by 30% and instead of 1 Kg he gives only 800gm per customer. How many ~~Prof~~ Profit of he get.

$P_1\% = 30\%$

$P_2\% = \frac{200}{1000-200} \times 100$

$= 25\%$

$= \frac{200}{1000-200} \times \frac{30}{100}$

$= \frac{200}{800} \times \frac{30}{100}$

Final Profit $= P_1 + P_2 + \frac{P_1 \times P_2}{100}$

$= 30 + 25 + \frac{30 \times 25}{100} = 55 + 7.5 = 62.5\%$

method-2

C.P = 100₹

final S.P price = $100 \times \frac{130}{100} \times \frac{125}{100}$

= 162.5

% P = 62.5%

Q) A shopkeeper bought an article at 12Rs/kg. and sould at 15Rs/kg. if he gives 850gm of to customer instead of 1 kilogram then how many % he will make in this.

$P_2\% = \frac{850}{1000-150} \times 100$

$= \frac{150}{850} \times 100 = \frac{300}{17}\% = 17.6\%$

$P_1\% = \frac{P}{C.P} \times 100$

$= \frac{3}{12} \times 100$

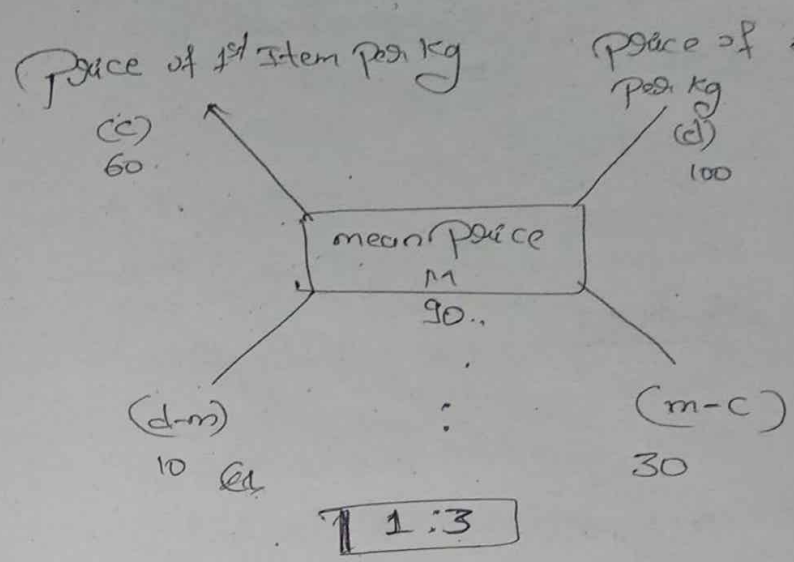
$P_1\% = 25\%$

C.P = 12
S.P = 15

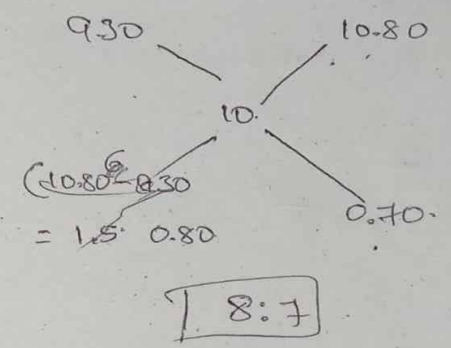
Final Profit % $= 25 + 17.6 + \frac{25 \times 17.6}{100}$

$= 42.6 + 4.4 = 47\%$

Mixtures and Alligation



Q) rice at Rs 9.30 per kg
rice at Rs 10.80
mixth Rs 10/kg

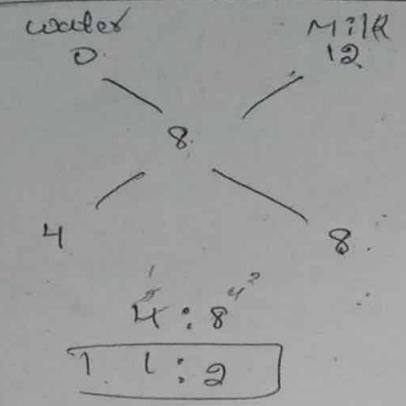


10.80 - 10
= .80

10 - 9.30
= 0.70

Q) Milk costing Rs. 12/liter.

Mixture cost Rs. 8/liter



12 − 8 = 4

8 − 0 = 8

Finding Mean Price

$$\text{Mean Price} = \frac{(1^{st}\ \text{Item} \times (d-M)) + (2nd.\ \text{Item}/kg \times (m-c))}{\text{Ratio}}$$

Eg:-

$$= \frac{60\times1 + 100\times3}{1+3} = \frac{360}{4} = 90/kg$$

Q) Type 1 price = Rs. 15/kg

Type 2 price = Rs 20/kg.

2 : 3

Find price/kg of the mixed variety

$$= \frac{15\times2 + 20\times3}{2+3}$$

$$= \frac{90}{5} = 18/kg$$

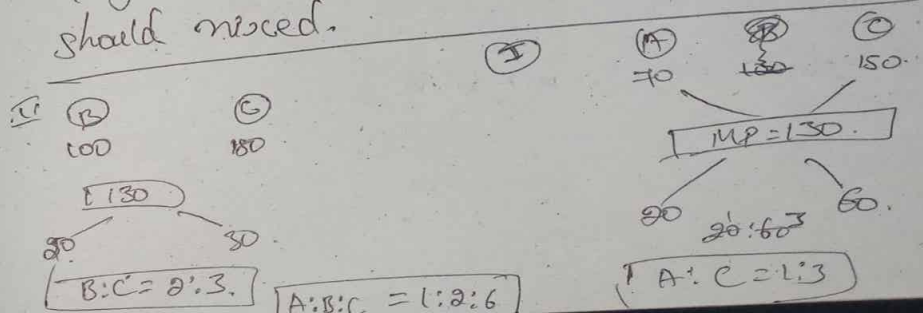
Q) 3 items at 60 Rs/kg, 100 Rs/kg & 150 Rs/kg mixed in ratio 2:3:5 what is the mean price of mixed

$$\text{Mean Price} = \frac{60\times2 + 100\times3 + 150\times5}{2+3+5}$$

$$= \frac{120 + 300 + 750}{10}$$

$$M.P. = \frac{1170}{10} = 117/kg$$

Q) 3 items at 70 Rs/kg, 100 Rs/kg & 150 Rs/kg is mixed to get mean price, 130 Rs/kg. In what ratio then should mixed.



Variety

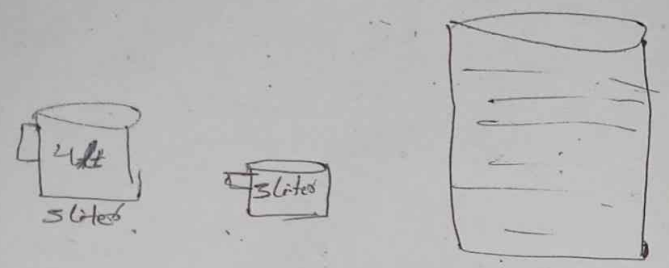
$$\text{Mean Price} = \frac{70\times1 + 100\times2 + 150\times6}{1+2+6}$$

$$= \frac{70+200+900}{7}$$

$$= \frac{1170}{7}$$

Puzzle :- 20/03/2021

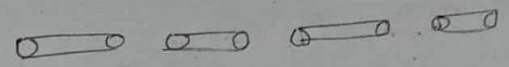
Measure 4 litres by 5 liter's & 3 liters



5liter jar will full one type, and dump 3liter Jar to fill, then 5liter Jar remains 2liter, then 3liter Jar make it empty.

- Then 5liter Jar Remaining 2liter put in to 3liter Jar.
- then take 5liter full and fill the remaing Part of 3liter Jar.
- Then 5liter Jar, remain 4liter.

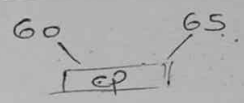
* 4 Tablets puzzle



- 2 tablet for Breakfast
  2 tablet for Cook
- make half 4 tablet, take ½ tablets each tablet.

Questions based on profits & loss

Q) In what ratio must a grocer mix two varieties of tea worth Rs 60 a kg & 65 Rs/kg. So that by selling the mixture at 68.20 Rs/kg he may gain 10%.

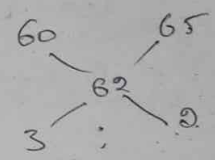


% P = 10%,
S.P = 68.20.

$$CP = \frac{S.P\times100}{100+\%P}$$

$$= \frac{68.20\times100}{100+10} = \frac{68.20\times100}{110}$$

$$= 62$$



Ans. 3:2

Q) tea cost.

60 Rs/kg, 75 Rs/kg 100 Rs/kg

S.P = Rs. 96/kg

% P = 20%

$$C.P = \frac{S.P \times 100}{100+20}$$

$$= \frac{96 \times 100}{120}$$

$$C.P = \frac{9600}{120} = \frac{19}{3} \quad \frac{96 \times 100}{120} = 80$$

A : C

60 — 80 — 100

80 — 80

A : C = 1 : 1

B : C

75 — 80 — 100

80 — 20 : 5

4 : 1

1 : 8 : 1

$$\boxed{A : B : C = 1 : 4 : 2}$$

Q) In a alloy,

zinc & copper = 1 : 2.

2nd alloy, 2 : 3.

what ratio should the 2 alloys be mixed so that the resultant alloy contains

zinc & copper = 5 : 8

C : Z — 1 : 2 — 3 : 3

C : Z — 2 : 3 — 3 : 5

5 : 8

3 : 5 — 3 : 6

$\frac{1}{3}$ zinc

1st alloy Z : C = 1 : 2

2nd alloy Z : C = 2 : 3

Resultant Z : C = 5 : 8.

Zinc

$\frac{1}{3}$ — $\frac{5}{13}$ — $\frac{2}{5}$

$\frac{2}{5} - \frac{5}{13}$: $\frac{2}{15} - \frac{1}{3}$

$\frac{1}{65} = \frac{2}{39}$

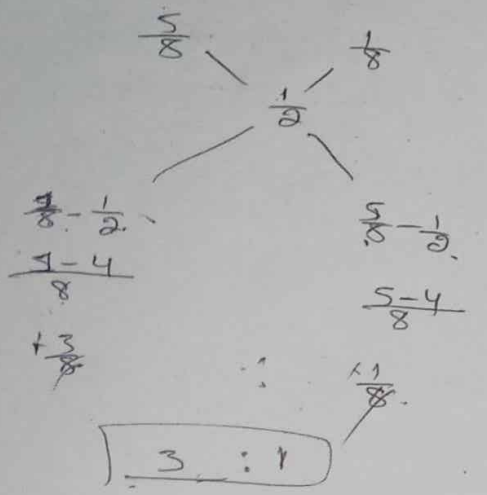
$\boxed{3 : 10}$

Similar copper

$\frac{2}{3}$ — $\frac{8}{13}$ — $\frac{3}{5}$

Q) Copper & Zinc = 5:3
and —"— = 1:7
In what ratio should the 2 alloy be mixed so that the resultant alloy contains equal proportions of copper & zinc

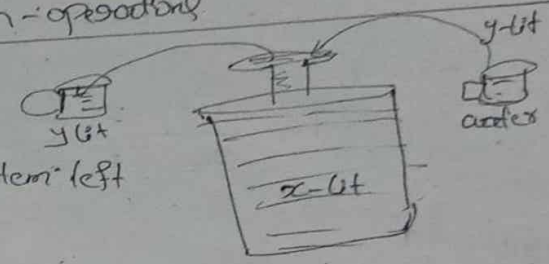
1st alloy = Z&C = 5:3
2nd alloy = Z&C = 1:7
Resultant Z&C = 1:1



Zinc
5/8, 1/8, 1/2

2(2.8/4)

Q) Final quantity of pure Item left in container after n-operations



~~Find~~ Final quantity of pure Item left
$= x\left[1-\frac{y}{x}\right]^n$

Q) Contains 40 litres of Milk. taken out 4 litres of Milk & replaced by water. Repeated this process 2 times. How much milk is now = ?

$= 40\left[1-\frac{4}{40}\right]^2$
$= 40\left[\frac{40-4}{40}\right]^2$
$= 40\left[\frac{36}{40}\right]^2$
$= 40 \times \frac{9}{16}$
$= \frac{90}{4}$
$= 22.5$

$40\left[\frac{9}{10}\right]^3$
$40 \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10}$

29.16 liter

Q) 30 litres of Milk, 20% out & fill up water first repeated 2 time. what amount of milk will be left in the cask.

$= 30\left[1-\frac{6}{30}\right]^2$
$= 30\left[1-\frac{1}{5}\right]^2$
$= 30\left[\frac{5-1}{5}\right]^2 = 30\left[\frac{4}{5}\right]^2 = 30 \times \frac{16}{25} = \frac{96}{5}$
$= 15.36$ liter

$x = 30$ liter
$y = \frac{20}{100} \times 30 = 6$ liters

Average

Formula

$$Avg = \frac{\text{Sum of observations}}{\text{No. of observations}}$$

eg:-

12, 13, 14

Avg = 13

Calculation

$$= \frac{12+15+14}{3} = \frac{39}{3} = 13$$

Q) Find the avg of 1st 50 natural no.

1, 2, 3 - - - - 25 | 26 - - - - 50

Avg = 25.5

$$Avg = \frac{1+2+ - - 50}{50}$$

$$= \frac{\frac{50\times51}{2}}{50}$$

$$= \frac{50\times51}{2} \cdot \frac{1}{50}$$

$$= \frac{51}{2} = 25.5$$

Q) What is the avg of 1st 65 natural no.

$$\frac{n(n+1)}{2}$$

$$= \frac{65(65+1)}{2}$$

$$= \frac{65\times66}{2}$$

$$= \frac{65\times33}{65} = 33$$

Q) If avg of 8, 7, 15, 17, 13, x. is x

$$\frac{8+7+15+17+13+x}{6} = x$$

$$\frac{60+x}{6} =$$

$$60+x = 6x$$

$$60 = 6x - x$$

$$60 = 5x$$

$$x = \frac{60}{5} = 12$$

n = 12

31/03/2021

Q) The Average of 12 no's is 15 & next 13 no's is 20. what is average of total 25 no's

$\cancel{\frac{12\times15}{25}}$

$$Avg = \frac{\text{Sum of observation}}{\text{No of observation}}$$

No	12	13	$\Rightarrow 25$
Avg	15	20.	
	12×15	13×20	

Sum = No. of observation × Avg

$$\text{Avg of 25 num} = \frac{\text{Sum of 25 num}}{25}$$

$$= \frac{12\times15 + 13\times20}{25}$$

$$= \frac{180+260}{25} = 17.6$$

Q) avg age of 35 students is 16 years
avg age of 21 students is 14 years
what avg age remaing 14 students.

35×16
210
35
560
14×21
280
14
294

avg age of 35 student =

$$\frac{\text{Sum of ages of 35 student}}{35}$$

No	35	21	14
Avg	16	14	x
	560	294	14x

$$16 = \frac{21\times14 + 14\times x}{35}$$

$560 = 294 + 14x$

$14x = 560 - 294$

$x = \frac{266}{14} = 19$ years

Q) avg age of 36 student is 14 years.
when teacher's age is included to it, avg increase by 1.
teacher's age = ?

36×14
144
36
504

avg age of (36 student + 1 teacher)

$$= \frac{\text{Sum of ages of 36 + 1 teach}}{37}$$

36	1	= 37
14.	x	
504	x	=

$x = \frac{504}{37}$

$$15 = \frac{36\times14 + T}{37}$$

$555 = 504 + T$

$T = 555 - 505$

$\boxed{T = 51 \text{ years}}$

Q) If mean of 29 observation is 33 & on adding one more observation the new mean becomes 34. what is the value of the 30th observation

=

$$\text{Avg of 30 observation} = \frac{\text{Sum of 30 obser}}{30}$$

$$34 = \frac{29\times33 + x_{30}}{30}$$

$1020 = 957 + x_{30}$

$\boxed{x_{30} = 63}$

Q). The avg age of 15 student = 15 years
out of these, avg age of 5 student = 14 years
other 9 student = 16 years
The age of the 15th student ?

Avg age of 15 students = $\frac{\text{Sum of ages of 15 students}}{15}$

$$15 = \frac{5\times14 + 9\times16 + x_{15}}{15}$$

$$225 = 70 + 144 + x_{15}$$

$$225 = 214 + x_{15}$$

$$x_{15} = 225 - 214$$

$$\boxed{x_{15} = 11 \text{ years}}$$

Q) avg wages of a worker is working days = 120 Rs/day
During first 7 days,
his avg. wages was Rs 110/day
avg wages during last 7 days = 124 Rs/day
what was his wage on the 8th day

Avg wages of 15 days = $\frac{\text{Sum of wages of 15 days}}{15}$

$$120 = \frac{7\times110 + 7\times124 + x_8}{15}$$

$$1800 = 770 + 868 + x_8$$

$$\boxed{x_8 = 162}$$

Q) The avg of 11 no. is 10.9,
avg 1st 6 no. is 10.5
avg last 6 no. is 11.4.
avg of middle no. is ?

$$10.9 = \frac{6\times10.5 + 6\times11.4 - x_6}{11}$$

$$10.9 = \frac{63 + 68.4 - x_6}{11}$$

$$11\times10.9 = 130.4 - x_6$$

$$119.9 = 131.4 - x_6$$

$$x_6 = 131.4 - 119.9$$

$$x_6 = 11.5$$

10.5×6
63.0

11.4×6
68.4

63
68.4
130.4

10.9×11
10.9
10.9
119.9

$11\times.9$
9.9

10
$110 + 9.9$
119.9

Q) A car owner buys petrol at Rs 7.50, Rs 8 & Rs 8.50 per litre for 3 successive years.
what approximately is the avg cost/litre of petrol if he spends Rs. 4000 each year

Avg. Price/litre = $\frac{4000 + 4000 + 4000}{\frac{4000}{7.5} + \frac{4000}{8} + \frac{4000}{8.5}}$

$$= 7.98 \text{ ₹/litre}$$

Avg. price per litre = $\frac{\text{Total Amount Spend}}{\text{Total litre of Petrol}}$

7.5
8
8.5
24.0

$\frac{24}{8} = 8$

Q) out of 9 persons,

8 persons spent = Rs 30

9th person spent = 30 more than avg expenditure of all the nine.

The total money spent by all them was

Let Avg of all 9 persons = x

Total Amount spend = $[8\times30+(x+30)]$

$= (260+x)$ Rs

$= 260+32.5$

$= 292.5$ Rs

$x = \frac{260+x}{9}$

$9x = 260+x$

$8x = 260$

$x = \frac{260}{8}$

$\boxed{x = 32.5}$

Permutation Combination

Permutation

Total possible ways to arrange 'n' given things is called permutation.

Keywords:- arrange, formation of ~~n digit~~ n-digit no etc

Combination :-

Total possible ways to select certain things out of n - ~~digit~~ given things.

Keywords :- Selection, pick, draw, a group / committee, Total hand shake, Total matches play, total no of lines ~~drawn~~ drawn.

Total no of triangles, Total no of diagonals of polygon etc,

Permutation

Case 1)

Total possible ways arrange an the friends taken a different ~~things~~ things $= n!$

n different things $= n!$

Eg. 8 soft drinks $= 8!$

"ORANGE" $= 6! = 6\times5\times4\times3\times2\times1 = 720$.

Case ii)

* arrangement of nth things such that some are repeated $= \frac{n!}{r_1! \times r_2! \cdots r_n!}$

Eg:- "CORPORATION" $= \frac{11!}{3! \times 2! \times \ldots}$

Q) In how many ways → how many arrange.
4 Red, 5 Blue & 6 different color balls.

$$\text{Ans} = \frac{15!}{4! \times 5!}$$

Case iii)

arrangement of nth things such that r things are taken at a time $= {}^nP_r = \frac{n!}{(n-r)!}$

Condition (I)

There are 4 left (ABCD) arrangement 2 left a time.

Formula.

$$\text{Ans} = {}^4P_2 = \frac{4!}{2!} = \underline{12}$$

Ans

- AB
- BA
- AC
- CA
- AD
- DA
- BC
- CB
- BD
- DB
- CD
- DC

Condit II

(1) (2) (3) (4) (5) (6) (7)

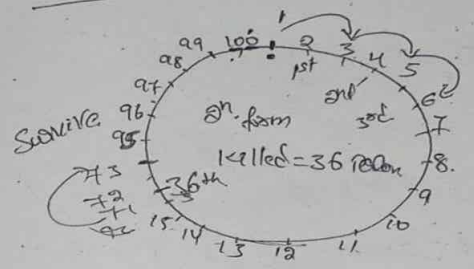
① 5ch 3Boys $= {}^5P_3$
② 5ch 4Boy $= {}^5P_4$
③ 5ch 5Boy $= {}^5P_5 = 5!$
④ 8ch 8Boys $= 8!$

01/04/2021

~~Case No~~

Puzzle

. 100 Persons standing in a circle



* if no of person in the circle is 2^n form, then always 1st person survive.

Eg:- 2, 4, 8, 16, 32, 64, 128, 256, 512.

method-1

* 100 person
2^n form.
killed = 36
place of 36th person = 72nd place
Survive = 73rd

* 50 person
2^n form
$2^n = 32$
Killed = 18
place = 36
Survive = 37

* 200 person
$2^n = 128$
killed = 72
Place = 144
Survive = 145th.

method-2

100 Person

64	32	16	8	4	2	1
(2^6)	(2^5)	(2^4)	(2^3)	2^2	2^1	2^0
1	1	0	0	1	0	0
0	0	1	1	0	1	1

value = 37
Survive = 100 − 37 = 73rd

Case-4

Total Possible ways to arrange 'n' things such that 'r' things are always together =

$= (n-r+1)! \times r!$

eg:- 7 different books. Arrange it such that 3 Particular books always together.

Array $= (7-3+1)! \times 3!$

$= 5! \times 3!$

method

$B_1\ B_2\ \boxed{B_3\ B_4\ B_5}\ B_6\ B_7$

Ans $5! \times 3!$

a) Letter of that word "LEADING" is arranged such that find arrangements which.

(a) vowels are together

(b) Vowels are not together.

a) LIEADING

A E I O U

$\boxed{EAI}$ LDNG

Arr $= 5! \times 3! = 720$

(b) Vowels not together = Total arrangement − when vowel together

$= 7! - 720$

$= 5040 - 720 = 4320$

* Letter word "LEADER" find arr. when,

(a) Vowels are together

(b) vowels are not together

a) 'LEADER'

(AEE) = 1

$\boxed{AEE}$ LDR

$= \frac{4! \times 3!}{2!} = 72$

(b) Vowel not together = Total Arr − when vowel together.

$= \frac{6!}{2!} - 72$

$= 360 - 72$

$= 288$

* CORPORATION

a) AIOOO − 1

$\boxed{AIOOO}$ CRPRTN

$\frac{5! \times 5!}{3! \times 2!}$

(b) Vowels not together = Total Arr − when vowel together.

$= \frac{11!}{3! \times 2!} - \frac{7! \times 5!}{3! \times 2!}$

$= \frac{11! - 7! \times 5!}{3! \times 2!} =$

(Q) They are 7 Software Engineers and 4 Civil eng.

Find

(a) Total Arr

(b) Arr. when SE & CE are together

(c) only SE together

(d) only SE together

(e) SE not together

(f) CE not together.

a). $7! * 4! = 11!$

b). $\boxed{S_1\ S_2\ S_3\ S_4\ S_5\ S_6\ S_7}$ $\boxed{C_1\ C_2\ C_3\ C_4}$

$\Rightarrow 2! \times 7! \times 4!$

c). $\boxed{S_1\ S_2\ S_3\ S_4\ S_5\ S_6\ S_7}$ C_1, C_2, C_3, C_4

$5! \times 7!$

(d) $\boxed{C_1\ C_2\ C_3\ C_4}$ $S_1\ S_2\ S_3\ S_4\ S_5\ S_6\ S_7$

$8! \times 4!$

e) Total Arg - when SE together.

$= 11! - 5! \times 7!$

d) CE not together = Total Arr - when SE together

$= 11! - 8! \times 4!$

g) no CE together

$|S_1|S_2|S_3|S_4|S_5|S_6|$

Arg $= 7! \times {}^8P_4$

(h) No SE together

$S_1\ (D)\ S_2\ (D)\ S_3\ (D)\ S_4\ (D)\ S_5\ S_6\ S_7$

this arrange is not Possible

* Alternate Arrange :-

Case-1

when boys and Girls are equal

5B 5G

$\Rightarrow B_1 G_1 B_2 G_2 B_3 G_3 B_4 G_4 B_5 G_5$

$G_1 B_1 G_2 B_2 G_3 B_3 G_4 B_4 G_5 B_5$

$A_1 + Arr = 2 \times 5! \times 5!$

nBoys nGirls,

$A_1 + Arrange = 2 \times n! \times n!$

10 Boys 10 Girls

$A_1 + Arr = 2 \times 10! \times 10!$

(3) when boys & girls not equal

5 Boys 4 Girls

$B_1 G_1 B_2 G_2 B_3 G_3 B_4 G_4 B_5$

$A_1 * Arr = 5! \times 4!$

mBoys nGirls

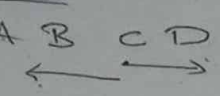
$\boxed{\text{Other Arr} = m! \times n!}$

* Circular Arrangement.

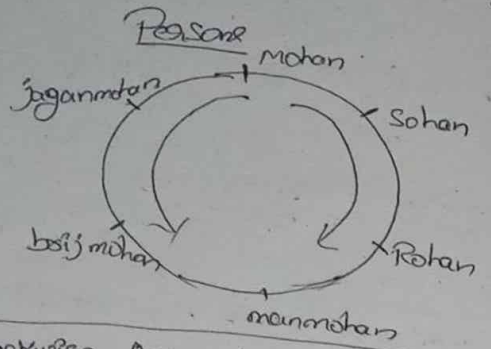
02/04/2021

Line

A B C D

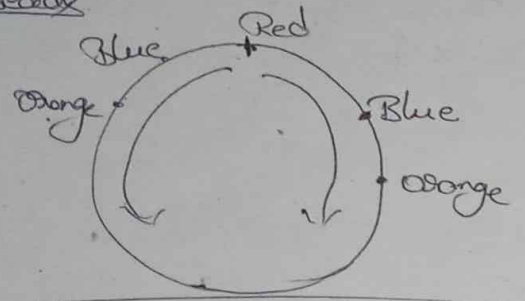


Persons



Clockwise Arr ≠ Anticlockwise arr

Beads



Clockwise = Anticlockwise Arr

(Case-i)

Total circular arr, when 'n' Persons are seated on a circular table $= (n-1)!$

(Case-ii)

Total arrangement when n beads are arranged in a necklace $= \frac{(n-1)!}{2}$

Q) They are 5 Indian, 4 American and 3 British to be seated on circular table. Find.

i) Total arrangement

ii) arrange when Ind. American & British together

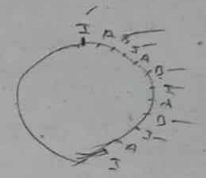
iii) only Indian together.

iv) only American together.

v) only British together.

vi) No Indian together.

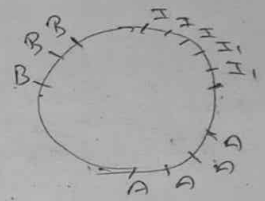
vii) No American together.



i) Total arr

$= (n-1)!$

$= (12-1)! = 11!$



ii) $= (3-1)! * 5! * 4! * 3!$

iii) $= (8-1)! * 5!$

$= 7! * 5!$

iv) $= (9-1)! \times 4!$

$= 8! \times 4!$

v) $(10-1)! \times 3!$

$= 9! \times 3!$

vi) $(7-1)! \times {}^7P_5$

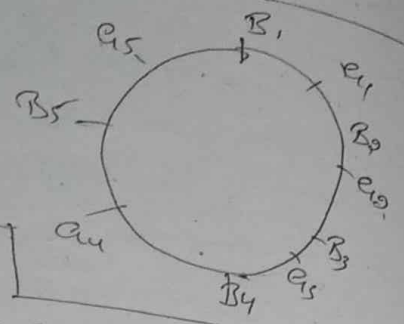
$= 6! \times {}^7P_5$

vii) $\cancel{(8-1)! \times}\ (8-1)! \times {}^8P_4$

$= 7! \times {}^8P_4$

* Alternate arrangement on Circular Table

eg:- 5B & 5G



Alternate Arr $= (5-1)! \times 5!$

$= 4! \times 5!$

> n Boys n Girls.
> Circular Table Alternate Arr $= (n-1)!\, n!$

- 16B & 16G =
- Alternative Arr $= 15! \times 16!$

* There are Some Envelops:-

5 letter, 5 envelops

Envelop :- E_1 E_2 E_3 E_4 E_5

Letter :- L_1 L_2 L_3 L_4 L_5

① Total how many ways to arrange letters into Envelops

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

2). Total ways to arrange such that all letters are in right envelops $= 1$.

3) Total ways to arrange such that atleast one left is in wrong envelops

$= 120 - 1 = 119$ ways

4) All letters are in wrong envelops

Dearrangement

$$D_n = n!\left[1 - \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} - \cdots n\right]$$

$$D_5 = 5!\left[1 - \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} - \frac{1}{5!}\right]$$

$$= 5!\left[1 - 1 + \frac{1}{2} - \frac{1}{6} + \frac{1}{24} - \frac{1}{120}\right]$$

$$= 5!\left[\frac{60 - 20 + 5 - 1}{120}\right]$$

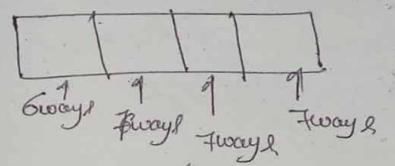
$$= [65 - 21] = 44$$

* Formation of n-digit number

2, 3, 4, 5, 6, 8, 0

Form 4-digit number such that

a) Repitition allowed

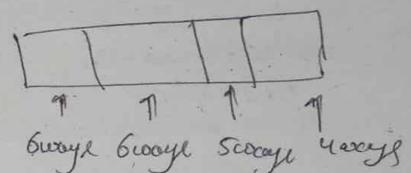


Total $= 6 \times 7 \times 7 \times 7$

$= 6 \times 343$

$= 2058$

b) No Repitition allowed



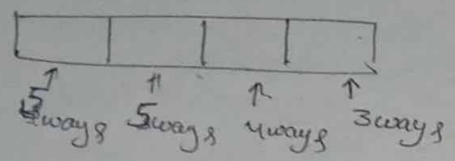
Total $= 6 \times 6 \times 5 \times 4$

$= 36 \times 20$

$= 720$

a) By using digits 2, 3, 4, 5, 6, 8, 0 — for 4 digit no. without Repitions such that

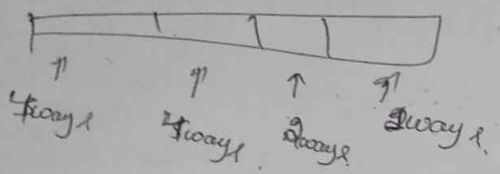
a) if Ends with 3 (or) 5 (or) 6



Total = 5x5x4x3
= 300

b) last 2 place is 5 (or) 8.

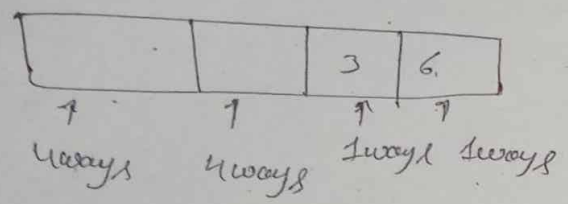
2, 3, 4, 5, 6, 8, 0



Total = 4x4x2x1
= 32

c) ~~starts with~~
last place is 3 & 6

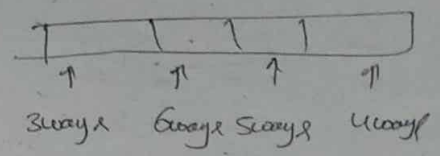
2, 3, 4, 5, 6, 8, 0



Total = 4x4x1x1
= 16.

d) It starts with 3 (or) 4 (or) 6

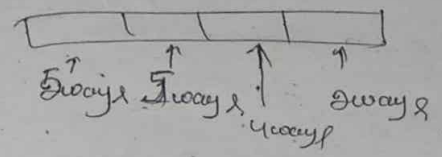
2, 3, 4, 5, 6, 8, 0



= 3x6x5x4
= 360

2, 3, 4, 5, 6, 8, 0

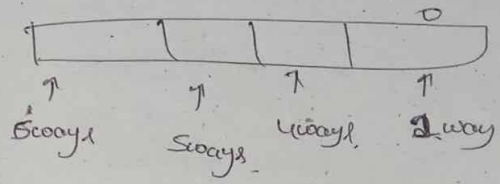
e) It is an odd no's



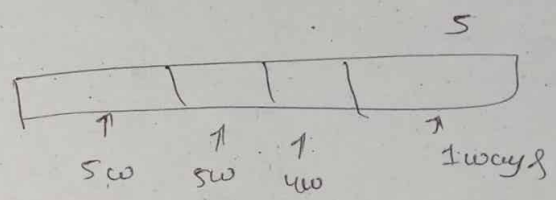
5x5x4x2
= 200

d) It is divisible by 5

2, 3, 4, 5, 6, 8, 0

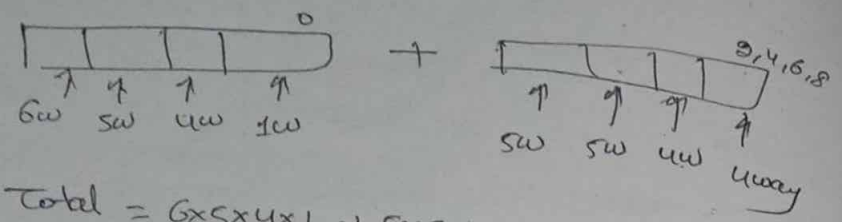


+



Total = (6x5x4x1) + (5x5x4x1)
= 120 + 100
= 220

g) It is divisible by 3



Total $= 6\times5\times4\times1 + 5\times5\times4\times4$

$= 120 + 400$

$= 520$

Formation of a group / commitee

05/04/2021

Use of "AND" $\Rightarrow \times$

"OR" $\Rightarrow +$

Combination

$^nC_r = \frac{n!}{(n-r)!\,r!}$

Q) There are 8 boys & 6 girls, a group 7 Member ad to be selected such that there a 5-boys & 2 girls in the group.

$\Rightarrow$ 8-boys & 6 girls

7 Member

5-Men & 2 girls

$^8C_5 \times {}^6C_2$

$^8C_5 = \frac{8\times7\times6}{3\times2\times1} = 8$

$^6C_2 = \frac{6\times5}{2\times1} = 30$

Rule

if $^nC_{r_1} = {}^nC_{r_2}$

provided $r_1 + r_2 = n$

$^{15}C_{10} = {}^{15}C_5$

$^{12}C_{10} = {}^{12}C_2$

$^{20}C_{17} = {}^{20}C_3$

$^{12}C_{17} = {}^{12}C_1$

$^{12}C_{12} = {}^{12}C_0$

Q) There are 9 boys & 8 girls, a team of 7 members has to be selected such that there are 2 boys in the team

7-member.

2 men & 5 girl

$^9C_2 * {}^8C_5$

$\frac{9\times8}{2\times1} * \frac{8\times7\times6}{3\times2\times1}$

$(9\times4) * (8\times7)$

$36 * 56$

$= 2016$

Q) There are 6 boys & 5 girls. a group of 6-member has to selected such that there are atleast 4 boys in the group 6-member

$\Rightarrow$ ~~$6C_4$ $5C_2$~~ 6-Boys & 5 girls

6 member

~~6×5~~ atleast 4 boys

4 Boys and 2 girls $\rightarrow {}^6C_4 * {}^5C_2$

or 5 Boys and 1 girls $\rightarrow {}^6C_5 * {}^5C_1$

or 6 Boys $\rightarrow {}^6C_6$

$^6C_4 * {}^5C_2 + {}^6C_5 * {}^5C_1 + {}^6C_6$

$\Rightarrow \frac{6\times5\times4\times3}{4\times3\times2\times1} * \frac{5\times4}{2} + \frac{6\times5}{5\times4} * 5 + 1$

$= 150 + 30 + 1 = 181$

Q) 7 Men & 6-women
5-member to be selected - At least 3 are there
7-men & 6-women

=> 3boys and 4 women
OR 4boys and 3women
OR 5boys and 2women
OR 7 boys

$\Rightarrow {}^7C_3 * {}^6C_4 + {}^4C_4 * {}^6C_3 + {}^7C_5 * {}^6C_2 + {}^7C_6 * {}^6C_1 + {}^7C_7$
$= A$
$= \underline{756}$

Q) Boy-6 & 8-girl a committee of 8 member has to be made there are atmost 2-boys in the group.

8-memb 8-member.

Case-1 :- boy-2 & girl 6
OR boy 1 & girl 7
OR boy-0 & girl-8

${}^6C_2 * {}^8C_6 + {}^6C_1 * {}^8C_7 + {}^8C_8$
$= \frac{6 \times 5}{2} * \frac{8 \times 7}{2} + \frac{6}{1} \times \frac{8}{1} + 1$
$= 420 + 48 + 1 = 469$

* Total hand shake (or) total matches

5- Person

A=4 AB AC AD AE
B=3 BC BD BE
C=2 CD CE
D=1 DE
E=0 0

10 combination

${}^5C_2 = \frac{5 \times 4}{2!} = \underline{10}$

Total hand shake / Total matches $= {}^nC_2 = \frac{n(n-1)}{2}$

every total 2 matches

Total matches $= 2 \times \frac{n(n-1)}{2}$

Total handshake $= \frac{20 \times 19}{2} = 190$

Q) In a meeting when every person shake hand with one another then total Hand shake was 105 How many member there in the meeting.

$\frac{n(n-1)}{2} = 105$
$n(n-1) = 105 \times 2$
$\boxed{n(n-1) = 210}$
$n^2 - n - 210 = 0$
$n^2 - 15n + 14n - 210 = 0$
$n(n-15) + 14(n-15) = 0$
$n - 15 = 0$
$\boxed{n = 15}$ People

Q) In a meeting when 1-particular person for what to shake hand other particular person then total Hand shake 65, so How many member in meeting.

=> $65 = \frac{n(n-1)}{2}$ — (1) No hand with one part

$66 = \frac{n(n-1)}{2}$
$n(n-1) = 66 \times 2$
$n(n-1) = 132$
$n^2 - n - 132 = 0$
$n^2 - 12n + 11n - 132 = 0$
$n(n-12) + 11(n-12) = 0$
$\boxed{n = 12}$

(4) IPL

Total matches = 10 Teams

= (1st stage matches) + (3 S.F) + 1 Final

$= 2 \times \frac{8 \times 7}{2} + 4$

$= 60$

(5) Truth town & Lie town

Truth town		Lie town

(a) which side of the town do you lies

06/04/2021

* n×n matrix

3×3 (using 1-9)

Formula

Constant of n×n matrix

$= \frac{n(n^2+1)}{2}$

$= \frac{3(3^2+1)}{2} = \frac{3(9+1)}{2}$

$= \frac{3 \times 10}{2} = \frac{30}{2}$

$= 15$

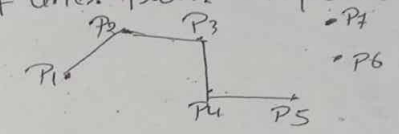
6	1	8
3	5	7
2	9	4

Common no must be even

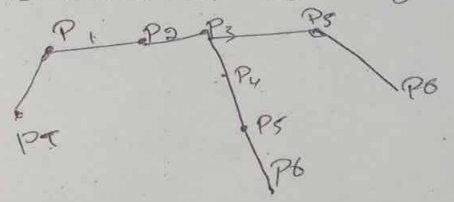
(6) Use of Combination in Geometry:-

i) No of lines

a) No of lines from 'n' point $= {}^nC_2 = \frac{n(n-1)}{2}$



b) No of lines from 'n' points such that 'm' point are collinear $= {}^nC_2 - {}^mC_2 + 1$



Q) How many lines can drawn from 25 Point such that 16 Point are Collinear.

No of lines $= {}^nC_2 - {}^mC_2 + 1$

$= {}^{25}C_2 - {}^{16}C_2 + 1$

$= \frac{25(25-1)}{2} - \frac{16(16-1)}{2} + 1$

$= \frac{25(\overset{12}{24})}{2} - \frac{\overset{8}{16}(15)}{2} + 1$

$= 25\times12 - 8\times15 + 1$

$= 300 - 120 + 1$

No of lines $= 181$ lines

Q) How many lines can be drawn from 12 know Collinear from & 8 Collinear Points.

$= {}^{20}C_2 = {}^{12}C_2 + {}^{8}C_2 + 1$

$= \frac{20(19)}{2} = \frac{12(11)}{2} + \frac{8(7)}{2} + 1$

$= 10\times19 = 66 + 28 + 1$

$= 190 - 66$

$= {}^{20}C_2 - {}^{8}C_2 + 1$

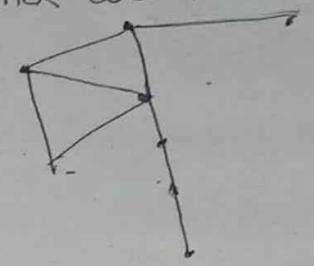
$= \frac{20\times19}{2} - \frac{8\times7}{2} + 1$

$= 190 - 28 + 1$

$= 163$

ii) No of traingles

No of triangles from 'n' points such that 'm' points are collinear $= {}^nC_3 - {}^mC_3$.



Q. How many traingles from

method-1

$= {}^nC_3 - {}^mC_3$

No of traingle $= {}^{11}C_3 - {}^7C_3 - {}^4C_3$

$= \cancel{\frac{11(10)}{3} - \frac{7(6)}{3} - \frac{4(3)}{3}} = \frac{11\times10\times9}{3\times2} - \frac{7\times6\times5}{3\times2} - \frac{4\times3\times2}{3\times2}$

$= \cancel{\frac{110}{3} - 14 - 4}$

$= 165 - 35 - 4$

$= 126$

method-2

No of traingles $= {}^7C_2 \times {}^4C_1 + {}^4C_2 + {}^7C_1$

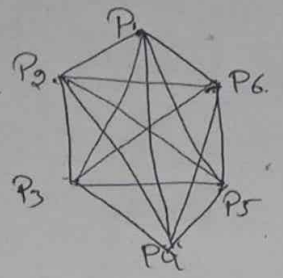
$= 21\times4 + 6\times7$

$= 84 + 42$

$= 126$

III) No of diagonals :-

Total no of diagonals of a Polygon having n-sides $= {}^nC_2 - n = \frac{n(n-3)}{2}$.



$= {}^6C_2 - 6 \longrightarrow$ side.

$= \frac{6(5)}{2} - 6$

$= 15 - 6 = 9$

Q) If regular Polygon has 35 diagonals & how many sides it have

$35 = \frac{n(n-3)}{2}$

$n(n-3) = 2 \times 35$

$n(n-3) = 70$

$10 \times 7 = 70$.

$n = 10$

$n^2 - 3n - 70 = 0$

$n^2 - 10n + 7n - 70 = 0$.

~~$n^2 + 3n - 70 = 0$.~~

$n(n-10) + 7(n-10) = 0$

$(n-10)(n+7) = 0$

Probability

$P(E) = \frac{\text{Likely outcome } (E)}{\text{Total Possible outcome } (E)}$

$0 \le P(E) \le 1$

0% 100%

Q) what is probability to get 3 heads when 8 coins thrown together,

HHHTTTTT ~~$\frac{1}{2} \times 8! = 4$~~ ~~$= \frac{1}{2} \times \frac{1}{3}$~~ $= \frac{8!}{3! \times 5!} = 56$

Total Possible out come when 'n' coins thrown together $= 2^n = \frac{56}{2^8} = \frac{56}{256} = \frac{7}{32}$

* 1 - Coins.

Total outcome $= 2^1 = 2$.
H, T

$P(H) = \frac{1}{2}$

$P(T) = \frac{1}{2}$

* 2 Coins

Total outcome $= 2^2 = 4$

HH, HT, TH, TT,

$P(\text{ex. } 1H) = \frac{2}{4} = \frac{1}{2}$

$P(\text{ex. } 2h) = \frac{1}{4}$

$P(\text{atleast } 1h) = \frac{3}{4}$

$P(\text{atmost } 1h) = \frac{3}{4}$

Q) Two unbiased coins are tossed. The Probability of obtaining at least one head is.

$= \frac{3}{4}$

③ 3 Coins

HHT
HHH
HTH
HTT
THH
THT
TTH
TTT

a) $P(ex.1h) = \frac{3}{8}$

b) $P(ex.2h) = \frac{3}{8}$

c) $P(atleast\ 1h) = \frac{7}{8}$

d) $P(atmost\ 1h) = \frac{4}{8}$.

③

ⓐ $P(ex.1h) = \frac{3}{2^3} = \frac{3}{8}$

HTT

$= \frac{3!}{2!} = 3$

ⓑ $P(ex.2h) = 3/8$

HHT $= \frac{3!}{2!} = 3$

ⓒ $P(atleast\ 1h) = \frac{7}{8}$

HTT
HHT
HHH

$\left.\begin{matrix} 3 \\ 3 \\ 1 \end{matrix}\right\} = 7$

ⓓ $P(atmost\ 1h) = \frac{4}{8}$

HTT = 3
TTT = 1 } 4

3 Coins

Total outcome $= 2^3 = 8$

$2 \times 2 \times 2 = 8$.

4) Eleven coins are tossed simultaneously. In how many of the outcomes will the sixth & eight coin turn up a head

$\frac{2}{2^9} \times \frac{2}{} \times 2 \times 2 \times 2 \times 1 \times 2 \times 1 \times 2 \times 2 \times 2$

07/04/2021

5) 7 coin ~~point flown together~~ throw together - find the probability to getting

a) exactly 3 heads
b) atleast 5 heads
c) atmost 1 head

160
32
128

$\frac{2}{4} \times \frac{2}{4} \times \frac{2}{4} \times \frac{2}{2}$

$16 \times 8 = 128$

a) exactly 3 heads

$P(ex.3h) = \frac{35}{2^7} = \frac{35}{128}$.

3H4T $= \frac{7!}{3! \times 4!} = 35$

b) atleast 5 heads

$P(atleast\ 5h) = \frac{29}{2^7} = \frac{29}{128}$

5H 2T $= \frac{7!}{5! \times 2!} = 21$
6H 1T $= \frac{7!}{6! \times 1!} = 7$
7H $= \frac{7!}{7!} = 1$ } 29

c) atmost 1 head

$= \frac{8}{2^7} = \frac{8}{128}$

1H 6T $= \frac{7!}{6!} = 7$
7T $= \frac{7!}{7!} = 1$ } 8

* Dice

Total outcome when n dice are thrown $= 6^n$

1) 1 Dice

Total outcome $= 6^1 = 6$

Q) what is probability to get a prime no, when Dice thrown

$P = \frac{3}{6} = \frac{1}{2}$

Q) If the outcome is an odd no when a dice is rolled, then calculate the probability that it is a prime number.

odd eg 1, 3, 5

ans $\frac{2}{3}$

2) 2 Dice

Total outcome $= 6^2 = 36$.

even

(1,1) (1,2) (1,3) (1,4) (1,5) (1,6) 3 odd
(2,1) (2,2) (2,3) (2,4) (2,5) (2,6) 3
(3,1) (3,2) (3,3) (3,4) (3,5) (3,6)
(4,1) (4,2) (4,3) (4,4) (4,5) (4,6)
(5,1) (5,2) (5,3) (5,4) (5,5) (5,6) 3
(6,1) (6,2) (6,3) (6,4) (6,5) (6,6)

Q) Find Probability of getting

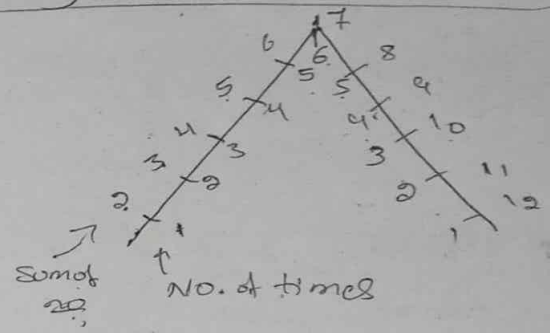
a) A double t.
b) sum of numbers equal to 5
c) sum of number less that 5
d) sum of number greater or equal to 8.
e) sum of numbers a prime no
f) Ratio of 2 no (a,b) is (1:2)
g) product is an even no
h) product is an odd no
i) sum is divisible by 4.
j) sum of divisible by 3 or 4.

a) $\frac{6}{36} = \frac{1}{6}$

b) $\frac{4}{36} = \frac{1}{9}$

c) $\frac{6}{36} = \frac{1}{6}$

d) $\frac{15}{36}$



e) Prime no :- 2, 3, 5, 7, 11 ans $\frac{15}{36}$

f) $\frac{2}{36}$

g) $\frac{2}{36}$ $\frac{27}{36} = \frac{3}{4}$

h) $\frac{9}{36} = \frac{1}{4}$

i) 4, 8, 12 are divisible by 4, $\frac{9}{36} = \frac{1}{4}$

j) 3, 6, 9, 12 ÷ 3 & 4, 8, 12 ÷ 4.

then $\frac{20}{36} = \frac{5}{7}$

Cards

52

- Red card (26)
  - Diamond (13): Jack (J), King (K), Queen (Q), Ace, 10, 9, 8, 7, 6, 5, 4, 3, 2
  - Heart (13): Jack (J), King (K), Queen (Q), Ace, ..., 2.
- Black card (26)
  - Spades (13): Jack (J), King (K), Queen (Q), Ace, ..., 2
  - Clubs (13): Jack (J), King (K), Queen (Q), Ace, ..., 2.

1) Probability to get a jack when one card is drawn.

$$P = \frac{4}{52}$$

2) Probability to get 2 jacks when 2 cards drawn

$$P = \frac{{}^4C_2}{{}^{52}C_2} \times \cancel{\frac{3}{51}}$$

3) probability to get 2 jacks when 5 cards drawn.

$$P = \frac{\text{2 jack \& 3 other than jack}}{{}^{52}C_5}$$

$$= \frac{{}^4C_2 \times {}^{48}C_3}{{}^{52}C_5}$$

4) what is probability to get a red card or a king and when 1 card drawn randomly.

Red card = 26.

King = 2.

$$P = \frac{28}{52}$$

5) what is probability to get diamond or a Jack when.

Diamond = 13.

Jack = 3

16

$$P = \frac{16}{52}$$

6) what is probability to get black card or a face card with one card is draw.

Black card = 26.

face card = 6

32.

$$P = \frac{32}{52}$$

(b) Find the probability to getting

a) 3 Kings when 3 cards drawn

$$P = \frac{^4C_3}{^{52}C_3}$$

(b) 3 Kings when 5 cards drawn

$$P = \frac{^4C_3 \times {}^{48}C_2}{^{52}C_5}$$

(c) 2 Kings and 3 Queens when 5 cards drawn

$$P = \frac{^4C_2 \times {}^4C_3}{^{52}C_5}$$

d) 3 Jack and 1 King when 6 cards drawn

$$P = \frac{^4C_3 \times {}^4C_1 \times {}^{44}C_2}{^{52}C_6}$$

* Selection of different color balls from a bag :- [Imp]

(a) A bag contains 6 Red, 5 blue and 4 orange color balls, find probability of getting

a) A Red ball when 1 ball drawn

$$P \Rightarrow \frac{^6C_1}{^{15}C_1} = \frac{6}{15}$$

b) 2 Red balls when 2 balls drawn

$$P = \frac{^6C_2}{^{15}C_2}$$

c) 2 Blue when 5 balls drawn

$$P = \frac{^5C_2 \times {}^{10}C_3}{^{15}C_5}$$

d) 2 orange & 1 Red when 5 balls drawn

$$P = \frac{^4C_2 \times {}^6C_1 \times {}^5C_2}{^{15}C_5}$$

e) atleast 2 Red when 3 balls drawn

$$P = \frac{^6C_2 \times {}^9C_1 + {}^6C_3}{^{15}C_3}$$

f) atleast ~~2 Red & 1 other~~ 1 orange when 5 balls drawn

$$P = \frac{^4C_1 \times {}^{11}C_4 + {}^{14}C_5}{^{15}C_5}$$

Q) A speaks truth 75% of cases and B in 80% of cases in what % of cases are there likely to contradict each other in narrating the same event

	A	B
Truth	$= \frac{75}{100} = \frac{3}{4}$	Truth $= \frac{80}{100} = \frac{4}{5}$
Lie	$= \frac{25}{100} = \frac{1}{4}$	Lie $= \frac{20}{100} = \frac{1}{5}$

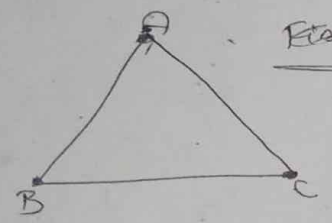
P (contradic) = A(T) and B(L) OR A(L) and B(T)

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

$= \frac{7}{20}$

% P $= \frac{7}{20} \times 100 = 35\%$

Puzzle



Triangle & ant puzzle

P (not collide) = A, B, C (clockwise) OR A, B, C (anticlock)

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

$= \frac{1}{8} + \frac{1}{8} = \frac{2}{8} = \frac{1}{4}$

P(collide) $= 1 - \frac{1}{4} = \frac{3}{4}$

08/04/2021

Q) The probability that a boy will not pass M.B.A. examination is 2/5 & that a girl will not pass is 4/5. Calculate the probability that at least one of them passes the examination

Ans

	Boy	Girl
NP =	$\frac{2}{5}$	$\frac{4}{5}$
P =	$\frac{3}{5}$	$\frac{1}{5}$

P(atleast one passes) = B(P) and G(NP) OR B(NP) and G(P) OR B(P) and G(P)

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

$= \frac{17}{25}$

method-2

P(nobody passes) = B(NP) and G(NP)

$= \frac{2}{5} \times \frac{4}{5} = \frac{8}{25}$

P (atleast one passes) $= 1 - \frac{8}{25}$

$= \frac{25-8}{25} = \frac{17}{25}$

Q) A problem in Mathematical is given to four Students A, B, C & D. Their chanced of solving the problem respectively are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$. what is the probability that the problem will be solved

Solution

	A	B	C	D
solve	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$
no solve	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{4}{5}$

P(problem Not Solved)

= A(NS) and B(NS) and C(NS) and D(NS)

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

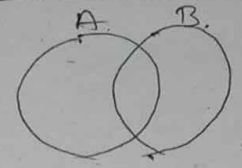
P(Prob. Solved) $= \cancel{\frac{1}{2} \times \frac{1}{3} \times \frac{1}{4}}$

$= 1 - \frac{1}{5} = \frac{4}{5}$

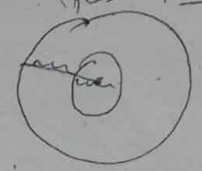
Syllogism (Reasoning)

statements

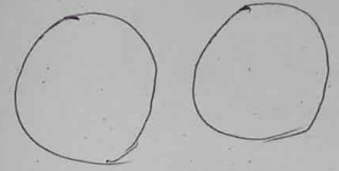
i) Some A and B



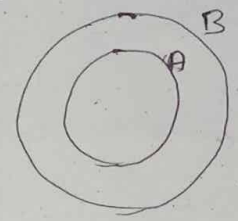
Possiblity



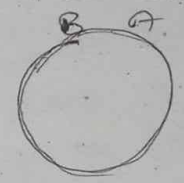
ii) NO A IS B



iii) All A are B

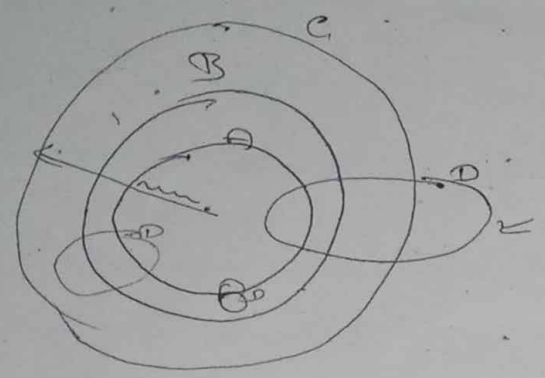


Possiblity:-



Statement

i) All A are B
ii) All B are C
iii) Some A are D.

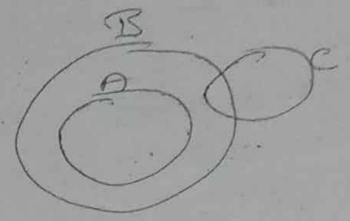


Conclution

i) Some C are A ✓
ii) All A are C ✓
iii) All C are A (✗)
iv) All C are B (✗)
v) Some B are D ✓
vi) Some C are D ✓
vii) All C are D (✗)
viii) All D are C (✗)
ix) All D are A (✗)

Statement

i) All A are B
ii) Some B are C

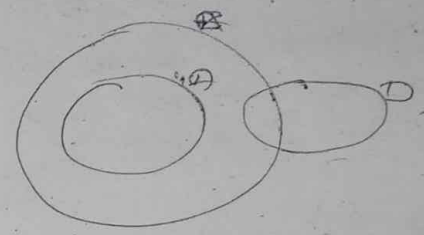


conclution

i) Some B are A ✓
ii) Some A are C (✗)

Statement

i) All A are B
ii) Some B are D.

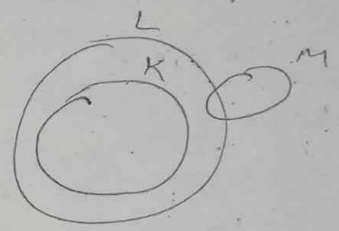


conclution

i) Some B are A ✓
ii) No A is D (✗)

Statement

i) All K are L
ii) Some L are M



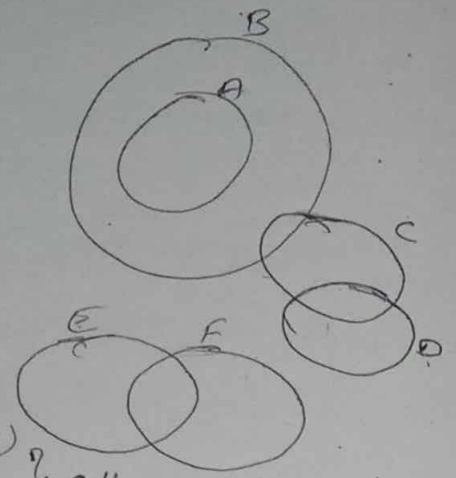
Conclution

i) Some L are K ✓
ii) Some K are M (✗)
iii) No K is M (✗)

] Either II or III true

* Statement

1) All A are B
Some B are C
Some C are D
Some E are F

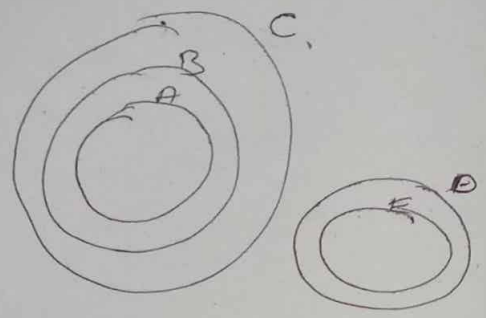


Conclusion

i) Some A are D (x)
ii) No A is D (x) } Either I or II true
iii) Some B are D (x)
iv) Some E are B (x)
v) Some F are B (x)
vi) No F is B (x) } Either V or VI true

* Statements

1) All A are B.
ii) All B are C
iii) No C is D
iv) All E are D.

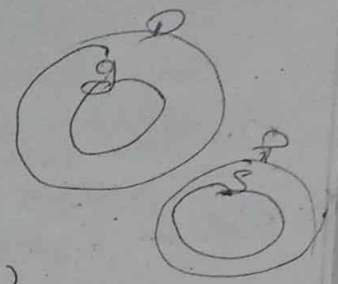


Conclusion

i) Some C are A ✓
ii) No E is A ✓
iii) Some D are B (x)
iv) No B is D ✓

Q) Statements

No person is a decorator
All students are persons.
All girls are decorators

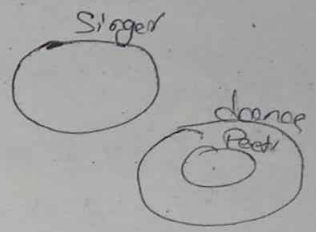


Conclusions

i) No student is a girl (✓)
ii) Some students are decorators (x)
iii) No decorator is a student (✓)
iv) Some persons are students. (✓)

Q) Statements:

i) No poet is Singer.
ii) All Poets are dancers

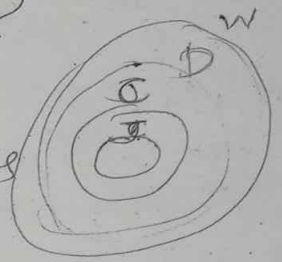


conclusions

i) No Singer is dancer. (✓)
ii) No dancers is singer. (✓)

Q) Statements

1) All jackals are carnivores.
2) All carnivores are dangerous animals
3) All dangerous animals are wild

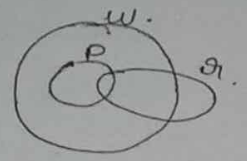


conclusions:

i) All dangerous animals are jackals (x)
ii) All jackals are wild. (✓)
iii) No carnivores are dangerous animals (x)
iv) No jackals are carnivores (x)

Q) Statements

a) Some Rings are Pins
B) All Pins are watches

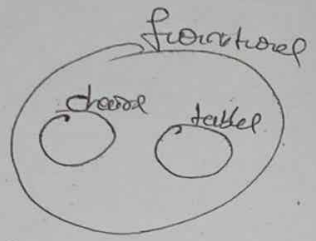


Conclusion

i) All watches are Pins (x)
ii) Some Pins are Rings. (✓)

Q). Statements

a) All chairs are furniture
b) All tables are furniture

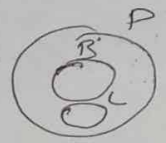


Conclusion

i) All chairs are tables (x)
ii) Some tables are chairs (x)

Q) Statements

a) All bats are Phones
b) All lamps are phones

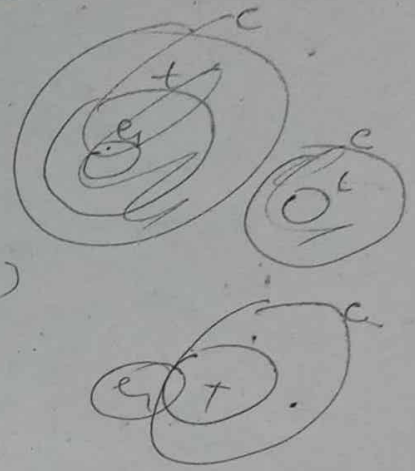


Conclusions

i) Some lamps are bats ×
ii) No lamp is bat (✓)] Either I (or) II true

Q) Statements

a) Some girls are teits
B) All leaf are cons.

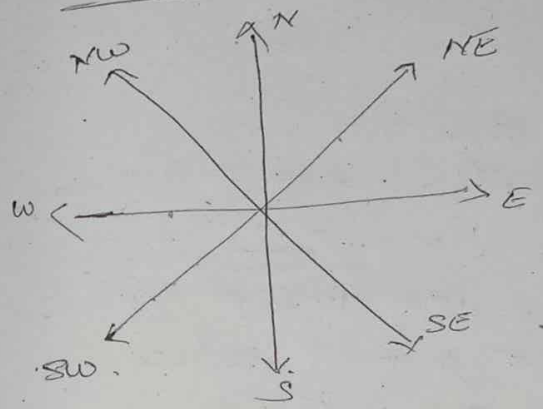


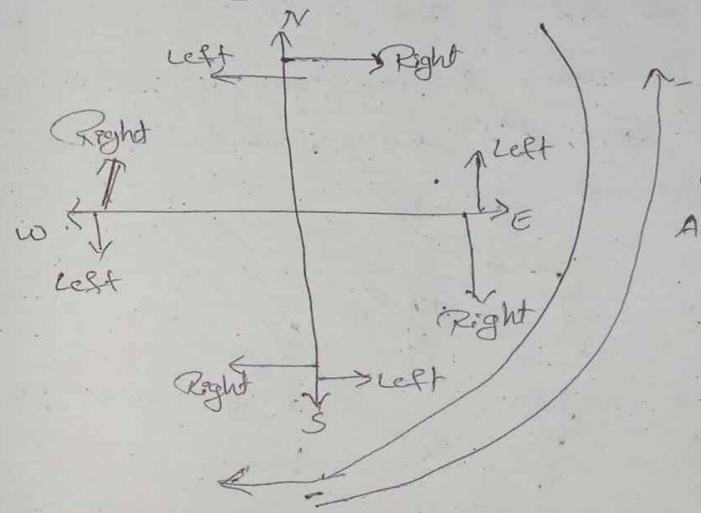
conclusion

i) Some girls are cons (✓)
ii) all cons are girls (x)

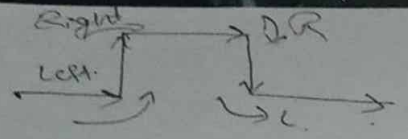
Direction Sense

9/04/2021

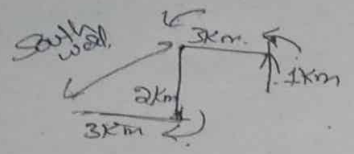




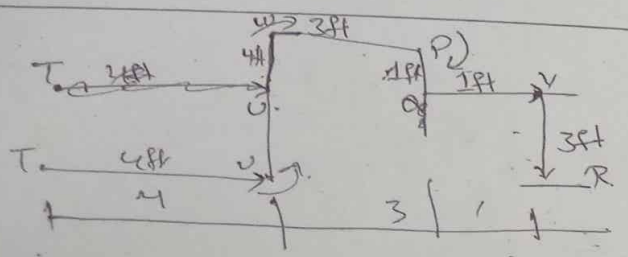
Clockwise = Right
Anticlockwise = Left



Q) walk 1km towards north to meet shikha
both take a left turn & walk 3km for lunch
they take left turn & walk 2km & eat ice
& get right turn & walk 3km.

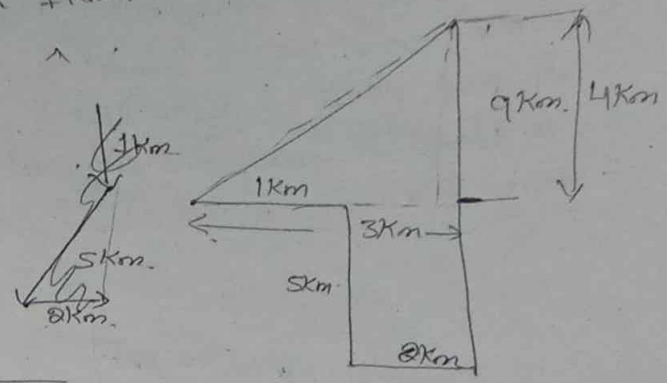


Q) Pooja starts at Point T.
walks straight to Point U which is 4ft away.
She turns left at 90° & walks to W.
which is 4 ft away, turns 90° right & goes 3ft
to P, turns 90° right & walks 1ft to Q,
turns left at 90°, & goes to V.
which is 1ft away & once again turns 90° right
& goes to R. 3ft away. what is the
distance b/n T and R



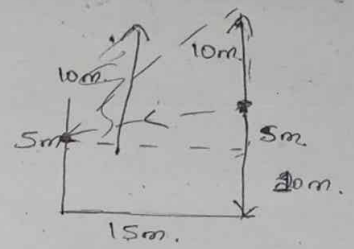
8ft

Q) A man walk 1km.



$h = \sqrt{4^2+3^2} = \sqrt{25} = 5km.$

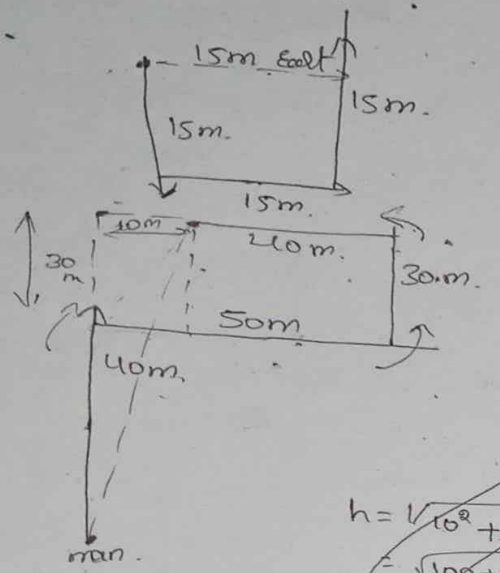
Q)



How far is he with respect to his starting point?

$h = \sqrt{15^2+5^2}$
$= \sqrt{225+25} = \sqrt{250}$
$= \sqrt{5 \times 5 \times 10}$
$= 5\sqrt{10}$ m Southwest.

Q) steate walking toward South, After walking 15m, he turns to his left & walks 15m. He again turns to his left & walks 15m.
How far is he from his original position & in which direction



Q)

$h = \sqrt{10^2 + 30^2}$

$= \sqrt{100 + 900}$

$= \sqrt{1000}$

$=$

$1600 + 400$

$40 + 20^2$

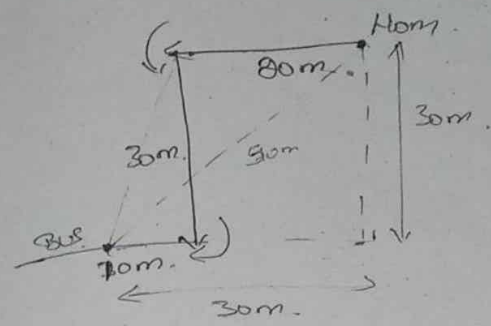
$= 40\sqrt{2}$

$h = \sqrt{70^2 + 10^2}$

$= \sqrt{5000}$

$= \sqrt{50 \times 50 \times 2}$ $= 50\sqrt{2}$ m

Q)



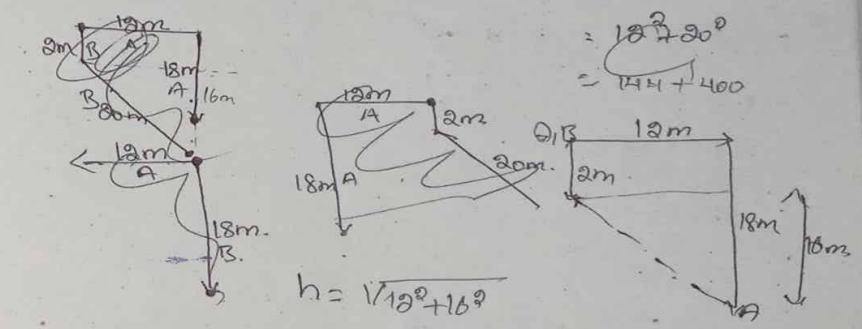
$h = \sqrt{30^2 + 30^2}$

$= \sqrt{900 + 900}$

$= \sqrt{1800}$

$= \sqrt{30 \times 30^2 \times 2}$ $= 30\sqrt{2}$ m

Q? A & B steate walking from a point. 'A' goes 12m east/west and 18m South and stops. 'B' goes 8m South and 8m South east and stops. what is diffance b/n A & B.



$= 12^2 + 20^2$

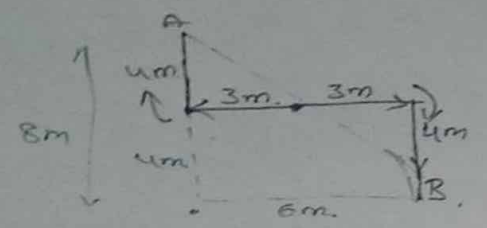
$= 144 + 400$

$h = \sqrt{12^2 + 16^2}$

$= \sqrt{144 + 256}$

$= \sqrt{400}$ $= 20$ km

Q)



$= \sqrt{8^2+6^2}$

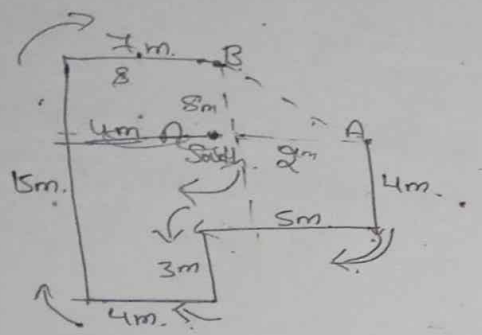
$= \sqrt{64+36}$

$= \sqrt{100}$

$= 10m.$

$\begin{array}{r} 64 \\ 36 \\ \hline 100 \end{array}$

6)



$= \sqrt{8^2+2^2}$

$= \sqrt{64+4}$

$= \sqrt{68}$

$= \sqrt{2\times2\times17}$

$= 2\sqrt{17}$

$\sqrt{8^2+4^2}$

$= \sqrt{64+16}$

$= \sqrt{80}$

$\begin{array}{r} 80 \\ 8 \end{array}$

Logarithms

$a^x = y$, $2^5 = 32$

$\log_a y = x$, $\log_2 32 = 5$

$\log_p q = r$

$p^r = q.$

* Find x.

$\log_3 x = 4.$

$3^4 = x$

$\boxed{x = 81}$

* Find x

$\log_6 216 = x.$

$6^x = 216 = 6^3$

$\boxed{x = 3}$

Q) a) $\log_9 \frac{1}{81} = ?$

$\log_9 \frac{1}{81} = x$

$9^x = \frac{1}{81}$

$9^x = (81)^{-1}$

$9^x = (9)^{-2}$

$\boxed{x = -2}$

b) $\log_{0.1} 0.00000001$

$= x$

$\log_{0.1} 0.00000001 = x$

$(0.1)^x = 0.00000001$

$\left(\frac{1}{10}\right)^x = \frac{1}{10000000}$

$\left(\frac{1}{10}\right)^x = \left(\frac{1}{10}\right)^8$

$\boxed{x = 8}$

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Properties

1) $\log_a 1 = 0$

Verify :- $\log_a 1 = x$

$a^x = 1 = a^0$

$\boxed{x = 0}$

2) $\log_a a = 1$

Verify :- $\log_a a = x$

$a^x = a^1$

$\boxed{x = 1}$

3) $\log_a x^n = n \log_a x$

Verify eg :-

$\log_4 3^8 = 8 \log_4 3$

4) $\log_{a^n} x = \frac{1}{n} \log_a x$

Eg :- $\log_{3^4} 8 = \frac{1}{4} \log_3 8$

5) $\log m + \log N + \log P = \log (m \times N \times P)$

Eg :- $\log 3 + \log 6 + \log 5 = \log (3 \times 6 \times 5)$

$= \log 90$

6) $\log m - \log N + \log K - \log P = \log \left(\frac{m \times K}{N \times P}\right)$

Eg :- $\log 180 - \log 6 + \log 8 - \log 2 = \log \left(\frac{\overset{\log 6}{\cancel{180}} \times 8}{\cancel{6} \times \cancel{2}}\right)$

$= \log 80$

7) $\log_b a = \frac{\log a}{\log b}$

Eg :- $\log_{16} 12 = \frac{\log 12}{\log 16}$

8) $\frac{1}{\log_b a} = \log_a b$

Eg :- $\frac{1}{\log_5 3} = \log_3 5$

1) $\log_{23}(22) * \log_{24}(23) * \log_{25}(24) * \log_{26}(25) * \ldots * \log_{40}(39)$

$\Rightarrow \log_{23}$

$$\frac{\log 22}{\log 23} * \frac{\log 23}{\log 24} * \frac{\log 24}{\log 25} * \frac{\log 25}{\log 26} * \ldots * \frac{\log 39}{\log 40}$$

$$= \frac{\log 22}{\log 26} * \frac{\log 39}{\log 40}$$

Ans $= \log_{40}(22)$

---

2) Which statement is correct

a) $\log_{10} 10 = 1$

b) $\log_{10} 1 = 0$

c) $\log(2+3) = \log(2\times3)$

d) $\log(1+2+3) = \log 1 + \log 2 + \log 3$

(B) $\log(2+3) = \log(2\times3)$ ✗

$\log 2 + \log 3 = \log(2\times3)$ ✓

(D) $\log(1+2+3) = \log 1 + \log 2 + \log 3$

LHS $= \log 6 = \log(1\times2\times3) = \log 1 + \log 2 + \log 3 =$ RHS

---

3) $\log_3(15) + \log_3(81) - \log_3(5)$

$$\frac{\log 15}{\log 3} + \frac{\log 81}{\log 3} - \frac{\log 5}{\log 3}$$

$$= \frac{\log 15}{\log 3} + \frac{\log 81}{\log 5}$$

$\log_3(15) + \log_3(81) - \log_3(5) = x$

$\log_3\left(\frac{15\times81}{5}\right) = x$

$\log_3 243 = x$

$3^x = 243 = 3^5$

$\boxed{x = 5}$

4) $\log_6(216) + [\log(42) - \log(6)] / \log(49)$

$= \log_6 216 + \log \frac{42}{6} / 49$

$= \log_6 216 + \log\left(\frac{42}{6} \times 49\right)$

$= \log_6 216 + \log 361$

$= \frac{\log 216}{\log 6} + \log 361$

7×49
81
28
361

$= \log_6 6^3 + \frac{\log\left(\frac{42}{6}\right)}{\log 49}$

$= 3\log_6 6 + \frac{\log 7}{\log 49}$

$= 3(1) + \log_{7^2} 7$

$= 3 + \frac{1}{2}\log_7 7$

$= 3 + \frac{1}{2}(1)$

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

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

a) Solve $\log_2(x) + \log_2(x-2) = 3$

$\log_2(x) + \log_2 x -$

$\log_2(x) + \log_2 x - \log_2 2 = 3$

$\log \log_2 x + \log_2(x-2) = 3$

$\log_2[x(x-2)] = 3$

$\log_2[x^2 - 2x] = 3$

$2^3 = x^2 - 2x$

$x^2 - 2x - 8 = 0$

$x^2 - 4x + 2x = 0$

$x(x-4) + 2(x-4) = 0$

$x = 4, -2$

b) If $\log_{10}5 + \log_{10}(5x+1) = \log_{10}(x+5) + 1$, Find x

$\log_{10}5 + \log_{10}(5x+1) - \log_{10}(x+5) = 1$

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

$\cancel{\log_{10}\left(\frac{25x+5}{x-5}\right) = 1}$

$\cancel{\log_{10}(25-1) = 1}$

$\cancel{\log_{10} 24 = 1}$

$10^1 = \frac{25x+5}{x+5}$

$10x + 50 = 25x + 5$

$15x = 45$

$\boxed{x = 3}$

c) $\frac{1}{\log_3 60} + \frac{1}{\log_4 60} + \frac{1}{\log_5 60}$

$\frac{\log 3}{\log 60} + \frac{\log 4}{\log 60} + \frac{\log 5}{\log 60}$

$= \log_{60} 3 + \log_{60} 4 + \log_{60} 5$

$= \log_{60}(3 \times 4 \times 5)$

$= \log_{60} 60 = 1$

d) $\log_2(\log_2(x)) = 1$

$\log_2(x) = 1$

$2^1 = x$

$2^1 = \log_2(x)$

$x = 2^2 = 4$

$\log_2(x) =$

e) $\log_4(\log_2(\log_3(2x-1))) = \frac{1}{2}$, find x

$\log_4(2x-1)$

$4^{\frac{1}{2}} = \log_2 \log_3(2x-1)$

$2 = \log_2 \log_3(2x-1)$

$2^{1/2} = \log_3(2x-1)$

$4 = \log_3(2x-1)$

$3^4 = 2x - 1$

$2x = 3^4 + 1 = 82$

$\boxed{x = 41}$

Partnership

Started A	Started B	Joined after 4 month, C
40,000	30,000	50,000

Ratio of Investment $40000 \times \frac{12}{3} : 30000 \times \frac{12}{3} : 50,000 \times \frac{8}{8}$

12 : 9 : 10.

Profit of A $= \frac{12}{31} \times 62000 = 24000$

— " — B $= \frac{9}{31} \times 62000 = 18000$

— " — C $= \frac{10}{31} \times 62000 = 20,000.$

If year profit 62,000, then what will be share of A, B & C ?

Ratio of profit

A : B : C

~~24 each~~ ct

24000 : 18000 : 20000

12 : 9 : 10

Ratio of Investment = Ratio of Profit

Q) Alfred started a business investing Rs 45000 after 3 months Peter joined him with a capital of Rs 60,000. After another 6 months, Ronald joined them with a capital of Rs 90,000. At the end of the year, they made a profit of 16,5000. The share of Peter is

	Started	Joined after 3 mon	Join after 6 mon
	A	P	R
	45,000	60,000	90,000.
Ratio of Inv	$45,000 \times 12$	$60,000 \times 9$	$90,000 \times 3$
	2 :	2 :	1

Peter $= \frac{2}{5} \times 165000 = 6600$

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3) A, B and C started a business each investing Rs 20000. after 5 months 'A' withdrew Rs 5000, 'B' withdrew Rs 4000 & 'C' invest Rs 6000 more. At the end of the year, a total profit of Rs 69,900 was recorded. share of 'C' is

	A	B	C
Ratio of Investing →	$20,000 \times 5 + 15000 \times 7$	$20,000 \times 5 + 6000 \times 7$	$20000 \times 5 + 26000 \times 7$
	205000 :	212000 :	282000
	205 :	212 :	282

$C = \frac{282}{699} \times 69,900 = 28,200/-$

Q) 'A' began a business with Rs. 85,000. He was joined afterwards by 'B' with Rs. 42,500. For how much period does 'B' join, if the profits at the end of the year are divided in the ratio of 3:1?

A : B
3 : 1

	A		B
Ratio of Investment	85000×12	:	$42500 \times x$
	24	:	x

no. of months for which he was in business

Ratio of Investment = Ratio of profit

$$\frac{24}{x} = \frac{3}{1}$$

$$\frac{8}{x} = 1$$

$$\boxed{x = 8} \text{ months.}$$

'B' is on 8 months duration.

Q)

	A		B
	70000×12	:	$60,000 \times x$
	14	:	x

Ratio of Investment = Ratio of profit

$$\frac{14}{x} = \frac{2}{1}$$

$$\boxed{x = 7 \text{ months.}}$$

B joined after 5 months

Q)

	A		B
	30000×12	:	$x \times 9$
Ratio of Investment	3140000	:	$x \times 7$
	36000	:	x

let total profit $= x$

profit of A $= \frac{3}{5}x$

profit of B $= \frac{2}{5}x$

Ratio of profit

A : B

$$\frac{3x}{5} : \frac{2x}{5}$$

$$\boxed{3 : 2}$$

$$\frac{3,60000}{x} = \frac{3}{2}$$

$$\boxed{x = 2,40,000}$$

Q) A & B invest in a business in the ratio 3:2. If 5% of the total profit goes to charity & A's share is Rs. 855, the total profit is

	A		B
Ratio of Investment	3	:	2.

Total Profit is 5%. goes to charity
A's share is Rs. 855.

A : B
855×12.

Total profit

100

5% → 5 Rs

95% → 95 Rs

Let total profit $= x$

$\frac{5x}{100}$ charity

$\frac{95x}{100}$ Remaining profit

Profit of A = 855

$\frac{3}{5} \times \frac{95x}{100} = 855$

$x = 1500$

Calendar :

1) odd days :-

when given no of days, is divided by 7, then its remainder is called odd-days

eg:-

18 days = 7 + 7 + 4 - days

$7 \overline{)18}$ → 2
14
4 → days

30 days = 2 odd days
50 days = 1 odd days
100 days = 2 odd days.

Range :- 0 → Sunday, 1 → monday, 2 → Tues, 3 → wed, 4 → Thur, 5 → Fri, 6 → Satur

* Day of any given Date
* Day after n no of days
* same calendar year
* mis

2) Number of ~~odd~~ all days in the leap year is

$7 \overline{)366}$ → 52
35
15
14
02

= 2 odd days

3) no of odd days no leap year

$$7 \overline{)365} = 52$$
$$35$$
$$15$$
$$14$$
$$1$$

1 odd day

4) Century years are leap years, if they are divided by 400 years and no of odd days after Century years is always 0.

Eg:-

400y, 800, 1200, 1600, 2000, 2400 years etc

No of odd days in

100 years = 5 odd days.

200 years = 3 odd days

300 years = 1 odd days

$5 \times 2 = 10$ $\frac{10}{7} = 3$

$5 \times 3 = 15$ $\frac{15}{7} = 1$

400 years = 0 odd days.

500 years = (400 + 100) = 5 odd days
0 + 5

1800 years = (1500 + 300) = 3 odd days
0 + 3

1900 years = (1600 + 300) = 1 odd days
0 + 1

5) No of odd days in a group of years

95 years = L.y + NLy
= (23×2) + (72×1)
= 46 + 72
= 118 days ÷ 7
= 6 odd days

$$4 \overline{)95} = 23$$
$$8$$
$$15$$
$$12$$
$$3$$

$$95 - 23 = 72$$

75 years = L.y + NLy
= (18×2) + (57×1)
= 36 + 57
= 93 days ÷ 7
= 2 odd days

$$4 \overline{)75} = 18$$
$$35$$
$$32$$
$$3$$

$$7 \overline{)93} = 13$$
$$7$$
$$23$$
$$21$$
$$2$$

$$75 + 18 = 57$$
$$36 + 57 = 93$$

100 years = L.y + NLy
= (25×2) + (75×1)
= 50 + 75
= 125 days ÷ 7
= 5 odd days

$$4 \overline{)100} = 25$$
$$8$$
$$20$$
$$20$$
$$00$$

$$125 + 75 = 200$$

$$7 \overline{)125} = 17$$
$$7$$
$$55$$
$$49$$
$$06$$

= (24×2) + (76×1)
= 48 + 76
= 124 ÷ 7
= 5 odd day

- No of leap years

100 years = 24 years

(24) (200 years) = 48 years

(24) (300 years) = 72 years

(24) (400 years) = 97 years.

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Number System

) Number of zeroes followed in factorial of a number :- [Imp]

Eg. $6! = 720$

$7! = 5040$

Concept

$20 \times 16 \times 35 \times 250 \times 40 \times 24$

$\Rightarrow 2^2 \times 5^1 \times 2^4 \times 5 \times 7 \times 5^3 \times 2 \times 2^3 \times 5 \times 2^3 \times 3$

$\Rightarrow 2^{13} \times 5^6 \times 3^1 \times 7^1$

$(2^6 \times 5^6) \times 2^7 \times 3^1 \times 7^1$

6 zeroes

2×5

10 → 1 zero.

combination of 2 & 5 is 1 zero.

Q) 10!

$1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10$

$2^n = 2^8$

$5^n = 5^2$

2 Pairs

2 zeroes.

a) $\boxed{\text{No of zeroes} = \text{No of 5's} = \frac{n}{5} + \frac{n}{5^2} + \frac{n}{5^3} + \dots}$

No of zeroes (100!) $= \frac{100}{5} + \frac{100}{25}$

$= 20 + 4$

$\boxed{= 24 \text{ zeroes}}$

Manually

5, 10, 15, 20, 25, 30, 35, 40, 45, 50
55, 60, 65, 70, 75, 80, 85, 90, 95, 100.

b) $40! = \frac{40}{5} + \frac{40}{25}$

$= 8 + 1$

$= 9$ zeroes

25)40(1
25
15

Find

a) 150!

$= \frac{150}{5} + \frac{150}{25} + \frac{150}{125}$

$= 30 + 6 + 1 \quad = 37$ zeroes

c) 60! + 80!

$= \frac{60}{5} + \frac{60}{25} + \frac{80}{5} + \frac{80}{25}$

$= 12 + 2 + 16 + 3$

$= 33$ zeroes

5)60(12
5
10
10
00

5)80(16
5
30
30

Small no taken

Eg
10 + 10
= 1 zero
1 zero
= 1 zero

d) 60! × 80!

$\frac{60}{5} + \frac{60}{25} + \frac{80}{5} + \frac{80}{25}$

$= (12+2) \times (16+3)$

$= 14 \times 19$ 33 zeroes

multiple

zeroes will added.

100 × 100

2 zero + 2 zero

4 zero

* Highest Power of a number in factorial

10! = 1×2×3×4×5×6×7×8×9×10

$8^n = 2^5$

$5^n = 5^2$

In 100! what is Highest Power of a
a) 2, 4, 8, 3, 9, 6, 7, 21

a) 2

No of 2's $= \frac{100}{2} + \frac{100}{4} + \frac{100}{8} + \frac{100}{16} + \frac{100}{32} + \frac{100}{64}$

$= 50 + 25 + 12 + 6 + 3 + 1 = 97$

$2^n = 2^{97}$

b) $\cancel{48 = \frac{100}{4} + 10 + 6}$

$4^n = 4^{\frac{97}{2}} = 4^{48}$

c) $8^n = 2^{\frac{97}{3}} = 32$

d) $9 = 3^2$ $\quad 3^n = \frac{100}{3} + \frac{100}{9} + \frac{100}{27} + \frac{100}{81}$

$= 33 + 11 + 3 + 1$

$= 48$

$3^n = 3^{48}$

$\frac{33}{2}$

(e) $9^n = 9^{\frac{48}{2}} = 9^{24}$

$\because 6 = 2 \times 3$

(f) $6^n = 6^{48}$

(g) no of 7

$= \frac{100}{7} + \frac{100}{49}$

$= 14 + 2 = 16$

$7^n = 7^{16}$

(h) 21^n

$21^n = 21^{16}$

Remainder Theorem [Imp]

i) $\frac{(16)^{42}}{7}$

Remainder =

Too method

$\frac{12 \times 9}{7} = \frac{108}{7} = 3$

$\frac{12 \times 9}{7}$

$= \frac{5 \times 2}{7} = \frac{10}{7} = 3$

Remender

i) $\frac{40 \times 38 \times 58 \times 100}{7}$

$= \frac{5 \times 3 \times 2 \times 2}{7} = \frac{60}{7}$: Rem 4

ii) $\frac{40 + 38 + 58 + 100}{7} = \frac{5 + 3 + 2 + 2}{7} = \frac{12}{7}$ = Rem 5

iii) $\frac{35 \times 60 + 52}{7} = \frac{0 \times 4 + 3}{7} = 3$ Rem 3

i) $\frac{(16)^{42}}{7}$

$\frac{16 \times 42}{7} = 0$

$\frac{(2)^{42}}{7}$

$= \frac{(2)^{3 \times 14}}{7}$

$= \frac{(2^3)^{14}}{7}$

$= \frac{(8)^{14}}{7}$

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

Rem = 1

ii) $\frac{(16)^{43}}{7}$

$= \frac{(2)^{43}}{7} = \frac{(2)^{3 \times 14 + 1}}{7}$

$= \frac{(2^3)^{14} \times 2}{7}$

$= \frac{(8)^{14} \times 2}{7} = \frac{(1)^{14} \times 2}{7} = \frac{1 \times 2}{7}$

$= \frac{2}{7} =$ Rem 2

7) 42 (6
49
00

$\frac{16}{7} = 2$

Points Rem = 1

$\frac{(15)^5}{7}$: Rem = 1

$\frac{(29)^{150}}{7} = \frac{1}{7}$: Rem = 1

$\frac{(35)^{50}}{17}$: Rem = 1

(c) $\frac{(16)^{44}}{7}$

$= \frac{(2)^{44}}{7}$

$= \frac{(2^3)^{14+2}}{7}$

$= \frac{(8)^{14} \times 2^2}{7}$

$= \frac{1^{14} \times 4}{7}$

$= \frac{1 \times 4}{7} = \underline{\underline{4}}$

(d) $\frac{(30)^{35}}{7}$

$= \frac{(2)^{35}}{7}$

$= \frac{(2)^{3\times11+2}}{7}$

$= \frac{(2^3)^{11} \times 2^2}{7}$

$= \frac{(8)^{11} \times 4}{7}$

$= \frac{1^{11} \times 4}{7} = \frac{1\times4}{7}$

$= \frac{4}{7} = \text{Rem } \underline{\underline{4}}$

(e) $\frac{(38)^{67}}{7}$

$= \frac{(3)^{67}}{7}$ $\quad 67 = 2\times33+1$

$= \frac{(9)^{33} \times 3}{7}$

$= \frac{(2)^{3\times11} \times 3}{7}$

$= \frac{(8)^{11} \times 3}{7}$

$= \frac{1^{11} \times 3}{7}$

$= \frac{3}{7} = \text{Rem } \underline{\underline{3}}$

(f) $\frac{(38)^{66}}{7}$

$\frac{(3)^{66}}{7}$

$= \frac{(3)^{33\times2}}{7}$

$\frac{(3^2)^{33}}{7}$

$= \frac{(9)^{33}}{7}$

$= \frac{(2)^{33}}{7} = \frac{(2)^{3\times11}}{7}$

$= \frac{(2^3)^{11}}{7}$

$= \frac{(8)^{11}}{7} = \frac{(1)^{11}}{7} = \underline{\underline{1 \text{ Rem}}}$

* -ve Remainder theorem

(a) $\frac{-27}{5} = \underline{\underline{3}}$

$$\begin{array}{r|l} & -6 \\ 5 & -27 \\ & -30 \\ \hline & \underline{\underline{3}} \end{array}$$

- $\frac{-1}{8} = 7$
- $\frac{-1}{12} = 11$
- $\frac{-30}{12} = 6$
- $\frac{-50}{15} = 10$
- $\frac{6\times6\times6}{7} = \frac{216}{7} = \text{Rem } \underline{\underline{6}}$
- $\frac{(35)^{47}}{18} = \frac{(-1)^{47}}{18} = \frac{-1}{18} = \text{Rem } \underline{\underline{17}}$