Peco

Percentages -

1 - 100 %.	1/6 - 16.66 %.	1/11 - 9.09 %	1/16 - 6.25 %
1/2 - 50 %.	1/7 - 14.28 %.	1/12 - 8.33 %	1/17 - 5.85 %.
1/3 - 33.33 %.	1/8 - 12.50 %.	1/13 - 7.69 %.	1/18 - 5.5 %.
1/4 - 25 %.	1/9 - 11.11 %.	1/14 - 7.14 %.	1/19 - 5.26 %.
1/5 - 20 %.	1/10 - 10 %.	1/15 - 6.66 %.	1/20 - 5 %.

- If A is 1/n more than B then B is 1/n+1 less than A.

ex.

A = 150 — A is 1/2 greater than B.

B = 100 — B is 1/3 less than A.

- IF A is m/n more than B then B is m/(m+n) less than A.

ex.

$\frac{+40}{100}$ ↑ A = 140 ↓ $\frac{-40}{140}$

B = 100

- Price of a chocolate increases by 10% due to which now I am able to purchase 4 chocolate less for Rs. 100 Find increased price of each chocolate.

→

100 — x

1 chocolate → $\frac{100}{x}$

new chocolate

100 — x-4

new price = $\frac{100}{x-4}$

$\frac{100}{x-4} = \frac{100}{x} \times \frac{110}{100}$ ($\because$ old price × 110% = new price)

$100x = 110x - 440$

$440 = 10x$

$x = 44$

new price = $\frac{100}{44-4} = \frac{100}{40} = \frac{5}{2} = 2.5$ RS.

By traveling 20% faster than the usual speed a man reaches his office 10 min earlier then the scheduled time by how many min. he would be delayed if he reduces the speed by 25%.

→

speed × time = Distance → const.

$\uparrow s \rightarrow \frac{1}{s}$ ∴ time $\downarrow \frac{1}{s}$

$\frac{1}{6} \times$ time = 10

time = 60

$\frac{1}{4} \downarrow s$ ∴ time $\uparrow \frac{1}{3}$

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

∴ 20 mins delay

- Price of article increases by 20%. by what %.tage consumption should change if expend. increases by 10%.

→

expenditure = P x C

P	C	E
10	10	100
12	x	110

$\therefore x = \frac{110}{12} = 9.1$

$\therefore$ 9%. less $\frac{9}{10}$

- The H and B of a triangle are such that even though B is decreased by 10% area still increases by 10%. Find %. increase in H.

→

$+10\% \rightarrow 1 + \frac{1}{10} = \frac{11}{10}$

$-10\% \rightarrow 1 - \frac{1}{10} = \frac{9}{10}$

Area original $\times \frac{11}{10}$ = new Area

$\frac{1}{2} \times B \times H \times \frac{11}{10} = \frac{1}{2} \times B \times \frac{9}{10} \times H'$

$\frac{H \times 11}{9} = H'$

$\frac{H'}{H} = \frac{11}{9}$ $\therefore$ 22.2% increase.

- when prices of milk went up by 18.18%. the consumption was decreased by 8.33%. by what % expenditure of the family changes.

→

$$P \times C = E$$

$$\frac{2}{11} \uparrow p \quad C \downarrow \frac{2}{13}$$

$$\frac{13}{11} \times \frac{11}{12} = \frac{\text{new } E}{E}$$

$$\frac{13}{12} = \frac{\text{new } E}{E}$$

$\therefore$ increase is $\frac{1}{12} \longrightarrow 8.33\% \uparrow$

- successive percentage changes.

- The population of the city increases by 25%., 18.18%., 10%. in 3 consecutive years and decreased by 9.09% in 4th year the population after 4 years was 65 lacks Find the original population.

→

initial population = x

$$x \times \frac{5}{4} \times \frac{13}{11} \times \frac{11}{10} \times \frac{10}{11} = 65$$

$\therefore x = 44$ lakh.

• Population of city change by +12.5 %, -12.5 %, + 6.6% in 3 years find total % change in 3 years

→

$$x \times \frac{9}{8} \times \frac{7}{8} \times \frac{16}{15} = x'$$

$$\frac{x'}{x} = \frac{9}{8} \times \frac{7}{8} \times \frac{16}{15}$$

$$= \frac{63}{60}$$

$$= \frac{21}{20} = \frac{1}{20} \uparrow$$

∴ 5% increase.

• Fresh greps contains 90% water and dry contains 85% matter. How many kg of fresh greps are to be processed in order to obtain 25 kg dry greps.

→

	water	matter
Fresh	90%.	10%.
Dry	15%.	85%.

matter is always constant

$$x \times 10\% = 25 \text{ kg} \times 85\%$$

$$x = \frac{25 \times 85}{10}$$

$$=$$

- a large watermelon whose weight is 20 kg with 96%. of weight is water. It is allowed to stand in sun for a while and some water evaporates. so that now only 95%. is water. Its reduced weight will be.

→

96%. 4%.

95%. 5%.

$20 \times 4 = x \times 5$

$x = 16$ kg

- M is equal to 30% of Q

Q = ~~30~~ 20%. P

N = 50%. P

Then $\frac{M}{N} = ?$

→

$M = \frac{Q \times 30}{100}$

$Q = \frac{20 \times P}{100}$

$N = \frac{50 \times P}{100}$

$\frac{Q}{N} = \frac{2}{5}$

$\frac{\frac{M}{1}}{\frac{2}{5}} = \frac{\frac{Q \times 30}{100}}{\frac{Q}{N}}$

$\frac{M \times 5}{2} = \frac{30}{100} \times N$

$\frac{M}{N} = \frac{60}{500} = \frac{6}{50} = \frac{3}{25}$

• A team won 80% of the games it played. It played 5 mode of which it won 3 and loss 2 Its loss % change to 25%. How many games did it play overall.

→

	won	loss
x	$\frac{4}{5}x$	$\frac{1}{5}x$
5	3	2

$(x+5)$ — $2+x$

100 — loss

$$\text{loss} = \frac{100 \times \frac{10+x}{5}}{x+5}$$

$$= \frac{x+10}{x+5} \times 20$$

$$25 = \frac{x+10}{x+5} \times 20$$

$$25x + 125 = 20x + 200$$

$$5x = 75$$

$$x = 15$$

loss = $\frac{25}{100}$

. Income of A is 50% more than B. expend. of B is equal to savings of A and savings of A is 3 times of B. What % of his income does A save.

→

let B income is 100

∴ A income = 150

A saving = x

∴ B expend. = x

∴ B saving = $100 - x$

$(100-x) \times 3 = x$

∴ $x = 75$

∴ $\frac{SA}{IA} = \frac{75}{150} = \frac{1}{2}$

• Income of A is 50% more than B. expend. of B is equal to savings of A and savings of A is 3 times of B. What %. of his income does A save.

→

let B income is 100

∴ A income = 150

A saving = x

∴ B expend. = x

∴ B saving = 100 - x

$(100-x) \times 3 = x$

$\therefore x = 75$

$\therefore \frac{SA}{IA} = \frac{75}{150} = \frac{1}{2}$

• Speed distance time.

1) Distance between A and B is 60 km. It goes with speed of 30 km/hr and reach B.

2) ~~$50 = \frac{2 \times 75 \times y}{75 + y}$~~

~~$\therefore 75 + y = 3y$~~

~~$2y = 75$~~

~~$y =$~~

$50 = \frac{2 \times 30 \times y}{30 + y}$

$50 \times (30 + y) = 60y$

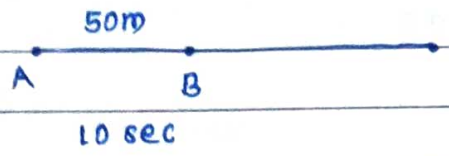
$150 + 5y = 6y$

$y = 150$ km/hr

• average speed $= \frac{2xy}{x+y}$

where x and y are speed of going and comming back from destination.

3)



speed of B $= \frac{50\text{ m}}{10\text{ sec}} = 5\text{ m/sec}$

time taken by B $= \frac{1000}{5} = 200$ sec.

4)

Distance is constant

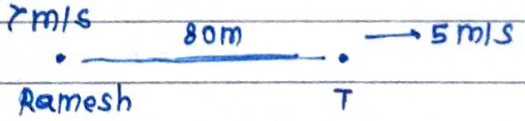
$\therefore x \times t = \frac{x \times 9}{5}(t-30)$

$\therefore 5t = 9t - 270$

$\therefore 4t = 270$

$\therefore t = \frac{270}{4} = 67.5$ mins.

5)



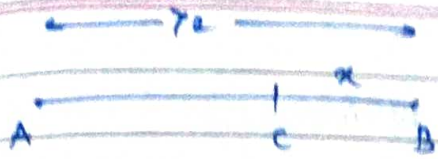
$\frac{(80+D)}{7} = \frac{D}{5}$

$400 + 5D = 7D$

$2D = 400$

$D = 200\text{ m}$

6)



time const.

$$\frac{72-x}{17} = \frac{72+x}{13}$$

$\therefore 13 \times 72 - 13x = 17 \times 72 + 17x$

$\therefore 36x = 2 \times 72$

$\therefore x = 4$ km

7) Dist. const.

$50 \times (t+30) = 60 \times (t-10)$

$5t + 150 = 6t - 60$

~~$t = 90$ mins~~. $t = 210$ mins.

~~1.5 hr~~ ~~$50 \times (2) = 100$ km~~

~~$\frac{25}{50} \times (230 \text{ mins})$~~ $\frac{50 \times 240}{60} = 200$ km

~~$\frac{25 \times 23}{3}$~~

8) $30(t+20) = 45(t+8)$

$2t + 40 = 3t + 24$

$t = 16$

$\frac{45 \times 24}{60} = 3 \times 6 = 18$ km

D =

9) $t_2 = \frac{100}{S_B} = \frac{90}{S_C}$ $\quad S_B = \frac{100 \times S_C}{80}$

$t_1 = \frac{100}{S_A} = \frac{80}{S_B} = \frac{100}{S_A} = \frac{80 \times 80}{100 \times S_C} = \frac{64}{S_C}$

$\therefore$ C will travel 64 m

$\therefore$ ans = 36 m.

- opposite direction = $x+y$
  same direction = $x-y$.

- Train -

1) $D = S \times P = 60 \text{ km/hr} \times 9 \text{ sec}$

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

$= 150 \text{ m}$

2) $D = S \times t$

$125 = (x-5) \times 10$

$\frac{125}{10} = x-5 \times \frac{5}{18}$

$\frac{125 \times 18}{10 \times 5} = x-5$

$5 \times 9 = x-5$

$x = 50 \text{ m/sec}$

3) $D = (130+d) = \frac{45 \times 5}{18_3} \times 30^{15} 5$

$130+d = 15 \times 5 \times 5 = 75 \times 5 = 375$

$d = 375 - 130$

$d = 245 \text{ m}$

4) $D = \frac{54 \times 5}{18} \times 20 = 3 \times 5 \times 20 = 300\ m$

$(300 + D) = 15 \times 36$

$300 + D = 540$

$D = 540 - 300 = 240\ m.$

5) $2x = \frac{10 \times 5}{18} \times 36$

$x = 25 \times 2 = 50\ m$

Date __/__/____

Saathi

Time and Work

- Units of Work.
- Work equivalence:
- Pipes and systems.

1) A and B → 12 day B and C can finish in 16 days A and B started without C.
   i) A leaves after 5 days
   ii) C works for 13 days
   iii) B leaves after 7 days
   In how many days can C finish work alone?

→

A + B = 12
B + C = 16
→ consider LCM → 48 units of work

work done A and B in 12 days is 48 units
∴ work done in one day is 4 units

∴ similar for B and C one day work is 3 units.

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Saathi

2) A, B and C can finish a work in 15 days. All started but A leaves after 5 days. B and C completes the remaining work in 20 days. How many days A will take to complete entire work.

→

Total work is 15 units

work done in one day by all is 1 unit

work done by all in 5 days is 5 units.

∴ Remaining work = 15-5 = 10

10 ⟶ B+C in 20 days

∴ in one day 1/2 units

∴ work done by A is one day = 1 - 1/2 = 1/2

∴ A will take 30 days.

3) A, B, C can do work in 6, 7, 14 hrs working alone all started together at 9 am. A leaves after 2hrs. B leaves 20 mins before the completion. what time the work compleated.

→

42 units of total work

by A in one hr ⟶ 7

B in one hr ⟶ 6

C in one hr ⟶ 3

∴ For 1st 2hrs ⟶ 14 + 12 + 6 = 32

∴ remaining 10 units.

$$\therefore \quad t \times 6 + t \times 3 + \frac{1}{3} \times 3 = 10$$

$$\therefore \quad 9t = 9$$

$$t = 1$$

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Saathi

∴ 9 am + 2 hr + 1 hr + 20 mins
= 12 : 20 pm.

application base question -

1) A can build a wall in 50 days. B can break it in 60 days. They work on alternate days starting with A, in how many days the wall is completely build.

→

300 units of work
∴ A 1 day work = 6 unit
∴ For B = 5 unit

∴ $(x+1) \times 6 + x \times (-5) = 300$
∴ $6x + 6 - 5x = 300$
∴ $x = 294$
∴ total days = 294 + 295 = 589 days.

⇒

- Efficiency $\propto \frac{1}{\text{time}}$

2) A does half as much work as B and C does half as A and B together. C alone finish in 40 days. Find time by all together to finish the work.

→

C → 40 day
A + B → 20 days

A : B
1 : 2

C : A + B
1.5 : 3

∴ total work = 40 × 1.5 = 60 units.
∴ For all work done in 1 day = 1 + 2 + 1.5 = 4.5
∴ Days = 60/4.5 = 13.33 days

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Saathi

Que. 1) A can do 50% more work than B in the same time. B alone can do in 30 hr. B started and has already worked for 12hr when A joins him. How much time they should work together to complete remaining.

→

A : B

3 : 2

∴ units = 30 × 2 = 60

work by B in 12 hr = 24 units

∴ remaining = 36

∴ For both = $\frac{36}{5}$ = 7.2 hr

Que. 2) A, B, C can type 900 pages in 20 days working for 8 hr a day. In a day B types as many pages more than A and C types as many pages more than B. Page typed by A in 4 hr = C in 1 hr. How many page C type each hr.

→

900 page → 20 day

1 day → 45 pages by A, B, C

1 : 4 → pages by A and C in 1 hr.

1 : 2.5 : 4

$x + 2.5x + 4x = 45$

$2x + 5x + 8x = 90$

$15x = 90$

$x = 6$

$\therefore 4x = 24$

~~∴ work do~~ ∴ C do 24 pages in 8 hr.

∴ 3 pages 1 hr.

Date __/__/____

Saathi

- work equivalence ⟶

Que. A and B completed the work in 5 days. Had A worked at twice the speed of B and B as half of A. The work would completed in 4 day. how much time it take for A done to complete work.

⟶

~~2 : 1 - work done by A - B~~

~~2+1 = 3 done per day~~

~~∴ total work = 12 units~~

A + B ⟶ 5 days
2B + A/2 ⟶ 4 days
] ⟶ 20 units

A and B First case ⟶ 4 units per day
for 2nd case ⟶ 5 units per day

$A+B = 4 \quad -①$

$\frac{4B+A}{2} = 5$

$4B+A = 10$

$4B = (4-A) \times 4$ ⟶ From ①

$16 - 4A + A = 10$

$3A = 6$

$A = 2$

∴ 10 days for A.

Date __/__/____

Saathi

work equivalence -

$$\frac{m_1 d_1}{w_1} = \frac{m_2 d_2}{w_2}$$

Que. 1) Certain number of men can finish the work in 36 days. If 2 more men are added it will take 16.66 % less time. How many men are required to finish work in 20 days.

→

$$\frac{m_1 \times 36}{w_1} = \frac{(m_1+2) \times \left(36 - \frac{36 \times 1}{6}\right)}{w_2}$$

$$\frac{36 \times m_1}{w_1} = \frac{(m_1+2) \times 30}{w_2}$$

$$6 m_1 = 5 m_1 + 10$$

$$m_1 = 10$$

$$\frac{10 \times 36}{w_1} = \frac{20 \times m_2}{w_1}$$

$$m_2 = 18 \text{ mens}$$

Que. 2) 20 men can finish the work in 23 days working together.

i) All started but 1 man leaves after every one day Find % of work completed when last man leaves. → 45%

→ ii) All started but 1 man joins after every day. How many days are required to finish work.

→

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Saathi

Total units → 23×20 = 460 units

for 1 men → 1 unit

∴ For 1st

$20 + 19 + 18 + 17 \ldots + 1 = \frac{n(n+1)}{2} = \frac{20(21)}{2} = 210$

460 — 210

100 — x

$\therefore x = \frac{100 \times 210}{460} = 45.6\%$

∴ For 2nd

$20 + 21 + 22. + \ldots + x. = 460$

$\therefore \frac{n}{2}[2 \times a + (n-1) \times d] = 460$

$\therefore n \times 2a + n^2 - dn = 920$

$\therefore n^2 + 40n - n = 920$

$\therefore n^2 + 39n - 920 = 0$

$\therefore n \simeq 17$ days $16 + \frac{5}{9}$ days.

Que.3) In garrison of 600 soldiers the food stock is sufficient for 24 days after 15 days 200 additional men arrived and the conssumption last for only 5 days. Find the % increase in consumption.

→

$600 \times 24 \times x = (x \times 600 \times 15) + (800 \times y \times 5)$

$24 \times 6 \times x = 15 \times 6 \times x + 40y$

$9 \times 6x = 40y$

$27x = 20y$

$\frac{x}{y} = \frac{20}{27}$

20 — 7

100 — x

$\frac{100 \times 7}{20} = 35\%$ ↑ increase

Date __/__/____

Saathi

Que. 4) 6 painters can paint 18 walls in 2 weeks How many wall of twice the area can 15 painters paint in 3 weeks.

→

$$\frac{6 \times 8 \times 2}{18 \times a} = \frac{15 \times 3}{a \times 2 \times x}$$

$$2x = 72$$

$$x = 36 \text{ walls}$$

Que. 5) 15 men or 24 women or 36 boys can do a work in 12 days working for 8 hr a day. How many men must be associated with 12 w and 6 b to do another work 9/4 x times big in 30 days working for 6 hr a day.

→

$$15\,m = 24\,w = 36\,b$$

$$\therefore \frac{15 \times 12 \times 8}{1} = \frac{x \times 30 \times 6}{9/4}$$

$$3 \times 12 = 2x$$

$$x = 18 \div \quad ym + 12w + 6b$$

$$18 = ym + \frac{15}{2}m + \frac{15}{6}b$$

$$18 \times 12 = 12y + 15 + 15 \times 2$$

$$18 \times 4 = 4y + 5 + 5 \times 2$$

$$72 = 4y + 15$$

$$4y = 47$$

$$y = \frac{47}{4}$$

$$18 \times 6 = 6y + 45m + 15m$$

$$18 \times 2 = 2y + 15m + 5m$$

$$36 = 2y + 20$$

$$2y = 16$$

$$y = 8$$

∴ 8 men.

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Saathi

Que.6) The daily work of 2 men = 3 women = 4 youngsters
14 m , 12 w , 12 y can finish work in 24 days.
But it is required to be in 14 days and as an additional labour only men are reliable. How many of them are required.

→

$$\frac{\text{prev} \times 24}{w} = \frac{\text{curr} \times 14}{w}$$

$$(14m + 12w + 12y) \times 12 = ((14+x)m + 12w + 12y) \times 7$$

$$(14m + 8m + 6m) \times 12 = ((14+x)m + 8m + 6m) \times 7$$

$$28m \times 12 = ((14+x)m + 14m) \times 7$$

$$48 = 14 + x + 14$$

$$x = 20$$

∴ 20 mens are required.

Que.7) The no. of men, women, children working together are 18 together they earn 4000/- per day. Sum of the wages of all men, women and child are in ratio of 18 : 10 : 12
and individual wages are in 6:5:3 How much does a women earn in a day.

→ no. of men women children →

$$\frac{18}{6} : \frac{10}{5} : \frac{12}{3}$$

3 : 2 : 4

$3x + 2x + 4x = 18$

$\therefore x = 2$

∴ 6 men
4 women
8 children

$18y + 10y + 12y = 4000$

$40y = 4000$

$y = 100$

$\therefore 10y = 1000$

$\frac{1000}{4} = 250$ Rs

Page No.

u = boat speed
v = current speed
u+v = downstream
u-v = upstream

Date __/__/____ Boats and streams

Saathi

1) B ⟶ 13 km/hr ∴ speed in downstream = 17 km/hr
W ⟶ 4 km/hr ∴ time = $\frac{68}{17}$ = 4hr

2) u+v = 15 km/hr v = 2.5 km/hr
∴ u = 12.5 km/hr
∴ u-v = 10 km/hr ⟶ upstream speed

3) u = 9 kmph v = 1.5 kmph
For downstream speed = 10.5
time = $\frac{105}{10.5}$ = 10 hr
For upstream speed = 7.5
time = $\frac{105}{7.5} = \frac{1050}{75} = \frac{42}{3}$ = 14 hr
∴ total time = 10 + 14 = 24 hr.

4) u = 15 kmph

$$4+\frac{1}{2} = \frac{30}{x} + \frac{30}{y}$$

$$\frac{9}{2} = 30\left(\frac{x+y}{xy}\right)$$

$$9 = 60\left(\frac{(u+v)+(u-v)}{(u+v)(u-v)}\right)$$

$$9 = 60\left(\frac{15+15}{(15)^2 - v^2}\right)$$

$$9 \times (225 - v^2) = 60 \times 30$$

$$-v^2 = \frac{60 \times 30}{9} - 225 = \frac{1800 - 1575}{7}$$

$$v^2 = 25$$

$$v = 5 \text{ kmph}$$

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Saathi

5) Down stream speed = 8 kmph

upstream speed = 4 kmph

$(u+v) + (u-v) = 8+4$

$2u = 12$

$u = 6$ kmph $\quad \therefore v = 2$ kmph

6) $u = 15$ kmph $\quad v = 3$ kmph

downstream $= 18 \times \frac{5}{18}$ m/sec $= 5$ m/sec

$\therefore$ in 12 mins it will travel $= 5$ m/sec $\times 12 \times 60$ sec

$= 300 \times 12 = 3600$ m $= 3.6$ km

7) upstream time = t $\quad u = 10$ mph

$\therefore$ downstream time = $t - 1.5$ $\quad d = 36$ miles

$u+v = 10+v = \frac{36}{t-1.5}$

$10-v = \frac{36}{t}$

$20 = \frac{36}{t} + \frac{36}{t-\frac{3}{2}}$

$5\ 10 = 9\left[\frac{t-1.5+t}{t(t-3/2)}\right]$

$5 = 9\left[\frac{4t+3}{t(2t-3)}\right]$

$\therefore 10t^2 - 15 = 36t + 27$

$\therefore 10t^2 - 36t - 42 = 0$

$\therefore 5t^2 - 18t - 21 = 0$

$1.5 = 36\left[\frac{1}{10-v} - \frac{1}{10+v}\right]$

$1 = 24\left[\frac{10+v-10+v}{100-v^2}\right]$

$100 - v^2 = 24v \times 2$

$v^2 + 48v - 100 = 0$

$\therefore v = 2$ mph

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8) $u+v \longrightarrow 1\text{ hr}$ $\quad v = 3\text{ kmph}$

$u-v \longrightarrow 1.5\text{ hr}$

$d = (u+v) \times 1 = (u-v) \times 1.5$

$2u+2v = 3u-3v$

$u = 5v$

$u = 15\text{ kmph.}$

9) ~~$u = \frac{48}{14}$~~ $\quad$ ~~$u = \frac{48}{7}$~~ $=$

$u+v = \frac{4}{t}$

$u-v = \frac{3}{t}$

$\frac{u+v}{u-v} = \frac{4}{3}$

$3u+3v = 4u-4v$

$7v = u$

~~48~~ $\quad 14 = t_1 + t_2$

$14 = \frac{48}{u+v} + \frac{48}{u-v}$

$7(u^2-v^2) = 24(2u)$

$7u^2 - 7v^2 = 48u$

$7 \times 49v - 7v^2 = 48 \times 7v$

$v^2 = v$

$v = 0 \quad$ or $\quad v = 1$

$\therefore v = 1\text{ kmph}$

10)

Date ___/___/_____

10) $d_1 + d_2 = 300$

$30 \times t + 10 \times t = 300$

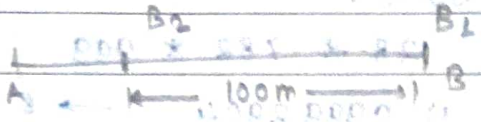
$4t = 30$

$t = \frac{15}{2} = 7.5$ hr

$d_1 = 30 \times \frac{15}{2} = 225$km

$d_1 = 300$ m

$\therefore t = \frac{200}{30} = 10$ hr



$\therefore d_2 = 10 \times 10 = 100$km

distance between them is 100 m

$\frac{d-100}{10} = \frac{d}{20}$

$2d - 200 = d$

$d = 200$km from B

$\therefore$ time = 10 hr

$\therefore$ total time = 20 hr → (10hr for B_1 to reach B and 10 hr for reach B_2)

Page No.

Date ___/___/_____ Digital Sum

Saathi

- Sum till we get single digit. ex. 1234 = 1+2+3+4 = 10 = 1+0 = 1

$9+x = x$ ex. $9+6 = 15 = 1+5 = 6$

$9 \times x = 9$ ex. $9 \times 7 = 63 = 6+3 = 9$

1) solve.

$128 * 782 * 999$

→ 1) 99992904 → 6 ×

2) 99999904 → 7 ×

3) 99994904 → 8 ×

4) 99995904 → 9 ✓

$1+2+8 = 11 = 2$

$7+2+8 = 17 = 8$

$9+9+9 = 27 = 9$

→ $16 \times 9 = 144 = 9$

2) $(88)^{\wedge}2$

→ 1) 7544 2) 7644 3) 7744 ✓ 4) 7844

88 × 88

$16 = 7 \times 7 = 49 = 4$

3) 73^2 ⟶ $(1)^2 = 1$

1) 5129 × (8) 2) 5229 × (9) 3) 5239 1 (✓) × 4) 5329 1 (✓) ✓

73 → 3 → 09

7 → 49

13 → 169

17 → 289

23 → 529

second last digit is always even if last is 9.

Date __/__/____

Saathi

4) $(24)^3$ —— $(\quad)^3 = 216 = 9$

→ 1) 13524 (6) 2) 13624 (7) 3) 13724 (8) 4) 13824 (9 ✓)

5) 1.15×1.27 ⟶ $7 \times 1 = 7$

→ 1) 1.4615 (8) 2) 1.4705 (8) 3) 1.4625 (9) 4) 1.4605 (7 ✓)

6) 27% of 37 ⟶ $\frac{27}{100} \times 37 = 9$

→ 1) 9.69 (6) 2) 9.79 (7) 3) 9.89 (8) 4) 9.99 (9 ✓)

8) Principal = 5000 ROI = 18% no. of years = 2
amount ? (compounded Annually)

→ 1) 6762 (3) 2) 6862 (4) 3) 6962 (✓5) 4) 7062 (6)

$$A = P\left(1 + \frac{R}{100}\right)^N$$

$$= 5000\left(1 + \frac{18}{100}\right)^2$$

$$= 5000\left(\frac{118}{100}\right)^2$$

$5 \times (1)^2 = 5$

9) $\sqrt{1+20 \times 21 \times 23 \times 22}$ ⟶ $\sqrt{1+2\times3\times5\times4} = \sqrt{1+20} = \sqrt{3+1} = \sqrt{4} = 2$

1) 441 2) 451 3) 461 4) 471

→ 9 square (9) ↓ 1 ↓ 1 — 2 (✓) ↓ 4 (✓) — 3 (✗) ↓ 9

$(1+4)^{\frac{1}{2}} = (\sqrt{5})^{\frac{1}{2}} = 4$

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10) 88 % (6242) × 12 % (225)

→ 1) 13426318 2) 13988322 3) 15622184 4) NOTA (may be)

11) $\left(\frac{2562}{3416} \times 100\right)$ % of 4016

→ 1) 3015 2) 3012 3) 4004 4) 1004 5) NOTA

12) $(21 \times 41 \times 97 + 4)^{1/4}$

→ 1) 16 2) 17 3) 18 4) 15

$(3 \times 5 \times 7) + 4$

$105 + 4$

$6 + 4 = (1)$

$(1)^4 = (RHS)^4$

$1 = (RHS)^4$

$8 \times 8 \times 8 \times 8 = 64 \times 64 = (1)$ ✓

13) 443 × 456 − 8792 + 20 % of 555

→ 1) 184321 2) 193327 3) 206357 4) 189332

$7 + 8 = 15 = 6$

$2 \times 6 - 8 + 3$

$3 - 8 + 3$

$6 - 8 \rightarrow (-2) \Rightarrow$ ans $= -2 + 9 = (7)$

$(6) \rightarrow RHS + 8$

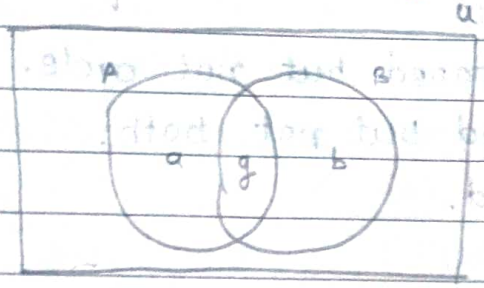
Date __/__/____ Reasoning

Saathi

- Set Theory (venn diagrams) -

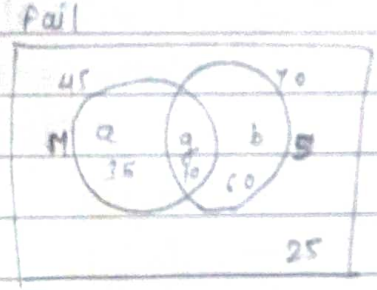
1) Two set venn diagram -

General venn diagram -



1) In a class of 130 students 85 passed in maths, 60 passed social and 10 failed both.

→ 1) How many failed in exactly one.
2) Passed in social, failed in maths.
3) Passed in only social.



passed in maths = 60 85
∴ Failed in maths = 130 - 85 = 45
Failed in social = 130 - 60 = 70
Failed in both = 10

∴ Failed in only maths = 45 - 10 = 35
Failed in only social = 70 - 10 = 60
passed in social and failed in maths = 35
passed in only social = 35

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Que. 2) In a class of 100 students 45 have cycles. the no. of students who have neither moped nor cycle is 25%. of total those who have moped. 33.3% having both bycycle have moped.

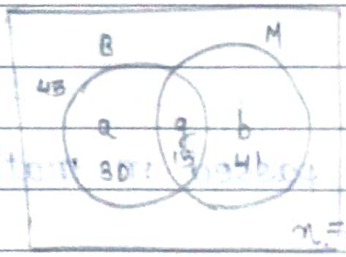
also

i) How many have a moped but not cycle. → 41

ii) Have cycle or moped but not both. → 71

iii) do not have moped. → 44

→



$a+g+b+n = 100$

$a+g = 45$

$\therefore b+n = 55$

$n = (b+g) \times \frac{25}{100}$

$\frac{45 \times 1}{3} = 15 = g$

$b+n = 55$

$b+15 = 4n$

$n+15 = 55-4n$

$5n = 70$

$n = 14$

Que.3 In a community of 160 people a survey was conducted to know the people likings for the movies of

1) every male who like B movies likes A movies also
2) Female who like movies of both is half total males.
3) 45% of total like B movies.
4) each person likes atleast one movie.

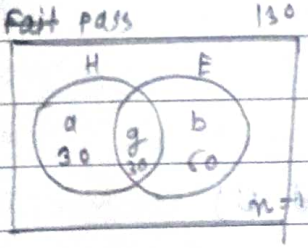
→

	A	B	both	total
male	60	12	12	60
female	70	60	30	100 ← provided
total	130	72	42	160

provided

Que.4) In a class of 130 students 90 passed in exactly one subject. The number of students who failed in both is 16.66% of those who failed in only in hindi. Half of the students who passed in Hindi failed in only english.

→



$a+b+g+n = 130$

$a+b = 90$

$g = \frac{1}{6} \times a$

$\frac{b+n}{2} = b$

$n = b$

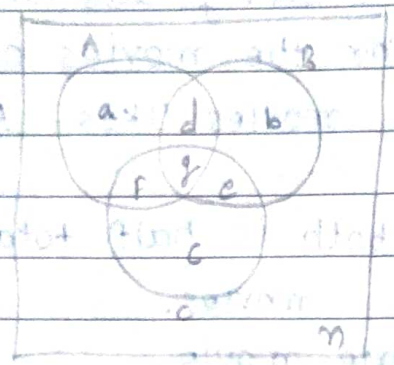
$n = \frac{1}{6} \times b$

$\frac{a+g}{2} = a \Rightarrow a = g$

Date __/__/____

Saathi

THREE SET

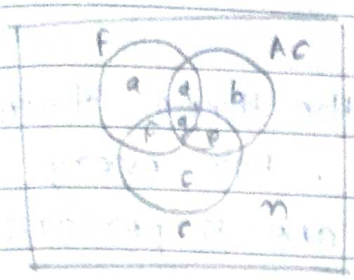


only A and B = d
only B and C = e
only C and A = f

- set no. 1 percentages -

que. 1) In the summer last year it was observed that 112- coolers.
number of houses which are equiped with none of these is 5 ty times of that with all the 3.
10 %. have coolers and fans.
42 %. have AC.
44 %. have fans
20 %. have none.
22 %. have only fans
12 %. have AC and coolers.
Find.
How many have fans only ⟶ 88
How many were survey. (Find U) ⟶ 400
How many have 2 devices. ⟶ 120
How many have almost 1 device. ⟶ 280

⟶



$c + e + f + g = 112$ —

$n = 5 \times g$ —

$f + g = \frac{u \times 10}{100}$ —

$d + b + g + e = \frac{u \times 42}{100}$ —

$n = \frac{u \times 20}{100}$ —

$a = \frac{u \times 22}{100}$ —

$g + e = \frac{12 \times u}{100}$ —

44% have fans

$\therefore \quad a + d + f + g = \frac{44 \times u}{100}$

a	22%.
b	18%.
c	10%.
d	12%.
e	8%.
f	6%.
g	4%.
n	20%.

$c + e + f + g = 112$

$u\left(\frac{10}{100} + \frac{8}{100} + \frac{6}{100} + \frac{4}{100}\right) = 112$

$\therefore u = 400$

Date Ratio.

Saath

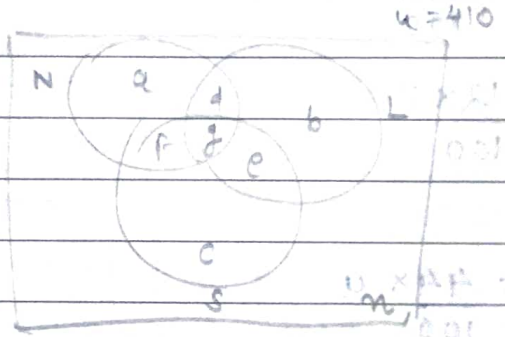
Que.1) 410 mobile users

For each person who use all the three there are 2 persons who use exactly 2. For every 2 persons who use exct. 2 there are 5 persons who use exct. 1.

For every 5 persons who use all 3 there is 1 person who does not use any.

Those who use nokia, LG, Siemens → 210, 220, 170.

→



$$\frac{g}{d+e+f} = \frac{1}{2}$$

$$\frac{d+e+f}{a+b+c} = \frac{2}{5}$$

$$\frac{g}{n} = \frac{5}{1}$$

$$a+d+f+g = 210$$

$$b+e+d+g = 220$$

$$c+e+f+g = 170$$

$$a+b+c+d+e+f+g+n = 410$$

$$5g + 2g + g + \frac{g}{5} = 410$$

$$\frac{40g+g}{5} = 410$$

$$g = 10 \times 5$$

$$g = 50$$

$$\therefore n = 10$$

Date ___/___/_____

Saathi

i) Those who use only siemens are 100 then how many use both nokia and LG.

$c = 100$

$d + g = ?$

$c + e + f + g = 170$

$f + e = 170 - 100 - 50 = 20$

$2g = d + e + f$

$100 = 20 + d$

$\boxed{d = 80}$

$\therefore d + g = 130.$

ii) Only nokia and siemens is 50 how many use only LG.

$f = 50$

$b = ?$

$b + e + d + g = 220$

$b + 50 + 50 = 220$

$b = 120$

iii) If 100 people who use LG do not use siemens, how many use only siemens.

$b + d = 100$ can not be determined.

$c = ?$

$c + f + g + e = 170$

$c + (e + f) + 50 = 170$

$c + (2g - d) + 50 = 170$

$c = 120$

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iv) 80 do not use either siemens or LG then how many use only siemens and LG.

$a+n = 80$

$a = 70$

$e = 8$

$a + d + g + f = 210$

$70 + d + 50 + f = 210$

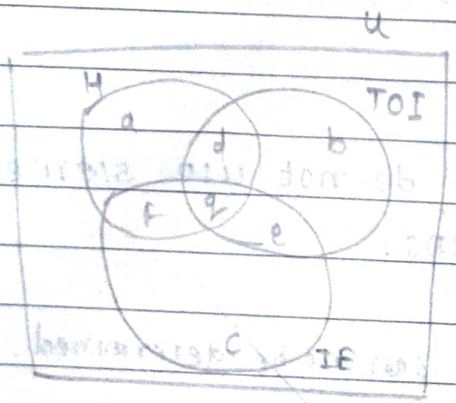
$d + f = 90$

$100 = 90 + e$

$e = 10$

que. 180 families Hindu times
120 read india expres
250 read either Hindu or times of India.
each family read atleast one newspaper and 30 read both Hindu and TOI.

→



$a+d+f+g = 180$

$c+f+g+e = 120$

$d+g = 250$

$a+d+f+b+e+g = 250$

$d+g = 30$

$a+f+b+e = 250-30$

$a+f+b+e = 220$

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Saathi

i) If 60 read only IE, how many do not read I.E. ?

$c = 60$

$e+f+g = 60$

$\therefore a+b+d = 190$

ii) 110 families read atleast 2 newspapers then atleast how many families are residing in colony.

$d+g+e+f = 110$

$e+f = 80$

$a+b+c+d+e+f+g = 140+c+110 = 140+10+110 = 260$

$\therefore a+b = 220-(e+f)$

$a+b = 140$

$c+(f+g+e) = 120$ $\quad$ $d+(e+f+g) = 110$

~~$c+g = 120-80$~~

~~$c+g =$~~ consider c and d $\Rightarrow 0$

but condition break

$\therefore$ min is 10

c min = 10

iii) 60 families reads only IE, read exactly one more news paper then min. possible families that read exactly one news paper.

~~$e = 60$~~ $\quad$ $f+e = 60$

~~$f+g+e = 120-60$~~ c $\quad$ $(a+b+c)\min = ?$

~~$f+g+e =$~~

$a+b+30+60 = 250$

$a+b = 160$

$c+g = 60$ $\quad$ $d+g = 30$ $\quad$ $\therefore$ ans = 160+30 = 190

$g_{max} = 30$ $\quad$ $\therefore$ $c_{min} = 30$

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Saath

Data Interpretation Basics.

Que:

Find %. age.

1) $\frac{24}{192}$

approx $\frac{20}{200} \Rightarrow \frac{1}{10}$

$$\frac{24 + 8 \times \frac{1}{10}}{192 + 8} \times 100$$

$$\frac{24 + 0.8}{200} \times 100$$

$$\frac{24.8}{2} = 12.4\%.$$

2) $\frac{789}{9874}$

approx $\frac{7}{98} = \frac{1}{14}$

$$\frac{789 + \frac{1}{14} \times 126}{9874 + 126} \times 100 = \frac{198}{10000} \times 100$$

$$= \frac{.798}{100}$$

$$= 7.98\%.$$

3) $\frac{468}{21428}$

approx $\frac{4}{214} = \frac{1}{53}$

$$\frac{468 - \frac{1428 \times 1}{53}}{21428 - 1428} = \frac{468 - \frac{238}{9}}{20000} \times 100 = \frac{468 - 27}{20000} \times 100$$

$$= \frac{440}{200} = 2.2\%.$$

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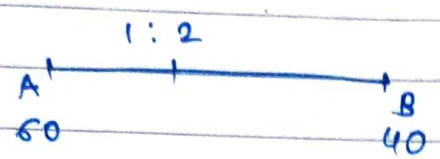
Saathi

4) Weighted average concept -



	count	average
A	60	60
B	120	40

$$\text{average} = \frac{60 \times 60 + 120 \times 40}{180}$$

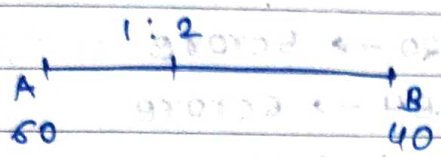
other method

$$\frac{60 + 40 \times 2}{3} = \frac{140}{3}$$

Date ___/___/_____

Saathi

4) Weighted average concept -



	count	average
A	60	60
B	120	40

$$\text{average} = \frac{60\times60 + 120\times40}{180}$$

other method

$$\frac{60+40\times2}{3} = \frac{140}{3}$$

Data interpretation IV

1) a) answer will be A or C

increase in A → 16% → 20%.

increase in C → 22% → 24%

∴ answer is A.

b) $$\frac{\text{sales of E in 2016}}{\text{sales of C in 2017}} = \frac{7.2\times21}{8.64\times24} = \frac{0.9\times7}{1.08\times8}$$

$$= \frac{6.3}{8.64}$$

$$= \frac{630}{864}$$

$$= \frac{315}{432}$$

$$= \frac{105}{144}$$

$$= \frac{35}{48}$$

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c) $\frac{₹20}{8.64} = \frac{5}{6}$

lets assume ₹20 → 5crore

8.64 → 6crore

for fruther calculations.

For A increase in sales

$6 \times 20 - 5 \times 16 = 120 - 80 = 40$

∴ increase $= 40/80 \times 100 = 50\%$

For B

∴ % increase = is not +ve

For C

$$\frac{24 \times 6 - 22 \times 5}{22 \times 5} \times 100 = \frac{12 \times 6 - 55}{55} \times 100$$

$= 30\%$

For d and E

% increase is -ve

∴ For A and C % ↑ > 20

∴ answer is (2)

other method

% increase in overall value is $= \frac{6-5}{5} = \frac{1}{5} = 20\%$

∴ if % is same in 2016 and 2017 or in 2017 have greater % then there will be min 20% growth.

∴ answer is A and C

answer = 2

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Saathi

d) % increase inc(2018) = 25%.

% increas = 25% = $\frac{x - 24\times6}{24\times6} \times 100$

$\frac{25\times24\times6}{100} = x - 24\times6$

$x = 36 + 24\times6 = 6(6+24) = 180$

$\frac{\%\text{ of C}}{\%\text{ of A}} = \frac{7}{6}$

$\%A = \frac{6}{7} \times \%C$

$\frac{\text{count of A}}{\text{Total}} \times 100 = \frac{6}{7} \times \frac{\text{count c}}{\text{total}} \times 100$

$= \frac{6}{7} \times 180$

$\therefore$ % increas in A = $\frac{\frac{6}{7}\times180 - 6\times20}{6\times20}$

=

d) % increase in C

$\therefore$ new value of C = prev $\times \frac{125}{100}$

$= \frac{24\times8.64}{100}$

assume same sales in 2018 aswell

$\therefore$ 25% increa = $\frac{25}{100} \times 24 = 6$

$\therefore$ new C = 30

$\frac{A}{C} = \frac{7}{6} = \frac{A}{30}$ $\quad \therefore A = 35$

$\therefore$ % increase = $\frac{35-20}{20} \times 100 = 75\%$.

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e) a+b+c in 2017 = 20+16+24 = 60%.

% increase = 27%.

$\therefore \frac{60 \times 27}{100} = \frac{6 \times 27}{10} = 16.2$

new a+b+c = 16.2 + 60 = 76.2%.

d+e in 2017 = 21+19 = 40%.

% increase = 12%.

$\therefore \frac{40 \times 12}{100} = 4.8\%$.

new d+e = 44.8%.

prev all = 100%.

new all = 76.2% + 44.8% = 121%.

$\therefore$ % increase = 21%.

F) $\frac{340}{11}$ % increase

% increase of c = $\frac{6 \times 24 - 5 \times 22}{5 \times 22} \times 100$

$= \frac{6 \times 12 - 5 \times 11}{5 \times 11} \times 100$

$= \frac{72 - 55}{55} \times 100$

$= \frac{17}{11} \times 20$

$= \frac{340}{11}$

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Saathi

q) answer = 24 y.

2)

B = 2C + some

3D + some = E

A < B

D > C

2, 3, 5, 7, 11, 13, 17, 19, 23

C	3	C	2
D	5	D	7
B	11	B	19
A	7	A	13
E	19	E	23

CRYPTORITHM

```
  9T 2H A T 9
+   1 8E A T 9
-------------
  A P P L E 8
  1 0 0 3
```

T+1 = AP

∴ T = 9

A = 1

P = 0

ue.

```
  C R O S S
+ R O A D S
-----------
D A N G E R
```

D is carry

∴ D = 1

S + S = R

∴ R = even

∴ by options

ans → 62513

Page No.

Que.

```
  9 Y 4 O   U   R      (O = 4 given)
    1 9 Y   O 4   U
-------------------
  H E   A   R   T
  1 0   3
```

$Y = 9$

$H = 1$

$E = 0$

0 1 2 3 4 5 6 7 8 9

$R - U = 4$

$\therefore$ only option is

$R = 6$

$U = 2$

$\therefore \quad Y + U + R + E = 17$

Que.

```
    T     0 1
+   G     0 1
-------------
  0 U     T 2
```

$0 + U + T = 2$

$0 = 1$

$T = 2$

$T + G = U$

~~$U - G = 2$~~

$\therefore \quad 2 + G = U$

G can be 8 or 9

but if 9

$\therefore U = 1$

$\therefore$ not possible

$\therefore \quad G = 8$

$\therefore \quad \therefore U = 0$

$\therefore \quad 0 + U + T = 3$

Date ___/___/_____

Saathi

que.

$$\begin{array}{r} {}^{1}\,{}^{8}C\ 1\,0\ 8\,C\ A\,6 \\ +\ 8\,C\ 1\,0\ {}_{9}T\ A\,6 \\ \hline 1\,0\ A\ S\ {}_{9}I\ S\,2 \end{array}$$

$S + O + T + I + C + A = 2$

→

$O = 1$

$S = 2$

$A = 6$

$C = 8$

$9 + T = I$

$\therefore T = 0 \rightarrow$ no carry

$\therefore I = 9$

ans = $2 + 1 + 0 + 9 + 8 + 6 = 26$

que.

$$\begin{array}{r} N\ \ X \\ +\ N\ \ X \\ +\ G\ U\,0\ \ N \\ \hline H\ U\ N\ \ T \\ 1\ 0 \end{array}$$

$H = 1$

$G = 8$ or 9

$U = 0$

From options answer = 1082

que.

$$\begin{array}{r} A\ B\ C\ D \\ \times\ \ \ \ \ \ 4 \\ \hline A\ B\ C\ D \\ D\ C\ B\ A \end{array}$$

$A < 3$

A can not be 0 or 1

$\therefore A = 2$

$\therefore D = 8$

$$\begin{array}{r} {}^{\cdot}\,{}^{3}\ \ {}^{3} \\ 2\ 1\ 7\ 8 \\ \times\ \ \ \ \ \ 4 \\ \hline 8\ 7\ 1\,{}^{1}8\ 2 \end{array}$$

carry of A : 0

$B < 3$

me

Date ___ / ___ / _____

Train

que. 1

length = l

speed = s

$$t = \frac{l}{s} = 15$$

$$\frac{l+100}{s} = 25$$

$$\frac{100}{s} + 15 = 25$$

$$\frac{100}{s} = 10$$

$$s = 10$$

$\therefore l = 150$ m.

que. 2

$$\frac{300+p}{39} = s$$

$$\frac{300}{18} = s$$

$$\frac{300}{18} = 10 + \frac{p}{30} \qquad \therefore p = 350\text{m}$$

$$\frac{120 \times 30}{18} = p$$

$$p = 20 \times 10 = 200\text{m}$$

Date ___/___/_____

Saathi

Que.8) $\frac{d_1}{s_1} = 27$ $\frac{d_2}{s_2} = 17$

$\frac{d_1 + d_2}{(s_1 + s_2)} = 23$

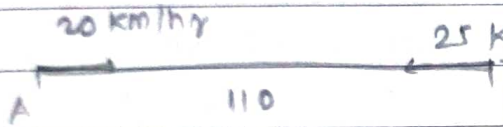
$\frac{27 s_1 + 17 s_2}{s_1 + s_2} = 23$

$27 s_1 + 17 s_2 = 23 s_1 + 23 s_2$

$4 s_1 = 6 s_2$

$\frac{s_1}{s_2} = \frac{3}{2}$

Que 4



For 1 hr

distance travelled by $t_1 = 20 \times 1 = 20$ km

$\therefore$ distance between t_1 and t_2 at 8 = 90

$\therefore$ ~~$90 = \frac{20 + 5525}{\text{tim}}$~~

$\frac{90}{\text{time}} = 20 + 25$

$\frac{90}{45} = \text{time} = 2$ hr

$\therefore$ 10 am

Date __/__/____ Profit and Loss

Que 1) A man purchase oranges at a rate of 5 for 2 Rs. sell for 7 for 8 Rs. Find profit or loss % in the transaction.

→

orange		RS
5	→	2
7	→	3

to byy 1 orange = $\frac{2}{5}$ RS

to ~~byy~~ sell 1 orange = $\frac{3}{7}$ RS

$$\frac{CP}{SP} = \frac{2/5}{3/7} = \frac{14}{15}$$

SP - CP =

Que.2) By selling 12 articles profit = selling prise of 3 articles Find profit %age.

→

arti.		prise
1	—	x
12x	—	3x
100	—	x

$$\frac{100 \times 3x}{12x} = 25\%$$

S.P = C.P. + P

C.P. = S.P. - P

= S.P. - P

= S.P.12 - SP. 9

= S.P. 9

$$\therefore \%\ \text{profit} = \frac{3 \times S.P._1}{9 \times S.P._1} \times 100$$

$$= 33.33\%$$

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Que.3) A map purchase few mangos which are prime number between 50 and 60 he sells 4 mangas to his son still left with more than 50. sell remaining to make profit = selling price of 4 mangoes. Find profit %age.

→

mangos = 59

rem. mangoes = 59 - 4 = 55

$$\% \text{ profit} = \frac{8}{51} \times 100 = 15.68\ \%$$

C.P. = S.P. - P

= 55 × S.P. - 4 × S.P

= 51 S.P.

Que.4) A trader sold 1/3rd stock at profit of 10%. and remaining at profit 25%. Find overall profit %.

→

condition 1

$$\frac{CP}{3} = SP_1 - P$$

$$SP = \frac{CP}{3} + \frac{CP}{10} = \frac{13\,CP}{30}$$

Remaining

$$\frac{2CP}{3} + \frac{CP}{4} = SP_2 = \frac{11\,CP}{12}$$

$$P = \frac{13\,CP}{30} + \frac{11\,CP}{12} - CP = \frac{26CP + 55CP - 60CP}{60}$$

$$= \frac{81CP - 60CP}{60} = \frac{21\,CP}{60} = \frac{7CP}{20}$$

$$\therefore \% = \frac{\frac{7}{20}}{1} \times 100 = 35\ \%$$

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(Ex. 5) A man purchase few pencils at rate of 2 for RS 1 and equal number of 3 for 2 RS. He sells the entire lot at 5 for RS. 3. Find %.

→

$C.P_1 = \frac{1}{2}$

$CP_2 = \frac{2}{3}$

$\therefore$ CP for 2 pencils $= \frac{7}{6}$

SP for 1 pencil $= \frac{3}{5}$

$\therefore$ For 2 $= \frac{6}{5}$

$\therefore$ ~~% P~~ $= \frac{\frac{6}{5} - \frac{7}{6}}{\frac{7}{6}} \times 100 =$

$\frac{CP}{SP} = \frac{7/6}{8/5} = \frac{35}{36}$

profit = 1

$\therefore$ % $= \frac{1}{35} \times 100$

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Que.6) when cost of article increases by 170, Trader increases selling price by 10%. Because of these changes profit decreases from 20% to 15%. Find cost price of an article after increase.

→

prev. cost = x

new = $x + 170$

prev. sell. = $x + \frac{x}{5} = \frac{6x}{5}$

new sell = $\frac{6x}{5} \times \frac{110}{100} = x + 170 + \frac{x \times 15}{100}$

$\frac{3}{1}\frac{6x}{5} \times \frac{110}{100} - \frac{15x}{100} - x = 170$

$x\left(\frac{33}{25} - \frac{3}{20}\right) - x = 170$

$x\,\frac{(132 - 12)}{100} - x = 170$

$x\,\frac{130}{100} - x = 170$

$1.32x - x = 170$

$0.32x = 170$

$x = 1700$

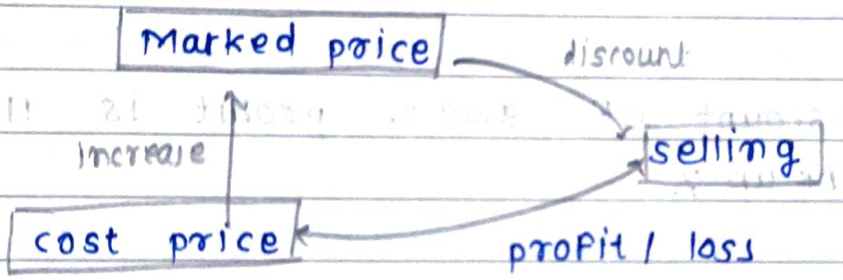
$(x \times 92 = (x + 170)(115)$

$109x =$

$17 = 115 \times 70$

Discount → reduced amount from marked price.

20 %. Discount → 80 %. of MP → SP



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Que. A trader marked up his goods by 27.27%. and then offered a discount of 8.33%. Find %. of profit

→

$$CP = x$$

$$MP = x + \frac{3x}{11} = \frac{14x}{11}$$

$$SP = \frac{14x}{11} \times \left(1 - \frac{1}{12}\right) = \frac{14x \times 11}{12 \times 11}$$

Que. After discount of 9.09%. profit is 11.11%. Find mark up %. → 22.22%

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Que. By selling an article at 5/6 of marked price loss is 10%. Find the % of profit if discount of 5% is given on the MP.

→

$$SP = \frac{5}{6} MP$$

$$\text{Discount} = \frac{1}{6}$$

let CP = 100

$$\therefore SP = 90 = \frac{5}{6} MP$$

$$M = 108$$

$$SP = \frac{108 \times 95}{100} = 102.60$$

∴ % profit = 2.6%

Que. By giving a discount of 30%. profit = 20%. Find marked price. if by giving discount of 400 loss is 20%.

→

$$SP = \frac{70}{100} MP = \frac{7}{10} MP = \frac{120 \times CP}{100}$$

$$7MP = 12CP$$

$$MP - 400 = \frac{80}{100} CP = \frac{4CP}{5}$$

$$5MP - 2000 = 4CP$$

$$= \frac{7MP \times 4}{12 \times 3}$$

$$15MP - 6000 = 7MP$$

$$8MP = 6000$$

$$MP = 750$$

~~60 MP - 24000 = 7MP~~

~~53 MP = 24000~~

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Que. After allowing discount of 25% on marked price a trader charges Rs 450 for a watch. Had he not given any discount profit = 20%. CP = ?

→

$$SP = \frac{75}{100} \times MP = 450$$

$$MP = 600$$

If $SP = MP$

$$\therefore SP = \frac{120 \times CP}{100} = 600$$

$$CP = 500$$

Que. A trader marks up his article 50% above CP and profit = 5%. By giving some discount find % change in SP if Markup % and discount % are each increased by 10% points.

→

Let $CP = 100$

$\therefore MP = 150$

and $SP = 105$

$150 - 105$

$100 - x$

$\therefore x = 70$

$\therefore$ % discount = 30%.

new discount = 40%.

new Markup % = 60%.

$$\therefore \text{new SP} = \frac{160 \times 40}{100} = 96$$

$\therefore$ % change in SP = -8.6%.

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Permutation and combination.

Saathi

- Arrangments

  - order is important
  - Formula $^{n}P_{r} = \frac{n!}{(n-r)!}$

- Combination

  - selection
  - Formula $^{n}C_{r} = \frac{n!}{(n-r)!\,r!}$

  - order is not important

- AND means multiplication
- OR means addition

Eg. 1) a) without repeat

$\underline{\quad}\ \underline{\quad}\ \underline{\quad}\ \underline{\quad}$

$7 \times 6 \times 5 \times 4$

ans → $7 \times 6 \times 5 \times 4 = 840$

b) with repeal

$\underline{\quad}\ \underline{\quad}\ \underline{\quad}\ \underline{\quad}$

$7 \times 7 \times 7 \times 7$

ans → $7 \times 7 \times 7 \times 7 = 2401$

Eg. 2) a) without repeat

$\underline{\quad}\ \underline{\quad}\ \underline{\quad}\ \underline{\quad}$

$6 \times 6 \times 5 \times 4$

ans → $6 \times 6 \times 5 \times 4 = 720$

↑ 0 can not be at start

b) with repeat

$\underline{\quad}\ \underline{\quad}\ \underline{\quad}\ \underline{\quad}$

$6 \times 7 \times 7 \times 7$

ans → $6 \times 7 \times 7 \times 7 = 2058$

↑ 0 can not be at start

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que 3) _ _ _ ans →

$3 \times 5 \times 4 = 60$

↑

remove 0, 2, 3

que.4)

_ _ _ _

$5 \times 4 \times 3 \times 1 = 60$

0

$4 \times 4 \times 3 \times 1 = 48$

5

108

que. 5)

_ _ _ _

↘ 1, 3, 5

$5 \times 5 \times 4 \times 3 = 300$

que. 7) a) $\frac{1 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{\_ \_ \_ \_ \_ \_ \_ \_}$

Q

EQUATION

not repeat

ans $= 7!$

b) consonants → Q, T, N → 3

$3 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 7! \times 3$

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c) ends with vowel (no. of vowels = 5)

$7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 \cdot \times 5 = 5 \times 7!$

d) starts with consonants and ends with vowels.

$3 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 \times 5 = 6! \times 3 \times 5$

$= 6! \times 15$

Que.8) BANKING

7 letters

N repeated 2 times ans = $\frac{7!}{2!}$

Que.9) ASSASSINATION

13 letters

A → 3

S → 4

I → 2

N → 2

T → 1

O → 1

13

all s together

∴ consider ssss → as one letter

∴ total letters = 10

∴ ans = $\frac{10!}{3! \times 2! \times 2!}$

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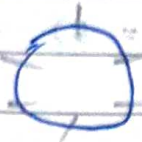
Que.10)



ans = 5!

2nd → 5

4th → 3

6th → 1

Que.11) ARRANGE

3 × 4 × 3 × 2 × 2 × 1 × 1

$\frac{3!}{2!} \times \frac{4!}{2!} = 36$ or

$\therefore \frac{3 \times 4 \times 3 \times 2 \times 2 \times 1 \times 1}{2! \times 2!} = 36$

Que.12) Rank of RAPID in RAPID

ADIPR → alphabetic

total 5! words

∴ ans ≤ 120

R _ _ _ _

For A at start 4! +

For D at start 4! +

For I at start 4! +

For P at start 4!

96

R A _ _ _

R A P _ _

IF I was at 3rd ∴ words = 2!

IF D was at 3rd words = 2!

R A P I _

if D was at 4th ∴ words = 1

+ current word = 102

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que.13) $9 \times 9 = 81$ total

-9 rej

1, 6, 8, 9 → $4 \times 3 = 12$

$81 - 12 = 69$

but 69 → rounded 69

96 → 96

$\therefore 69 + 2 = 71$

que.1) $5 \times 4 \times 3 \times 2 \times 1 = 5! = 120$

digital sum = 7

$7 \times 120 = 21 = 3$

$\therefore$ ans = option 1

Formula

$(n-1)!$ [sum] 11111

$= 24 \times 25 \times 1111 = 6666600$

or

$S_n = \frac{n}{2}$ [First num + last num]

$= \frac{n}{2}$ [13579 + 97531]

$= \frac{n}{2} \times 111110 = 60 \times 111110 = 6666600$

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Que.2) $(n-1)! \times \text{sum} \times 1111$

$= 133320$

Que.3) 8 options

6 A's

${}^8C_6 = 28$

when last row dont contains or 1st dont

$\therefore 28 - 2 = 26$

Que.4)

$${}^5C_3 \times \left[{}^4C_0 + {}^4C_1 + {}^4C_2 + {}^4C_3 + {}^4C_4 \right]$$

$= 10 \times (n^2) = 10 \times 4^2 = 160$

Que.5) $2 \times {}^7C_4 = 70$

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Factors -

- no. of factors -

$N = a^m b^n c^p$ (a, b, c are prime)

no. of Factors = $(1+m)(1+n)(1+p)$

- even factors -

$N = 2^m b^n c^p$ (b, c are odd and prime)

$m(1+n)(1+p)$

- odd factors -

$N = 2^m b^n c^p$

$(1+n)(1+p)$

- product of numbers / factors - $(N^{2/2})$

$180^{18/2} = 180^9$

- sum of the factors -

$N = a^m \times b^n \times c^p$

$= \left(\frac{a^{m+1}-1}{a-1}\right)\left(\frac{b^{n+1}-1}{b-1}\right)\left(\frac{c^{p+1}-1}{c-1}\right)$

$180 = 2^2 \times 3^2 \times 5^1$

$= \frac{7}{1} \times \frac{26}{2} \times \frac{24}{4} = 546$

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Que. $N = 1728$

2	1728
2	864
2	432
2	216
2	108
2	54
3	27
3	9
3	3
1	1
	1

$N = 2^6 \times 3^3$

$\therefore$ no. of Factors $= 7 \times 4 = 28$

Que. How many factors of 10800 are perfect squares?

$108 \times 100 = 10800$

2	108
2	54
3	27
3	9
3	3
	1

2	100
2	50
5	25
5	5
	1

$2^2 \times 3^3 \times 2^2 \times 5^2 = 2^4 \times 3^3 \times 5^2$

$2^4 \cdot 3^2 \cdot 5^2$

$2^2 \quad 3^0 \quad 5^0$

perfect squares $= 3 \times 2 \times 2 = 12$

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ques. positive integer solution (natural numbers)

$a^2 - b^2 = 120$

→ $(a+b)(a-b) = 120$

$= 2^3 \times 5^1 \times 3^1$

2	120
2	60
2	30
5	15
3	3
	1

no. of factors = 16

if N has n factors then no. of ways the N can be expressed is

$\frac{n}{2}$ if n is even

or

$\frac{n+1}{2}$ if n is odd

∴ 8 ways to express 120 $\Longrightarrow \because \frac{16}{2} = 8$

1×120 ✗ 3×40 ✗ 5×24 ✗ 8×15 ✗

2×60 ✓ 4×30 ✓ 6×20 ✓ 10×12 ✓

both a+b and a-b should be even

a+b	60	30	20	12
a-b	2	4	6	10
a	31	17	13	11
b	29	13	7	1

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Que. Find number of solutions of $\frac{3}{x} - \frac{4}{y} = 1$ if x and y are natural numbers.

→

$$\frac{3y - 4x}{xy} = 1$$

$$3y - 4x = xy$$

$$4x - 3y + xy = 0$$

$$xy - 3y + 4x = 0$$

$$y(x-3) + 4x = 0$$

$$y(x-3) + 4x - 12 = -12$$

$$y(x-3) + 4(x-3) = -12$$

$$(x-3)(y+4) = -12$$

$$a \times b = -12$$

$x - 3 = a$ $\qquad$ $y + 4 = b$

$x = a + 3$ $\qquad$ $y = b - 4$

$\therefore$ b is +ve and $b > 4$

a is -ve and $a > 2$

$a = -2$ $\qquad$ $b = 6$

$x = 1$ $\qquad$ $y = 2$

$a = -1$ $\qquad$ $b = 12$

$x = 2$ $\qquad$ $y = 8$

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que. a, b, c, d and e are distinct positive numbers (integers) in ascending order such that

$(68-a)(68-b)(68-c)(68-d)(68-e) = 725$

$a+b+c+d = e$

→ all a, b, c, d, e are +ve and < 68

$a < b < c < d < e$

5	725 =
5	145
29	29
	1

$5^2 \times 29^1$

no. of factors $= 3 \times 2 = 6$.

$725 = -5 \times 5 \times 29 \times 1 \times -1$

$68-a$ is biggest

$\therefore 68-a = 29$

$68-29 = a \quad = \quad a = 39$

$68-b = 5$, $68-c = 1$, $68-d = -1$

$b = 63$, $c = 67$, $d = 69$

$68-e = -5$

$e = 73$

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Saathi

- HCF and LCM
- HCF / GCD
  LCF = 1
- LCM
  HCM = ∞

HCF ≤ numbers ≤ LCM

HCF is a factor of LCM

(15, 20) → [5×3, 5×4]

HCF = 5

LCM = 60

co-primes
(Relatively prime to each other)
HCF = 1
numbers can be prime as well nonprime.

HCF × LCM = num1 × num2

que. product of 2 numbers = 2700, HCF = 15
How many pairs exists that satisfies this.

→

LCM = 2700 = 100 × 27 = 2×5×5×3×3×3
= $2^1 \times 3^3 \times 5^2$

$15 = 3^1 \times 5^1$

15x → num1 15y → num2

15x × 15y = 2700

x × y = 12

→ find coprimes

1, 12 ✓
2, 6 ×
3, 4 ✓

(15, 15×12) = (15, 180)

(15×3, 15×4) = (45, 60)

ans = 2

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distance of 2 nums min. product is max
sum is min

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que. sum of 2 nums = 144
HCF = 12
Find the maximum value of the product obtained.

→ $12x + 12y = 144$

$x + y = 12$

1, 11 ✓ 6, 6 ×
2, 10 ×
3, 9 ×
4, 8 ×
5, 7 ✓

→ find co-primes

$(12, 12 \times 11) = (12, 132) = 1584$ → min value
$(60, 84) = (60, 84) = 5040$ → answer

que. LCM = 84, HCF = 2 For 2 positive even numbers.
Find their minimum sum.

→

$num_1 = 2x$
$num_2 = 2y$
$2x \times 2y = 84 \times 2$
$xy = 42$

42 × 1
21 × 2 → co primes
14 × 3
7 × 6

∴ (14, 12) → 26 → ans (minimum)

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Remainders

Qu.
Divisor) Devidend

Que. Find the least number which when divided by 6, 7, 9 leaves the remainder of 4 in each, but exactly divisible by 11.

→

$6x+4$
$7y+4$
$9x+4$] → $126k+4$

$11 \times a$.

$\frac{126k+4}{11}$ = number

$\frac{121k}{11} + \frac{5k+4}{11}$

$\therefore k = 8$

$\therefore$ num = $126 \times 8 + 4 = 1012$

Que. Find least number which when divided by 6, 7, 9 leaves a remainder of 1, 2, 4 resp.

→

$6x+1$
$7y+2$
$9x+4$

$6-1$
$7-2$
$9-4$] diff = 5

$\therefore$ number = LCM of divisors − common diff.

= 126 − 5 = 121

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Que. A number when divided successively by 5 and 2 the resp. remainders are 3 and 1. what is the remainder if largest such 2 digit number is divided by 12.

→

$(2x+1)\times 5 + 3 = num$

$10x + 8 = num$

$\frac{10x+8}{12} \rightarrow \frac{98}{12}$ ∴ $(x = 9)$ biggest 2digit num

∴ number = 98

remainder = 2

- Cyclicity of numbers -

$2^1 = 2$	$2^5 = 32$
$2^2 = 4$	$2^6 = 64$
$2^3 = 8$	$2^7 = 128$
$2^4 = 16$	$2^8 = 256$

2	→ 2, 4, 8, 6
3	→ 3, 9, 7, 1
4	→ 4, 6
5	→ 5
6	→ 6,
7	→ 7, 9, 3, 1
8	→ 8, 4, 2, 6
9	→ 9, 1

Que. $(1!)^{99} + (2!)^{98} + \dots + (99!)^1$

$1^{99} = 1$

$2^{98} = 8$

$3^{97} = 9$

$4^{96} = 6$

$1 + 4 + 6 + 6$

17 → ans

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Que. $N = 2 \times 4 \times 6 \times 8 \ldots \times 100$

no. of zeros at end

~~5, 10, 15,~~ 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

1 1 1 1 2 1 1 1 1 2

~~10~~ ∴ total 12 zeros

Que. $5 \times 10 \times \ldots \times 100$

no. of zeros at end.

→

$5 \times 10 \times 15 \times 20, 25, 30, \ldots 100$

↑ dont have a 2

will not count it

∴ 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

1 1 1 1 2 1 1 1 1 2

1 2 1 3 1 2 12 4 1 2

12 → 5's

∴ 12 2's are gone.

total 2's between them = 19

5, 15, 25, 35, 45, 55, 65 ... 95

~~12+7 = 19~~

2's = 18 5's = more than 18

∴ ans → 18

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que. → $(1)^{101} \times (2)^{202} \times \ldots \times 9^{909}$ → last digit = ?

ans → 0

- Cyclicity for last 2 digits
- (for number ending with 1)

$4 \times 3 = 12$

$(41)^{23}$ → 21

$(71)^{77}$ → 91

$(51)^{49}$ → 51

- number is odd → ends with 1/7/9

use this ↓

- Base - 50/100/150/200/...

$(97)^2 = \frac{100}{\text{Base}} = (-3)^2 = 09$

$(89)^2 = \frac{100}{\text{Base}} = (-11)^2 = 21$

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que. $(87)^{64}$

→

$(87^4)^{16}$

$(87^2 \times 87^2)^{16}$

⇒ $(69^2)^{16}$

⇒ $(61)^{16}$

61

que. $(79)^{97}$

→

$(79^2) \times 79$

$(41)^{48} \times 79$

21×79

59

que. $(33)^{77}$

→ $33 \times (33^2)^{38}$

$33 \times (89)^{38}$

$33 \times (21)^{19}$

33×81

⇒ 93

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- number is even

$(2^{10})^{even}$ = $\underline{7}\,\underline{6}$

$(2^{10})^{odd}$ = $\underline{2}\,\underline{4}$

Que. 2^{126} → last 2 digits

$(2^{10})^{12} \times 2^6$

$76 \times 64 = \underline{6}\,\underline{4}$

- cyclicity of Remainders:

Que. 9^n divided by 7 (n is any natural number)

n	Remainder	Rem
1	$\Rightarrow 2^1 \rightarrow 2$	$9/7 = 2$
2	$\Rightarrow 2^2 \rightarrow 4$	$81/7 = 4$
3	$\Rightarrow 2^3 \rightarrow 8/7 \Rightarrow 1$	$9^3/7 = 1$
4	$\Rightarrow 2^4 \rightarrow 16/7 \Rightarrow 2$	$9^4/7 = 2$

∴ Remainder follows cyclicity of 2, 4, 1

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Que. $58^{75} \div 11$, what is Remainder ?

→

$58 \div 11 \xrightarrow{\text{Rem}} 3$

$(58)^2 \div 11 \xrightarrow{\text{Rem}} 9$

$\therefore$ rem → $(3)^n$

$\therefore$ rem → 3^{75}

$3^{75} \div 11$

$3^1 \div 11 \xrightarrow{\text{Rem}} 3$

$3^2 \div 11 \xrightarrow{\text{Rem}} 9$

$3^3 \div 11 \xrightarrow{\text{Rem}} 5$

$3^4 \div 11 \xrightarrow{\text{Rem}} 4$

$3^5 \div 11 \xrightarrow{\text{Rem}} 1$

$3^6 \div 11 \xrightarrow{\text{Rem}} 3$

Follows a cycle

$\therefore$ Rem → $(3^5)^{15}$ → Rem = 1

Que. $(315)^{315} \div 104$

$315 \rightarrow 104 \times 3 + 3$

$\frac{(104 \times 3 + 3)^{315}}{104} \Rightarrow \frac{3^{315}}{104}$

n	0	1	2	3	4	5	6	7
R		3	9	27	81	35	1	3

→ cycle of 6

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$315 \% 6 = 3$

$\therefore$ Rem $\rightarrow$ 27

que. $(81)^{81} / 13$

$\rightarrow$

$\frac{3^{81}}{13}$

n	1	2	3	4
R	3	9	1	3

$\rightarrow$ cycle of 3

$81 \% 3 = 0$

$\therefore$ ans $\rightarrow$ 1 (Rem)

que. $16^{17^{18}} \div 7$

$16^n \div 7$

$16 \rightarrow 2 \times 7 + 2$

$2^n \div 7$

n	1	2	3	4
R	2	4	1	2

$\rightarrow$ cycle of 3

ans $\rightarrow$ $n \% 3$

$17^{18} \% 3$

$(15+2)^{18} \div 3$

$2^{18} \div 3$

n	1	2	3
R	2	1	2

$\rightarrow$ cycle of 2

$\therefore$ ans $\rightarrow$ (1)

$\therefore$ ans of $16^n \div 7 \rightarrow$ 1st term i.e. 2

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que. $69^{69^{69}} \div 11$

→

$3^n \div 11 \rightarrow$ cycle of 5

n	1	2	3	4	5	6
R	3	9	5	4	1	3

$n \rightarrow 69^{69} \div 5$

$4^{69} \div 5$

n	1	2	3
R	4	1	4

→ cycle of 2

$\therefore 69 \% 2 = 1$

$\therefore$ 4th term

$\therefore$ ans = 4

que. $31^{31^{31}} \div 7$

→

$3^n \div 7$

n	1	2	3	4	5	6	7
R	3	2	6	4	5	1	3

→ cycle of 6

$n \rightarrow 31^{31} \div 6$

$1^{31} \div 6$

Rem → 1

$\therefore$ ans = 3

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Saathi

Que. $\frac{16^3+17^3+18^3+19^3}{70}$ Rem = ?

→

$$\frac{a^n+b^n+c^n+d^n}{a+b+c+d}$$ If a, b, c, d are consecutive ∴ rem = 0

∴ ans = 0

Que. $\frac{9^1+9^2+\ldots+9^{99}}{6}$

$$\frac{9}{6}+\frac{9^2}{6}+\frac{9^3}{6}+\ldots+\frac{9^{99}}{6}$$

↓ ↓

R 3 R =

Que. $(70)^{71}$ or $(71)^{70}$

$$\frac{70^{71}}{(70)^{70}} \qquad \frac{71^{70}}{70^{70}}$$

↓ ↓

$$70 \qquad \left(\frac{71}{70}\right)^{70}$$

$$\therefore 70 > \left(\frac{71}{70}\right)^{70}$$

$$\therefore (70)^{71} > (71)^{70}$$

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Saathi

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Que. How many natural number from 1 to 100 such that they are neither divisible by 2, 3, 5.

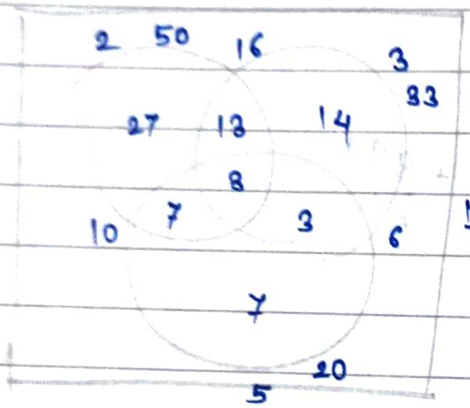
→

even x → 50

... 5 x → 10

2 in each 1, to 10 → 10

100 − 70 = 30



$\frac{100}{10}$

$\frac{100}{2} = 50$ $\quad \frac{100}{6} = 16$

$\frac{100}{3} = 33$ $\quad \frac{100}{15} = 6$

$\frac{100}{5} = 20$

$\frac{100}{30}$

∴ ans = 100 − [27 + 13 + 3 + 7 + 3 + 6 + 14]

= 100 − [40 + 10 + 12 + 14]

ans = 26

- Euler's Theorem

To find number of coprimes less than given numbe

$$\phi(N) = N\left(1 - \frac{1}{a}\right)\left(1 - \frac{1}{b}\right)\left(1 - \frac{1}{c}\right)$$

eg. $\phi(100) = 100\left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{3}\right)\left(1 - \frac{1}{5}\right)$

$= 50 \times \frac{2}{3} \times \frac{4}{5} = \frac{400}{5 \times 3} = 26.66\ldots$

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- properties of perfect squares -
- perfect square of has last digit as
  1, 4, 5, 6, 9
- perfect square can not end with
  2, 3, 7, 8
- Last digit is 1 $\Rightarrow$ second Last digit is even
- Last digit is 4 $\Rightarrow$ second Last digit is even
- last digit is 5 $\Rightarrow$ second last digit is 2.
- Last digit is 6 $\Rightarrow$ second Last digit is odd
- Last digit is 9 $\Rightarrow$ scond Last digit is even

$(88)^2 = 7744$

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- Indices -

General Rules For indices

$a^m \times a^n = a^{m+n}$

$\frac{a^m}{a^n} = a^{m-n}$

$(a^m)^n = a^{mn}$

$a^{m^n} \neq (a^m)^n$

Que. $\sqrt{2}$ $\sqrt[3]{3}$ $\sqrt[4]{4}$ greatest is

$2^{1/2}$ $3^{1/3}$ $4^{1/4} \Rightarrow 2^{1/2}$

$2 \overset{3\times1}{\underset{2\times3}{}}$ $2 \overset{3\times2}{\underset{3}{}}$

$2^{3/6}$ $3^{2/6}$

$8^{1/6}$ $9^{1/6}$

$\therefore \sqrt[3]{3} > \sqrt{2}$

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Que. $2^{1/2}$, $3^{1/3}$, $4^{1/4}$, $6^{1/6}$, $12^{1/12}$ greatest is

$(2^6)^{1/12}$ $(3^9)^{1/12}$ $(43)^{1/2}$ $(6)^{2\times1/12}$ $12^{1/12}$

$(64)^{1/12}$ $(81)^{1/2}$ $(64)^{1/2}$ $(36)^{1/12}$ $(12)^{1/12}$

$\therefore$ $3^{1/3}$ is greatest $\therefore$

Que. $a = 44^{44}$ $b = 4^{444}$ $c = 444^4$ $d = 4^{4^{4^4}}$

arrange in ascending order

→ $4^{4^{4^4}}$ is greater than 4^{444}

(a) $2^2 < 44 < 2^3$

$\therefore (44)^{44} \Rightarrow 4^{88} < 44^{44} < 4^{132}$

(c) $4^4 < 444 < 4^5$

$(444)^4 \Rightarrow 4^{16} < 444^4 < 4^{20}$

$\therefore d > b > a > c$

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Que. If $pqr = 1$

$$\frac{1}{1+p+q^{-1}} + \frac{1}{1+q+r^{-1}} + \frac{1}{1+r+p^{-1}}$$

→

$p \times q \times r = 1$

∴ let $p = q = r = 1$

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

Que.

Div. by 2 → number is even

Div. by 3 → sum of digits divisible by 3

Div. by 4 → last two digits divisible by 4

Div by 5 → last digit 0,5

Div by 6 → div. by 2 and 3

Div. by 13/7 → upto 3 digit no rule.

123456789 make pairs of 3 from RHS, add alterate pairs. If diff is divisible then number is divisible.

Div. by 8 → last 3 div. by 8

Div. by 9 → sum divisible by 9

Div by 10 → ends with 0

Div by 11 → alternate digit sum ≡ equat.or alternate sum diff is multiple of 11

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Saathi

- composite numbers -

24 → Break in coprimes

→ 8×3 ✓

→ 6×4 ×

Que. How many distinct values can x assume if 2835x24 is divisible by 8.

→

$\frac{7x4}{8}$ Rem = 0

~~724~~ 704 ∴ ans = 3

744 +40

784 +40

Que. If the number 18601257y is divisible by 72 find x+y

→

$72 = 8 \times 9$

$1+8+6+0+1+x+5+7+y = 9 \times p$

$28 + x + y = 9 \times p$

$x + y = 9 \times p - 28$

$\frac{57y}{8}$ ∴ $y = 6$

$\therefore \quad x + 6 = 9p - 28$

$\therefore \quad x = 9p - 34$

$x = 36 - 34$ ∴ x is 1 digit

$x = 2$

$\therefore x + y = 8$

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Que. If the number 173528c4y4 is divisible by 11. what is least value that x-y can assume.

→

$1+3+x+6+4 = 14+x$

$7+5+8+y = 20+y$

~~$(14+x) = (20+y)$~~

$20+y - 14+x = 11p$

$y-x = -6+11p$

$x-y = 6-11p$

x and y are 2 digit

$\therefore$ diff = -5 ($\because$ p=1)

Que. $N = (1)^1 \times (2)^2 \times \ldots (50)^{50}$ Find no. of 0's

→

$5 \rightarrow 5^5 \quad 10^{10} \quad 15^{15} \quad 20^{20} \quad 30^{30} \quad 35^{35} \quad 40^{40}$

& $45^{45} \quad 50^{50}$

2 5's, 1 25's

total 5's = $5+10+\ldots+50+(25+50)$

$= 275+75$

$= 350$

$\therefore$ ans = 350

Que. A number when divided succesively by 7, 5, 3 remainders are 5, 3, 1 resp. Find remainder when num is divided by 105.

→

$((3x+1)5+3)7+5$

$(15x+5+3)7+5$

$(105x+56)+5 = 105x+61$

$\frac{105x+61}{105} = \underline{\text{Rem} = 61}$

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Smathi

Que. $(1)^{1!} + (2)^{2!} + \dots + (10)^{10!}$

Find last digit.

→

$1 \to 1$

$5 \to 5$

$6 \to 6$

$4^{even} \to 6$

$9^{even} \to 1$

$(2)^{2!} + (3)^{3!} + (7)^{7!} + (8)^{8!}$

↓ ↓ ↓

$4 \quad 9 \quad 1 + 21 + 6$

$4+9+1+6+1+5+6+6+1 = 39$

$\therefore$ last digit $= 9$

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Saathi

- Pipes and cisterns -

capacity of tank = work done.

que. 4 pipes a, b, c and d can fill a tank in 20, 25, 40 and 50 hr. First pipe was opened at 6 am b at 8 am c at 9 am, d at 10 am at wat time tank will Full.

→

$\frac{1}{20} + \frac{1}{25} + \frac{1}{40} + \frac{1}{50}$ work = 200

$\frac{200}{20} \times x + \frac{200}{25} \times (x-2) + \frac{200}{40} \times (x-3) + \frac{200}{50} \times (x-4) = 200$

$10x + 8x - 16 + 5x - 15 + 4x - 16 = 200$

$27x = 200 + 32 + 15$

$27x = 247$

$x = \frac{247}{27}$

$\therefore x = 9.15$

$\therefore$ ~~6 hr +~~ 6 am + 9.15 hr = 3:08 pm

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Saathi

que. I went home.

Find noun → create question
who/whom/what

adverb

- Noun after Noun
  - singular

Info advice opinion → no plural

Calender

$\frac{365}{7}$ → 1 → odd day

if 1-6-2002 → saturday
then 1-6-2003 → sunday

similarly
per leap year
$\frac{366}{7}$ = 2 odd days

1-6-2004 → Tuesday

odd days in one century
24 leap years
76 ordinary years
$\therefore \frac{76+48}{7}$ = 5 odd days

100 → 5
200 → 5+5 → 3
300 → 1
400 → 6 + 1 (Leap century) = 7 → 0

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Saathi

Date __/__/____

Day code

S	M	T	W	T	F	S
0	1	2	3	4	5	6

Month code

J	F	M	A	M	J	J	A	S	O	N	D
0	3	3	6	1	4	6	2	5	0	3	5

Year

1600 - 1699 → 6
1700 - 1799 → 4
1800 - 1899 → 2
1900 - 1999 → 0
2000 - 2099 → 6

2100 - 2199 → 4
2200 - 2299 → 2
→ 0

cycle of 4
= 6, 4, 2, 0

steps -
① last 2 digits of year
② Divide by 4 (Quotient)
③ year code
④ Month code
⑤ Date

Que. 21th June 1911 Find day

$\frac{11}{4} = 2$

year code = 0
month code = 4
Date = 21

$21+4+2+11 = 38$ $\quad \frac{38}{7} = 3 \quad \therefore$ ans → Wednesday.

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Que. day on 28th May 2006 ?

→

$$06 + \frac{06}{4} + 6 + 1 + 28 = 6+1+6+1+28$$

$$= 42 = 42 \% 7 = 0$$

∴ ans → sunday.

Que. day on 27th Feb 2012 ? (Important)

→

12+3 + 6 + 3 + 27 = ~~54~~ 51

∴ 2 odd days

Tuesday → wrong answer.

If months are jan and feb and year is leap

ans = ans - 1

= Tuesday - 1 = monday.

Que. Monday in May 2002.

→

1st May 2002

2 + 0 + 6 + 1 + 1 = 10 = 3

wednesday

6 → Monday

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Ques. How many numbers can be created using 0, 7, 8 greater than 0 and less than a million ?

→ allowed repeatation

_ _ _ _ _ _ → all are zeros.

$3 \times 3 \times 3 \times 3 \times 3 \times 3 - 1 = 728$

Ques. 5 digit with 1, 2, 3, 4, 5 (no repeat) units place greater than ten's.

→

_ _ _ _ _

$1 \times 2 \times 3 \times 4 \times 1$ (5) + $1 \times 2 \times 3 \times 3 \times 1$ (4) + $1 \times 2 \times 3 \times 2 \times 1$ (3)

1, 2, 3, 4 → 5×

1, 2, 3 → 4×

$+ \; 1 \times 2 \times 3 \times 1 \times 1$ (2)

2 → 3×

$= 6 [4 + 3 + 2 + 1] = 60$

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Que.

man

7 rel ⟶ 4 la ⟶

+3 men

wife

7 rel ⟶ 3 la

4 men

party ⟶ 3 la + 3 men

3 man's

3 wife's

⟶

$^7C_3 \times {}^7C_3$ -

man wif

M (3)	L (4)	M (4)	L (3)
3	0	0	3
0	3	3	0
1	2	2	1
2	1	1	2

calculate

$^3C_3 \times {}^3C_3 + {}^4C_3 \times {}^4C_3 + {}^3C_1 \times {}^4C_2 \times {}^4C_2 \times {}^3C_1 + {}^3C_2 \times {}^4C_1 \times {}^4C_1 \times {}^3C_2$

ans ⟶ 485

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Que. How many 4 digit number contains 2

$9 \times 10 \times 10 \times 10 \rightarrow 9000 \rightarrow$ total

$8 \times 9 \times 9 \times 9 \rightarrow 5832 \rightarrow$ not e

$9000 - 5832 = 3168$

Que. PROPER → Rank = ?

✓ ✓ ✓ ✓ ✓

E, O, P, P, R, R

→

E start + O start = $\frac{5!}{2! \times 2!} \times 2$ = $\frac{5!}{2!}$

P → E second + O second + P second

↳ $\frac{4!}{2!} \times 3$

PR → 3!

PRO → 2!

PROP → +0

PROPER → +0

$2! + 3! + \frac{4!}{2!} \times 3 + \frac{5!}{2!}$

$2 + 6 + 3 \times 3 \times 4 + 5 \times 4 \times 3$

~~$8 + 36 + 23 = 44 + 23 = 67$~~

$60 + 8 + 36 = 104 + 1 = 105$

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Que. PLACES 48th word = ?

→ A C E L P S

→ E A start → 5! = 120

C → 4! = 120

∴ word start with A

AC → 4! = 24

∴ C can not be

AE → 24

∴ 24+24 = 48

∴ last word

∴ AESP LC → 24 + 23 = 47

∴ rank = 47+1 = 48

Que.

16 → 4 4 4 4

6 + 6 + 6 + 6

2 2 2 2

$^4C_2$

6 + 6

2 + 2

6

↳ 2 → +1

6×7+1 = 43

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Que. NO repeat 1 to 5 digits . 1-5 digit no.

→

~~5×4×3×2 = 48×3 =~~ 144

1 digit → 5

2 digit → 5×4

3 digit → 5×4×3

4 digit → 5×4×3×2

5 digit → 5×4×3×2×1

= 5 + 20 + 60 + 120 + 120

= 205 + 120 = 325

↳ ans

(5)

Que. 7m 6w

5 person committee

3 men atleast

Wrong

→

3M	2W
4M	1W
5M	0

$^{7}C_3 \times {}^{10}C_3 = \frac{7!}{3! \times 4!} \times \frac{10!}{3! \times 7!}$

$= \frac{10!}{3! \times 4!}$

$= \frac{10 \times 9 \times 8 \times 7 \times 6 \times 5}{3 \times 2}$

$= 10 \times 9 \times 8 \times 7 \times 5$

$= 90 \times 8 \times 7 \times 5$

$=$

$^{7}C_3 \times {}^{10}C_2 = \frac{7!}{3! \times 4!} \times \frac{10!}{8! \times 2!}$

$= \frac{10!}{3! \times 4! \times 2! \times 8}$

$= \frac{5 \cancel{10} \times 9 \times \cancel{8} \times 7 \times \cancel{6} \times 5}{\cancel{3} \times \cancel{2} \times \cancel{2} \times \cancel{8}}$

$^{7}C_3$

$= \frac{7!}{4! \times 3!} \times \frac{6!}{2! \times 4!}$

$+ \frac{7!}{4! \times 3!} \times \frac{8!}{11! \times 5!}$

$+ \frac{7!}{5! \times 2!}$

$7 \times 5 \times 3 \times 5$

$+ 7 \times 5 \times 6$

$\rightarrow 1575$

7×3

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que. LEADING → (EAI) → vowels should together

→

$\therefore \quad 5! \times 3! = 120 \times 6 = 720$

que. CORPORATION → vowels should together

→

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

Saathi

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que. LEADING → (EAI) → vowels should together

→

∴ $5! \times 3! = 120 \times 6 = 720$

que. CORPORATION → vowels should together

→

$$\frac{7!}{2!} \times \frac{5!}{3!}$$

- Formation of groups and distribution -
  (un-named groups)
  - 4 people
    Find 2 groups wher no. of people are 3 and 1.
    ∴ ans → $^4C_3 \times {}^1C_1$ ← select 1 from remaining (1)
    ↑
    select any 3 from 4
    ∴ rem = 4 - 3 = 1
- Formula
  groups of m, n, p
  ∴ ans = $\frac{(m+n+p)!}{m!\,n!\,p!}$ (where $m \neq n \neq p$)
- For equal group
  ABCD → into 2 groups of 2people each
  ans → $^4C_2 \times {}^2C_2 \rightarrow 6$ this wrong

G_1	G_2	
AB	CD	
AC	BD	Same
Same AD	BC	
CD	AB	
BD	AC	Same
BC	AD	

pairs are same
ans → 3 ⇒ $\frac{^4C_2}{2}$

$\frac{}{2!}$

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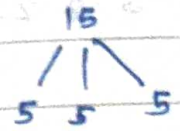
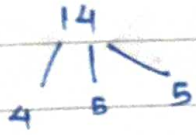
que. 15 students divide in 3 equal group such that two people must be together.

→



But 2 are together consider them as 1

∴

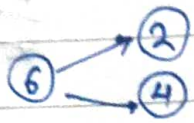


no of groups

$$\therefore \text{ans} = \frac{14!}{4!\,5!\,5!\times 2!} \times 3!$$

que. 6 toys between 2 brothers in ratio of 1 : 2.

→



ans → $\frac{6!}{2!\times 4!}$ (Formula for unequal) (For arrangements)

For distribution = $\frac{6!}{2!\times 4!} \times 2!$

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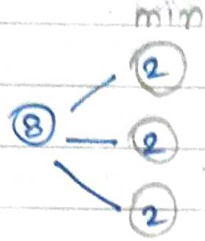
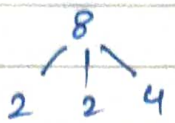
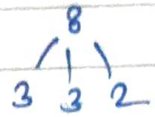
que. 8 book among 3 people, each atleast gets 2.

→







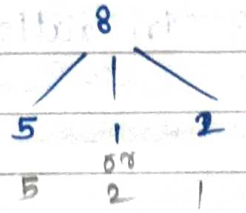
$$\frac{6!}{3! \times 2! \times 2! \times 2!} \times 3! \times ({}^3C_2 + {}^3C_1)$$ ✗ wrong

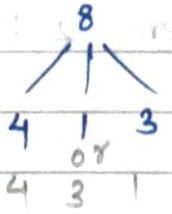
2340

$$\left[\frac{8!}{2!\,2!\,4! \times 2!} + \frac{8!}{3!\,3!\,2! \times 2!}\right] \times 3!$$

que. 8 toys → 3 brothers each atleast 1
no two gets equal toys, younger gets max. toys.

→





$$\therefore \text{ans} = \left[\frac{8!}{5! \times 1! \times 2!} + \frac{8!}{4! \times 1! \times 3!} + \frac{8!}{5! \times 2! \times 1!} + \frac{8!}{4!\,3!\,1!}\right] \times 8!$$

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Circular Permutation

Que. 5 boys and 5 girls in a circle such that no 2 girls are together.

→

ans → place 5 boys ∴ $(n-1)! = 4!$

∴ no. of spaces between boys = 5

∴ to place girls 5! required

∴ ans = $4! \times 5!$

Que. 5 Indians 4 English around a round table.

i) there is no restriction

→ total people = 9 ∴ ans = 8!

ii) all engish sit together

→

(EEEE) _ _ _ _ _ total 6 ∴ ans = 5!

but E can be interchanged

∴ For E = 4!

∴ ans = $5! \times 4!$

iii) all english do not together

ans = total − all sit together

= $8! - 5! \times 4!$

iv) no two english together

ans → place Indians → 4!

spaces created = 5

∴ ${}^5C_4 \times 4!$ For placing 4 english

∴ ans = $4! \times {}^5C_4 \times 4!$

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Que. 7 girls in circle such that they do not have same neighbors in any two arrangements.

→

place 7 girls → 6!

ans =

∴ $\frac{6!}{2!}$

Que. 10 Flowers form a gardand

→ ans = $\frac{(10-1)!}{2}$ → clockwise and anti are same.

Que. 20 people → arrange such that 2 always sit together

→

② are together

∴ total people = 19

place them in 18!

and 2! For arranging 2 people

∴ 18! × 2!

Que. 10 Firiends

i) 5 on one table and 5 on another

ii) 4 on one and 6 on another

→

ans(i) → $\frac{^{10}C_5 \times 4! \; ^5C_5 \times 4!}{2}$

ans(ii) → $^{10}C_4 \times 3! \times {}^6C_6 \times 5!$

Date __/__/____

Saathi

monday around circle such that vowels are separate.

→

m, n, d, y o, a

↳ 3! & 4 gaps $^4C_2 \times 2!$

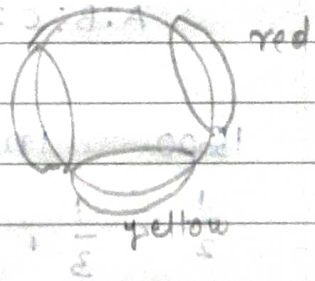
$\therefore 3! \times {}^4C_2 \times 2!$

For garland using 3 diff. red, 3 diff yellow, 4 diff blue. if same colours flowers are together

→

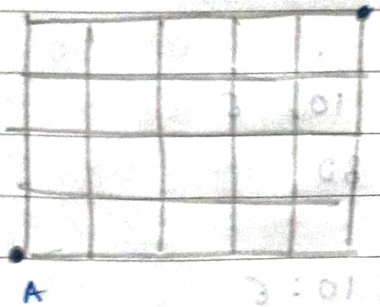
$\therefore$ consider total 3 flowers

$\therefore$ ans = $\frac{(3-1)!}{} = \frac{2!}{} = 2!$



for each colour

$2! \times 3! \times 5! \times 4!$



no. of shortest path

ans = $^9C_4$ or $^9C_5$ or $\frac{9!}{4!\,5!}$

cause total 5 right and 4 ups.

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Ratio and proportion

Que :→ $\frac{A}{B} = \frac{2}{3}$ $\frac{B}{C} = \frac{4}{5}$ $\frac{C}{D} = \frac{6}{7}$

$A:B:C:D = ?$

$\frac{A}{B} = \frac{2\times8}{3\times8}$ $\frac{B}{C} = \frac{4\times6}{5\times6}$ $\frac{C}{D} = \frac{6\times5}{7\times5}$

$\frac{A}{B} = \frac{16}{24}$ $\frac{B}{C} = \frac{24}{30}$ $\frac{C}{D} = \frac{30}{35}$

$\therefore A:B:C:D = 16:24:30:35$

Que. 15500 in 3 parts proportional to $\frac{1}{2}, \frac{1}{3}, \frac{1}{5}$

→

$\frac{1\times3}{2\times3}$ $\frac{1\times6}{3\times6}$ $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{5}$

$\frac{1}{2}, \frac{2}{6}, \frac{1}{5}$ 15, 10, 6

$\frac{1}{2}, \frac{2}{6}, \frac{6}{30}$ 30

$\therefore 1:2:$ $\therefore 15:10:6$

$15x + 10x + 6x = 15500$

$31x = 15500$

$x = 500$

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$26x + 3x = 14500$

$29x = 14500$

$x = 500$

$\therefore$ saving $= 3x = 1500$

$3x + 5x + 7x = 15x$

$7x = 1600$ $\quad 7x - 3x = 1600$

$x = \frac{1600}{7}$ $\quad 4x = 1600$

$x = 400$

$\therefore \quad 5x = 5 \times 400 = 2000$

$A = C - \frac{C}{5}$

$\frac{B}{A} = \frac{9}{10}$ $\qquad \frac{A}{C} = \frac{4}{5}$

$4C = 5A$

$C + \frac{C}{3} = D$

$\frac{D}{C} = \frac{4}{3}$

$\therefore \quad \frac{D \times 4}{5A} = \frac{4}{3}$

$\frac{D}{A} = \frac{5}{3}$

$5 - 3$

$100 - x$

$x = \frac{100 \times 3}{5} = 60$

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Que. $B = \frac{9A}{10}$ $B = \frac{4C}{5}$ $\frac{4C}{3} = D$

$\frac{9A}{10} = \frac{4C}{5}$

$A = \frac{8C}{9}$

$C = \frac{9A}{8}$

$\therefore \frac{4 \times 9A}{3 \times 8} = D$

$\frac{A}{D} = \frac{2}{3}$

$\therefore$ D is 50% more than A

Que. 330000

$\frac{1}{2} : \frac{1}{5} : \frac{1}{4}$ $\frac{10, 4, 5}{20}$

$10x + 4x + 5x = 330000$

$19x = 330000$

$\frac{1}{2} D = \frac{1}{4} W = \frac{1}{5} S = K$

$\therefore D = 2K \quad W = 4K \quad S = 5K$

$\therefore 2K + 4K + 5K = 330000$

$K = 30000$

$\therefore 2K = 60000$

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Income

Ex. $\frac{R}{S} = \frac{9}{8}$ · $E \rightarrow \frac{Y}{8}$ Saving = 8000

→ $\frac{9x}{8x} - \frac{7x}{8x} = \frac{2x}{2x} \Rightarrow \frac{8000}{8000}$

$x = 4000$

∴ income = $17x = 17 \times 4000 = 68\,k$

Ex. a $\left(\frac{A}{W} = \frac{5}{2}\right)$ b $\left(\frac{A}{W} = \frac{8}{5}\right)$ → 13y

↳ 7x

$\frac{\frac{5}{2} \times x}{\frac{8}{5} \times y} = \frac{9}{4}$

$\frac{25}{16} \times \frac{x}{y} = \frac{9}{4}$

$\frac{x}{y} = \frac{36}{25}$

Q

$\frac{5x + 8y}{2x + 5y} = \frac{9}{4}$

$20x + 32y = 18x + 45y$

$2x = 13y$

$\frac{x}{y} = \frac{13}{2}$

∴ ans = $\frac{7 \times x}{13 \times y} = \frac{7}{13} \times \frac{13}{2} = \frac{7}{2}$

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Que. A → 1/5 , B → 3/5 , C → 5/7

6a 8b 12c

5 : 4 : 5 → 14x

∴ ~~14, 24~~ LCM = 336

∴

Que. ROADIE are ~~pre~~ permutted and arranged in alphabetical order find Rank 44.

→

A D E I O R

word start with A

A E R D O I 4! → 44 - 24 = 20

20 - 3×3! = 2

Que. MONOS

→ 32nd = 2

M N O O S

word start with M = 4!/2! = 12

∴ 12×2 = 24

32 - 24 = 8

starts with O

∴ O NMSO 8 - 6 = 2

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THURSDAY → no word starts with T or ends with Y.

8 - letters

total = 8!

~~6~~ ~~×~~ ~~×5~~

~~7~~ × 6 × 5 × 4 × 3 × 2 × 1 × 6

~~6!~~ × 42 =

starts

Que. 5 member committee of 5 selected from 6 men 4 women such that atleast 1 women is selected. and 2 perticular women refuse to work in how many ways committee can be formed.

→

$^4C_1 \times {}^6C_4 + {}^3C_2 \times 2 \times {}^6C_3 + {}^3C_3 \times 2 \times {}^6C_2$

total	women	men	
5	1	4	$^6C_4 \times {}^4C_1 = 60$
5	2	3	$^6C_3 \times ({}^4C_2 - 1) = 100$
5	3	2	$^6C_2 \times 2 = 30$
5	4	1	→ not possible.

∴ ans = 190

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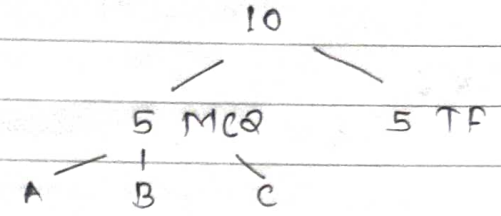
Que. A question paper has 10 question → 5 are MCQ, 5 are True or false. each MCQ Has 3 choises in how many ways a student can attend one or more questions.

→



options + NA

For MCQ options = 3 + 1 = 4

For 5 questions = $4 \times 4 \times 4 \times 4 \times 4 = 4^5$

similarly For true or false : 2+1 = 3

$\therefore 3^5$

$\therefore$ total = $3^5 \times 4^5 = 12^5$

But (-1) for not attempting

Que. How many 5 digit even numbers can be formed using digits 1, 2, 3, 4, 6 such that digit in 100 place, 10 place and unit place are in ascending order.

→

_ _ _ _ 3

↳ $3C_2 \times 2! = 6$

_ _ _ _ 6 +

↳ $4C_2 \times 2! = 12$

= 18

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Que. 5 identical ball in 3 diff box such that
i) each box contains any no. of balls.
ii) each atleast 1 ball

→

i) 0 — 0 — 5

Partition

O O O O O ans = $\frac{7!}{5! \times 2!} = 21$

or $^{n+r-1}C_{r-1} = {}^{7}C_2$

ii) already put 1 ball to each

∴ 1 O 1 O 1 = ans = $\frac{4!}{2!\,2!} = 6$

Que. How many natural number solutions exist for
$a+b+c+d = 20$

→

min value = 1

a → 1 b → 1 c → 1 d → 1 ∴ 16 remaining

ans = $^{19}C_3$

Que. How many 4 digit numbers exist such that sum of digits is 10.

→

$a+b+c+d = 10$

↑
min 1

∴ remaining = 9 = n r = 4 ⟹ $^{12}C_3$

ans → $^{12}C_3 - 1$

↳ if we give 9 to a → a becomes 10 ∴ dont count

Saathi

Date ___/___/___ **Probability**

- Probability = $\frac{\text{Favourable outcomes}}{\text{Total outcomes}}$

- $P(E) + P(\bar{E}) = 1$

Que. what is the prob. that sum of the numbers turned when 2 dice are rolled is 10

→

$$\text{ans} = \frac{3}{36} = \frac{1}{12}$$

- Independent events -

Two events are independent when outcome of one of the event does not affect the outcome of other event.

Que. • Probability of A sowing problem = 2/3

$P(A) = 2/3$

$P(B) = 1/2$

prob. that problem is solved.

→

cases →
$P(A)\,P(B)$ → Both solved
+
$P(\bar{A})\,P(B)$ → B solved
+
$P(A)\,P(\bar{B})$ → A solved
+
$P(\bar{A})\,P(\bar{B})$ → Both cant
1

$$\text{ans} = 1 - \frac{1}{3} \times \frac{1}{2} = \frac{5}{6}$$

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• conditional probability -

It is a situation where part info. of the outcome changes the prob. of event.

Que. 3 machines a, b, c produce ~~bolt~~ bolt of which some are dffective.

→

machine	total	deff
a	100	10
b	200	15
c	700	25

a bolt is picked find prob.

i) Bolt is made by a -

ii) if bolt is deffe. find prob. that bolt from a.

→

i) $\frac{100}{1000} = \frac{1}{10}$ ii) $\frac{10}{10+15+25} = \frac{10}{50} = \frac{1}{5}$

Que. 2 Bags having black and white marbels

	Black	white
B_1	6	5
B_2	3	2

one marbel picked from each bag.

i) Find prob. of both white

ii) one marble ~~is~~ from each if atleast if one of them is white find prob. that both are white.

→

i) ans → $\frac{5}{11} \times \frac{2}{5} = \frac{2}{11}$

B_1	B_2
W	B
B	W
W	W
B	B

DN

ii) $\frac{WW}{WB+BW+WW} = \frac{10}{37}$

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Que. The prob. of getting oil are Reliance - 1/3, cairns - 1/4 & shell - 1/5 IF oil is struck in oilfield. what is prob. that 2 of companies struck oil.

1/3	1/4	1/5
R	C	S
✓	✓	✓
×	✓	✓
×	×	✓
×	×	×
✓	✓	×
✓	×	✓
✓	×	×
✓	✓	×

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

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

$$+ \frac{1}{3}\times\frac{4}{5}\times\frac{3}{4} + \frac{1}{3}\times\frac{1}{4}\times\frac{4}{5} = \frac{9}{36}$$

or

$$1 - \bar{R}\,\bar{C}\,\bar{S} = 1 - \frac{2}{3}\times\frac{3}{4}\times\frac{4}{5} = \frac{3}{5}$$

$$\frac{\frac{9}{3\times4\times5}}{\frac{3}{5}} = \frac{9}{36}$$

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5 shots, the prob. of hitting is 1/4 what is the prob. that hitting 1st, 3rd and 5th attempt

ii) Any 5 attempts gets hitted.

i) $\left(\frac{1}{4}\right)^3 \times \left(\frac{3}{4}\right)^2$

ii) $^nC_r (p)^r (q)^{n-r} = {}^5C_3 \left(\frac{1}{4}\right)^3 \left(\frac{3}{4}\right)^2$

A dice is rolled a total of 8 time what is the prob. that I rolled a number greater than 4 on exactly 5 rolls.

$^8C_5 \times \left(\frac{2}{6}\right)^3 \times \left(\frac{4}{6}\right)^3$

A coin is tossed a total of 8 times. If head appears atleast 6 times what is prob. that head appears on exactly 7 tosses.

$$\frac{^8C_7 \times \left(\frac{1}{2}\right)^8}{^8C_6 \left(\frac{1}{2}\right)^8 + {}^8C_7 \left(\frac{1}{2}\right)^8 + {}^8C_8 \left(\frac{1}{2}\right)^8}$$

$$\frac{8}{28 + 8 + 1} = \frac{8}{37}$$

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odd is favour and odd in against

→ when odd in favour of an event are a : b then prob. of event occurs is $\frac{a}{a+b}$

→ when odd against event are a : b prob. of event is $\frac{b}{a+b}$

Que. odds in favour of a, b and c solving a problem is 2/3, 3/4, 4/5. what is prob. that problem is solved.

→

prob. A : $\frac{2}{5}$ P(B) : $\frac{3}{7}$ P(C) : $\frac{4}{9}$

∴ solving : 1 - not solved

$= 1 - \frac{3}{5} \times \frac{4}{7} \times \frac{5}{9}$

∴ ans $= \frac{51}{63}$

Que. 3 dice are thrown at random find prob. of getting a number greater than prev. each time.

→

D_1 D_2 D_3

\- \- \-

1 ← (1, 2) 3

↑

$^5C_2$ → 4

↑

$^4C_2$ → 5

↑

$^5C_2$ → 6

ans = $\frac{^5C_2 + {}^4C_2 + {}^3C_2 + 1}{6 \times 6 \times 6}$

ans = $\frac{10 + 6 + 3 + 1}{6 \times 6 \times 6} = \frac{20}{6 \times 6 \times 6} = \frac{5}{54}$

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Que. 3 dice are rolled what is prob. of getting sum as 13.

→

D_1	D_2	D_3	
4	4	5	→ 3!/2! = 3
6	6	1	→ 3
3	5	5	→ 3
2	6	5	→ 3! = 6
4	6	3	→ 3! = 6

$$\therefore \text{ans} = \frac{3+3+3+6+6}{6\times6\times6} = \frac{21}{216}$$

Que. 4 dice are thrown at random find the prob. that atleast 2 get same no.

→

$$\frac{{}^4C_2 \times \left(\frac{1}{6}\right)^2 \times \left(\frac{5}{6}\right)^2 + {}^4C_3 \left(\frac{1}{6}\right)^3 \times \left(\frac{5}{6}\right) + {}^4C_4 \left(\frac{1}{6}\right)^4}{6\times6\times6\times6}$$

$$= \frac{{}^4C_2 \times 25 + {}^4C_3 \times 5 + {}^4C_4}{6^4}$$

$$= \frac{6\times25 + 4\times5 + 1}{6^4} = \frac{150+20+1}{6^4} = \frac{170+1}{6^4} = \frac{171}{6^4}$$

∩ no one gets same

$$1 - \frac{360}{1296}$$

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Que. A chess board 8×8 cm. A square is selected at random. Find prob. that a square selected has length of diagonal as $\sqrt{32}$ cm.

→

$\therefore$ side = $\sqrt{2} \times \frac{\sqrt{32}}{\sqrt{2}} = 4$ cm

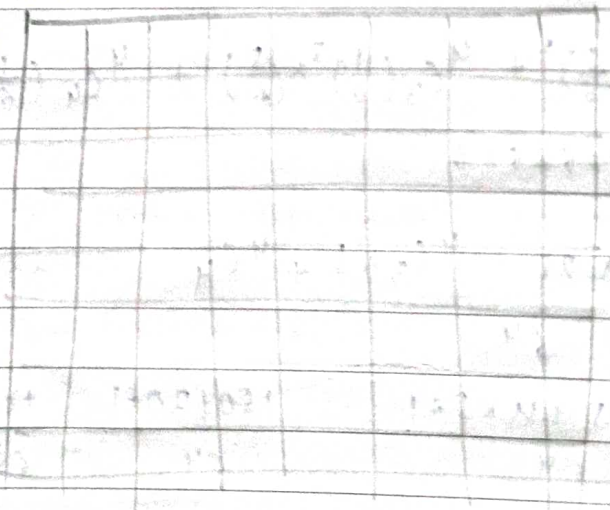
total squares →

$$\Sigma n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\Sigma n^2 = \frac{8 \times 9 \times 17}{6} = 204$$

side ↓ number

1cm = 64
2cm = 49
3cm = 36
4cm = 25
⋮
8cm = 1



$\therefore$ ans = $\frac{25}{204}$

total rectangles →

$$\Sigma n^3 = \left(\frac{n(n+1)}{2}\right)^2 = 1296$$

Date ___/___/_____ Saathi

Clocks

- 22 times angle between clock hands is zero in 24 hours and 11 in 12 hrs.

- speed of min and hr hand

	distance (angle)	time taken	speed
Min hand	360°	1 hr = 60 min	6° per min
Hr. hand	30°	60 min	(1/2)° per min

- Relative speed = $(\frac{11}{2})^\circ$ per min or $(5.5)^\circ$ per min

- 180° angle in a day comes 22 times (∠ angle of opposition ∠)

- time taken by hands to gets overlapped.

$$t = \frac{360}{11/2} = 65.45$$

∴ after every 65.45 mins clocks overlaps.

∴ no. of times it happened = $\frac{24 \times 60 \text{ min}}{65.45 \text{ min}} \approx 22$

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que. Accurate clock shows 8 o'clock. Find angle covered by hr hand till 2'o clock.

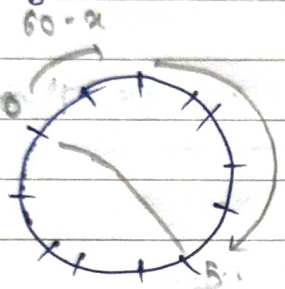
~~Qu~~ →

∠ covered in 1 hr = 30°

∴ in (8-2) = 6 hr = 6×30° = 180°

que. angle between hands at 10:25

→



= 30×3 = 150°

Find x

means ∠ coverd by hr hand in 25 mins = $30 \times \frac{5}{12}$ ← curr min hand / ← total

∴ $150 + 60 - 30 \times \frac{5}{12} = 197.5°$

or

initial angle between 10 and 12 at 10:00 is 60°

∴ after 25 mins

d = s×t

= 5.5 × 25

= 137.5

∴ total angle = 137.5 + 60 = 197.5°

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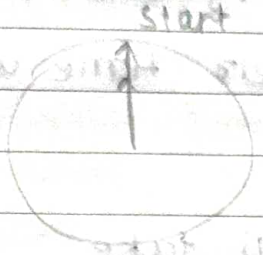
Que. clock started at noon By 10 min past 5, hr hand turned through

→



at 5 o'clock

angle = $30° \times 5 = 150°$

∴ 10 min after

$\angle = 150° + \frac{1}{2} \times 10$

$= 150° + 5° = 155°$

Que. angle at 2:25 pm

→

total angle = 90

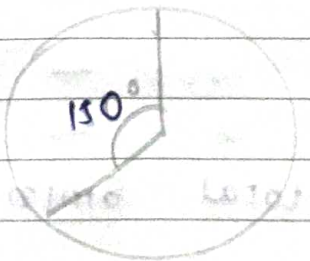
∠ covered by hr hand in 25 min = $25 \times \frac{1}{2} = 12.5$

∴ now ∠ = $90 - 12.5 = 77.5°$

Que. between 7:00 and 8:00 at how many times hands will be in oppo. direction.

→

time = same



opposite means ∠ = 180°

∴ ∴ relative distance = $180 - 150° = 30°$

∴ ans = $\frac{30°}{5.4}$ = 5.45 mins

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Que. clock C show right time

clock G 10 min gain every one hr

→ after how much time their time will be same

→ 1hr → 10 min

so min 6hr distance will take

such that 60 min gain = 1hr

but for currect time gain should be 12 hr

∴ 6 hr — 1hr

x — 12hr

∴ $x = \frac{12 \times 6}{1} = 72$ hr

Que. clock C losses 2 min every 36 hr

clock G Gains 2mins every 12 hr

6min gain after 12 hr

∴ total 8min diff in 36 hr

∴ 36 hr — 8min

x hr — 12×60 min

∴ x = 3240

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Que. one gain 5 min/hr other loses 10 min/hr start at 10 AM so after how much time diff = 12 hr

→

10 min Gap per hr

∴ 1 hr — 10 min

x hr — 12×60

∴ $\boxed{x = 72 \text{ hr}}$

Que. 4 sec — 1 min

4 min — 1 hr

4 min — 60 min

time diff = 7:20 − 10:00

= 9 hr 20 min

= 560 min

4 min — 60

x — 560

$x = \frac{560 \times 4}{60}$

56 min — 60 min

560 min — x

$\frac{560 \times 60}{56} = 10 \text{ hr}$

∴ ans = ~~08:00 PM~~ 08:00 PM

Binary Logic

Truth-teller → Always truth
Liar → Always false
Alternator → T, f, T, f, ...

I am a liar
→ only alternator will answer as true here.

I am not a truth teller
→ Given by an alternator.

I am an alternator
→ Given by a liar or an alternator.

I am not an alternator
→ Given by truthteller or alternator.

que. Karan is alternator.
Charan is liar

que. Saroj as T.T. Saroj T T
Manoj F F
Feroj F T

Manoj as TT Manoj T T
not possible

Feroj as TT Feroj T T
Saroj F F
Manoj F T
∴ ans = Feroj

Partnership

- A : B → investment ratio
  overall gain
- $\frac{A}{A+B} \times$ gain → gain by A or profit of A
- A × months of A : B × months of B
  ↳ changed ratio for monthly ratio investment.

Que.

A	:	B	:	C
2000 × 24	:	5000 × 24	:	3000 × 16
2 × 3	:	5 × 3	:	3 × 2
6	:	15	:	6
2	:	5	:	2

$\frac{6}{27} \times 6840 = \frac{5}{27} \times 6420$

$\frac{2}{9} \times 6480 = 1440$

Que.

A	:	B
60000 × 12	:	80000 × x
3 × 12	:	4x
36	:	4 × x

$\therefore$ x = 9

$\therefore$ ans = 12 − 9 = 3 months after.

Simple and Compound Interest

- Simple interest remains on principal amount
- compound is applied on principal + interest amount.

- Simple interest $= \frac{PNR}{100} = SI$
- compound interest $= A - P$

$$A = P\left(1 + \frac{R}{100}\right)^N \rightarrow \text{anually}$$

$$A = P\left(1 + \frac{(R/2)}{100}\right)^{2N} \rightarrow \text{for 6 months}$$

- Rule of 72

time required to double amount $= \frac{72}{R}$ years

↳ anual Rate of interest

For triple $= \frac{114}{R}$

For 4x $= \frac{144}{R}$