

GATE

CRASH COURSE

ALL BRANCH

Subject

General Aptitude

Lec : 05 Time and Distance

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Topics *to be covered*



1 Time and Distance





TIME and DISTANCE



Average Speed

$$(D) \text{ Distance} = \text{Speed} \times \text{Time}$$

(S) (T)



Relative Speed

opposite = (+)

Same = (v)

$$\frac{D}{T} = \text{Speed}$$

$$\frac{D}{S} = \text{Time}$$

Question



$$T = \frac{D}{S}$$

If you travel from M to N at 20km/hr and ~~Q~~ to ~~P~~ at 30 km/hr. What would be your average speed of the journey?

☆

$$\frac{2xy}{x+y}$$

6.5 min

20 kmph
'x' km

$$\frac{x}{20} + \frac{x}{30} = \frac{2x}{A.S.}$$

$$\Rightarrow \frac{8x}{60} = \frac{2x}{A.S.}$$

30 km/hr

$$\therefore A.S. = 24 \text{ km/hr}$$

$$\text{Average Speed} = \frac{\text{Total(D)}}{\text{Total(T)}}$$

$$A.S. = \frac{T \cdot D}{T \cdot T}$$

$$T \cdot T = \frac{T \cdot D}{A.S.}$$

Question



$$T = \frac{D}{S}$$

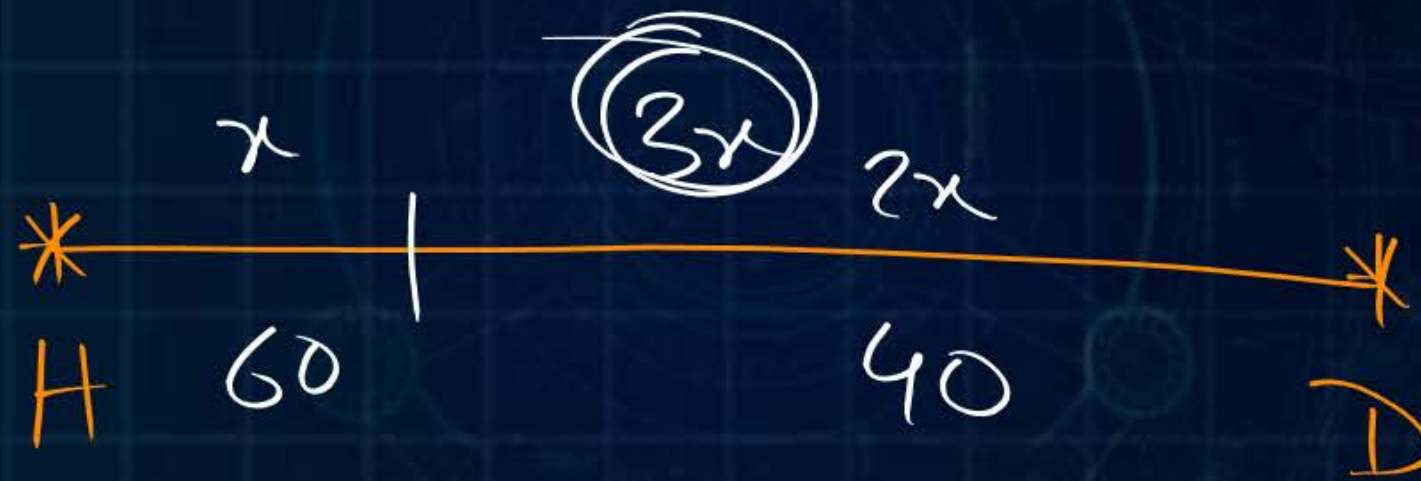
A man travels from Hyderabad to Delhi in his car. 1/3 of journey he covers at 60 km/hr & remaining journey at 40 km/hr. Find the average speed of his journey.

A 45 km/hr

B 28 km/hr

C 50 km/hr

D 48 km/hr



$$\frac{x}{60} + \frac{2x}{40} = \frac{3x}{A.S.}$$

$$\Rightarrow \frac{2x + 6x}{120} = \frac{3x}{A.S.}$$

$$\frac{8x}{120} = \frac{3x}{A.S.}$$

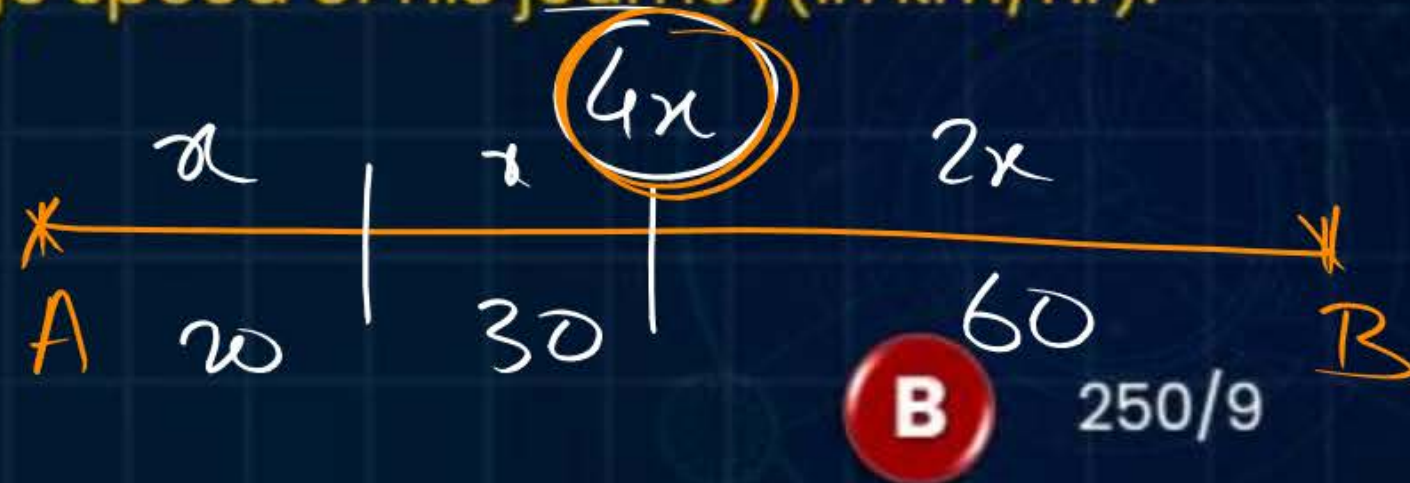
$$15$$

$$\therefore A.S. = \underline{\underline{45 \text{ km/hr}}}$$

Question



A man travels $\frac{1}{4}$ th of his journey at 20 km/hr, another $\frac{1}{4}$ th at 30 km/hr & remaining at 60 km/hr. Find the average speed of his journey (in km/hr).



$$\frac{x}{20} + \frac{x}{30} + \frac{2x}{60} = \frac{4x}{A.S.}$$

$$\Rightarrow \frac{3x + 2x + 2x}{60} = \frac{4x}{A.S.}$$

$$\frac{7x}{60} = \frac{4x}{A.S.}$$

$$A.S. = \frac{60 \times 4}{7}$$

$$= \frac{240}{7}$$

$$= 34\frac{2}{7}$$

$$= 34.28$$

Question



Two men walk along the same direction at 4.5 km/hr and 5.75 km/hr respectively. If they start walking together at their respective speeds, how many kilometers apart are they at the end of 3.5 hours?

A 30.725 km

B 4.375 km

C 5.75 km

D 4.5 km

$$R.S. = 5.75 - 4.5 \\ = (1.25)$$

$$Time = (3.5 \text{ hrs})$$

$$D = 1.25 \times 3.5 \\ = 4.375 \text{ km}$$

Question



$$64 \leftarrow \underline{S_C} : \underline{S_M} \rightarrow 32 \text{ km/hr}$$

A motorcyclist covers a distance of 192 km at a speed of 32 km/hr. A car starts from the same place as the motorcyclist 2.5 hours later, but covers the same distance 0.5 hour earlier. What is the ratio of the speed of the car and the motorcycle?

$$\text{Time} = \frac{\cancel{192}^{\cancel{48}}}{\cancel{32}^{\cancel{8}}} = \frac{6 \text{ hrs}}{1}$$

$$S_C = \frac{192}{3} = 64$$

A 1:2

B 3:1

C 2:1

D 4:3

$$\text{Time taken by Car} = (6 - 3) = 3 \text{ hrs}$$

$$S_C : S_M = \cancel{64} : \cancel{32} = 2 : 1$$

Question

Total Distance = 10 km $\frac{1}{6} \times 10$



P starts from X towards Y, 5 km apart at 9 AM at a speed of 5 km/hr. Q starts from X at 9:45 AM at a speed of 10 km/hr. After reaching Y, P starts back towards X. Likewise, Q reaches Y and returns. When do they meet?

A 10:10 AM

B 10:15 AM

C 10:12 AM

D 10:20 AM

After 9 am 't' hrs P \rightarrow 5 km/hr

$$10 = 5t + 10\left(t - \frac{45}{60}\right)$$

$$\Rightarrow 10 = 5t + 10t - \frac{30}{4} \quad 10 \text{ km/hr}$$

$$\Rightarrow 15t = \frac{40 + 30}{4} \Rightarrow \frac{70}{60} = t$$

$$\therefore t = 1\frac{10}{60} \text{ hr} = 1\frac{1}{6}$$

$$= 1 \text{ hr} \frac{10 \text{ km}}{10 \text{ km/hr}}$$

$$\underline{\underline{10:10 \text{ am}}}$$

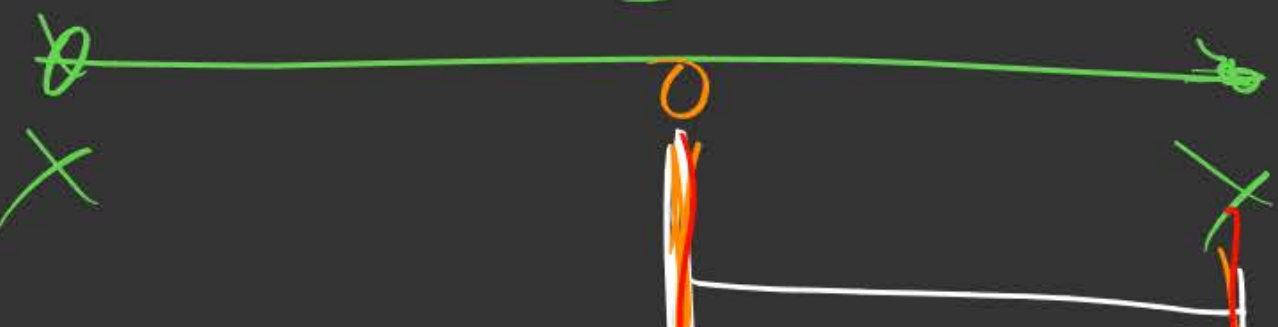
$$\text{Dist}(P) = \text{Dist}(Q)$$

10:30

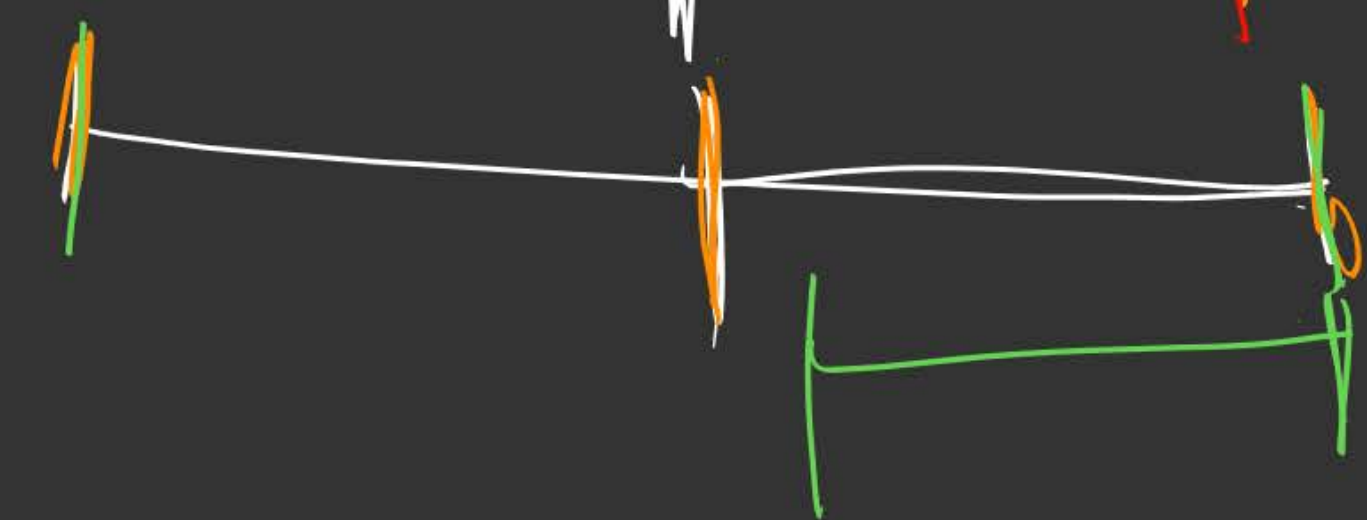
After 9 am (t) hrs



$$5t = 10\left(t - \frac{45}{60}\right)$$



$$5t = 10t - \frac{30}{4}$$



$$5t = \frac{30}{4}$$

$$t = \frac{30}{4 \times 5} = \frac{30}{20} = \underline{1.5 \text{ hrs}}$$

$$D = 600 \text{ km}$$

$$R.S. = 60 \text{ kmph}$$

$$T = \frac{600 \text{ km}}{60 \text{ km/h}} = 10 \text{ hrs}$$

$$D_1 + D_2 = \text{Total Distance}$$

P

$$\underline{400} + \underline{200}$$

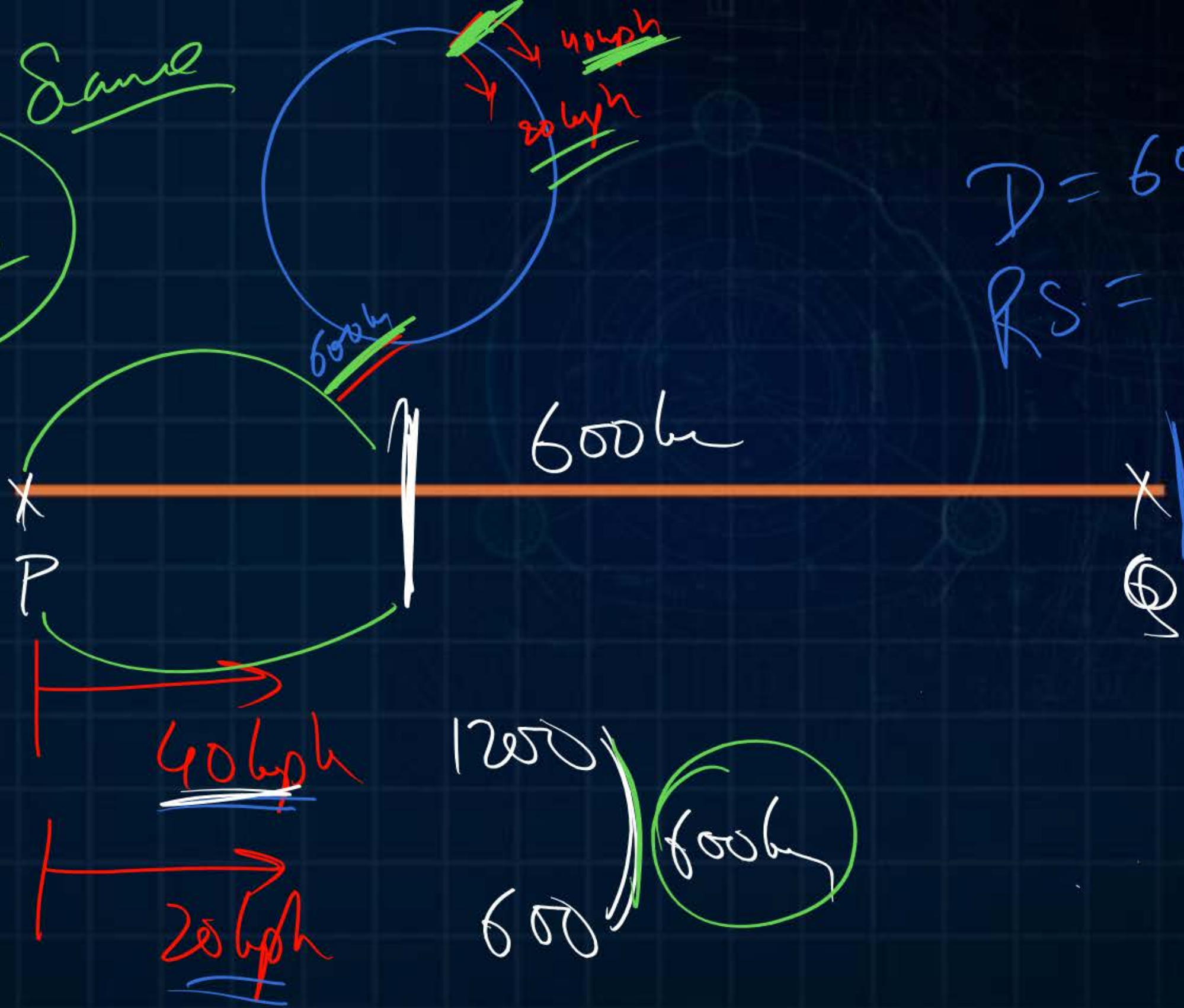
→
40 kmph

←
20 kmph

600 km

Same

$$D_1 = D_2$$



$$D = 600 \text{ mm}$$

$$RS = 20 \text{ mph}$$

$$T = \frac{600}{\pi \times 20}$$

$$= 30 \text{ mm}$$

Question



$9:30 + 2$
 $11:30 + 56 \text{ min}$
 $A \rightarrow (9:30)$
 $X (3 \text{ pm})$
 $12:26$
 $1:30 \text{ pm}$
 $11:30 \text{ am}$
 B

Train A leaves station X at 09:30 hours and reaches station Y at 13:30 hours. Train B leaves station Y at 11:30 hours and reaches station X at 15:00 hours. Assuming that the two trains travel at constant speeds, at what time do the two trains cross each other?

$\frac{14}{18} \times 60 \text{ min}$
A 14:00 hours

C 13:24 hours

$$S_A = \frac{x}{4} \text{ mph}$$

$$S_B = \frac{x}{3.5} \text{ mph}$$

B 12:26 hours

D 11:30 hours

After 9:30 am (y) hrs

$$x = \frac{x}{4} y + \frac{x}{3.5} (y - 2)$$

$$15y = 44$$

$$\therefore y = \frac{44}{15} = 2\frac{14}{15} \text{ hrs}$$

$$D_1 + D_2 = T \cdot D$$

$$\frac{y}{4} + \frac{y-2}{3.5} = 1$$

$$\Rightarrow \frac{y}{4} + \frac{10y-20}{35} = 1$$

$$\Rightarrow 35y + 40y - 80 = 140$$

Question

A person takes one hour more to cover a certain distance walking at a speed of 2 km/hr compared to walking at 3 km/hr. The distance is

A 4 km

B 6 km

C 8 km

D 10 km

'x' km

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

$$\Rightarrow \underline{x = 6}$$

Question

$$D = \overset{\text{R.S.}}{\text{Speed}} \times \underline{T_{\text{un}}} \quad \frac{D}{T} = \underline{\underline{\text{Speed}}}$$



X is running around a circular track completing one round every 40 seconds. Y running in the opposite direction on the same circular track crosses X every 15 seconds. The time in seconds taken by Y to complete one round is

A 12

C 30



B 24

D 36

24 seconds

$$\text{R.S.} = \left(\frac{a}{40} + \frac{a}{n} \right)$$

Time = 15 seconds

$$\frac{a}{15} = \frac{a}{40} + \frac{a}{n}$$

$$\Rightarrow \frac{1}{15} = \frac{1}{40} + \frac{1}{n}$$

$$\underline{n = 24}$$

$$\begin{aligned} \frac{1}{n} &= \frac{1}{15} - \frac{1}{40} \\ \frac{1}{n} &= \frac{8-3}{120} \\ \frac{1}{n} &= \frac{5}{120} \\ n &= 24 \end{aligned}$$

Question

$$\text{No. of stations} = \frac{24}{2} = 12$$
$$\frac{3}{4} \times \frac{12}{1} = 9$$



A metro train runs at a speed of 45 km/h. It covers a total distance of 72 km on its route from origin to destination station in 2 hours that includes stops at intermediate stations. If it stops for 2 minutes at each station, how many intermediate stations are there in the route?

A 24

B 18

C 12

D 9

Time taken by Train without stoppages

$$= \frac{72}{45} = 1 \frac{3}{5} \text{ hrs}$$
$$= 1 \text{ hr } 36 \text{ minutes}$$

Time with stoppage
= 2 hrs
24 min

Question



Suresh took 15 seconds to cross a rectangular field diagonally walking at the rate of 52m/min, and the Rajesh took the same time to cross the same field along its sides walking at the rate of 68m/min. Find the area of the field.

$$l^2 + b^2 = d^2$$

$$(l+b)^2 - 2lb = d^2$$

$$l \times b = 60 \text{ m}^2$$

A 50 m²

C 60 m²

$$\text{Dist (S)} = \frac{52}{60} \times \frac{15}{4} = 13$$

B 40 m²

D 30 m²

$$(d) = 13 \text{ m}$$

$$\text{Dist (R)} = \frac{68}{60} \times \frac{15}{4} = 17$$

$$(l+b)^2 = l^2 + b^2 + 2lb$$

$$(l+b)^2 - 2lb = l^2 + b^2$$

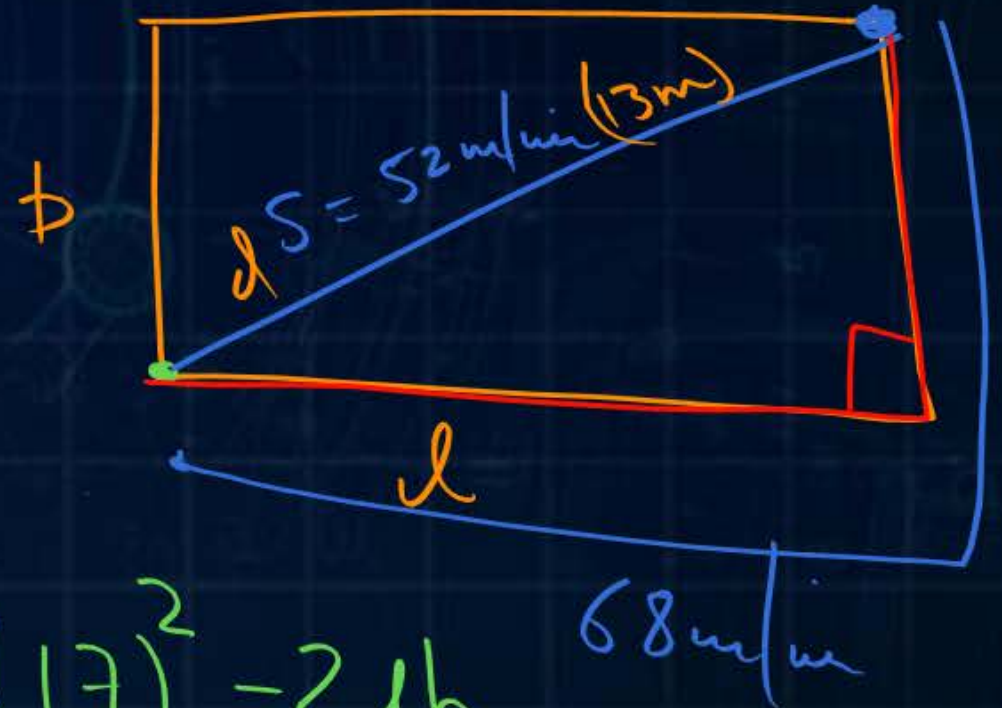
$$= 17^2 = 289$$

$$= (17 \text{ m})^2 = l^2 + b^2$$

$$(13)^2 = (17)^2 - 2lb$$

$$\Rightarrow 169 = 289 - 2lb$$

$$\frac{1200}{2} - lb = 60$$



Question (PYQ GATE Exam 2022 ME)



A person travelled 80 km in 6 hours. The person travelled the first part with a uniform speed of 10 kmph and the remaining part with a uniform speed of 18 kmph. What percentage of the total distance is travelled at a uniform speed of 10 kmph?

1st part = 'x' km
2nd part = 80 - x km

$$T = \frac{D}{S}$$

A 28.25

B 37.25

C 43.75

D 50.00

$$\frac{35}{80} \times 100 = \frac{x}{10} + \frac{80-x}{18}$$

$$\Rightarrow 6 = \frac{9x + 400 - 5x}{90}$$
$$= \frac{175}{90}$$
$$= 43.75\%$$

140 = 40

$$\therefore x = \frac{70}{2} = 35$$

Question (PYQ GATE Exam 2019 CS)



Two cars start at the same time from the same location and go in the same direction. The speed of the first car is 50 km/h and the speed of the second car is 60 km/h. The number of hours it takes for the distance between the two cars to be 20 km is ____

A 1

C 3

$$R.S. = 60 - 50 = 10 \text{ km/h}$$

B 2

$$D = 20 \text{ km}$$

D 6

$$T = \frac{20}{10} = 2 \text{ hours}$$

Question (PYQ GATE Exam 2017 CE)



Budhan covers a distance of 19 km in 2 hours by cycling one fourth of the time and walking the rest. The next day he cycles (at the same speed as before) for half the time and walks the rest (at the same speed as before) and covers 26 km in 2 hours. The speed in km/h at which Budhan walks is?

walking = 'x' km/h ✓
Cycling = 'y' km/h ✓
6 km/h

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

A 1

B 4

C 5

D 6

$$D = S \times T$$

$$19 = y \times \frac{1}{2} + x \times \frac{3}{4}$$

$$\Rightarrow 19 = \frac{y}{2} + \frac{3x}{4} \quad \times 2$$

$$26 = y + x$$

$$38 = y + 3x$$

$$\begin{array}{r} 38 = y + 3x \\ - 26 = y + x \\ \hline \end{array}$$

$$12 = 2x$$

$$\therefore x = \frac{12}{2} = 6$$

Question (PYQ GATE Exam 2019 CS)



A car travels 8 km in the first quarter of an hour, 6 km in the second quarter and 16 km in the third quarter. The average speed of the car in km per hour over the entire journey is

A 30

C 40

B 36

D 24

$$T \cdot D = 30 \text{ km}$$

$$T \cdot T = 45 \text{ minutes}$$

$$= 3 \frac{45}{60} \text{ hrs}$$

$$= 3 \frac{3}{4} \text{ hrs}$$

$$A.S. = \frac{T \cdot D}{T \cdot T}$$

$$A.S. = 30 \times \frac{4}{3} = 40 \text{ km/hr}$$

Question (PYQ GATE Exam 2013 ME, CS)



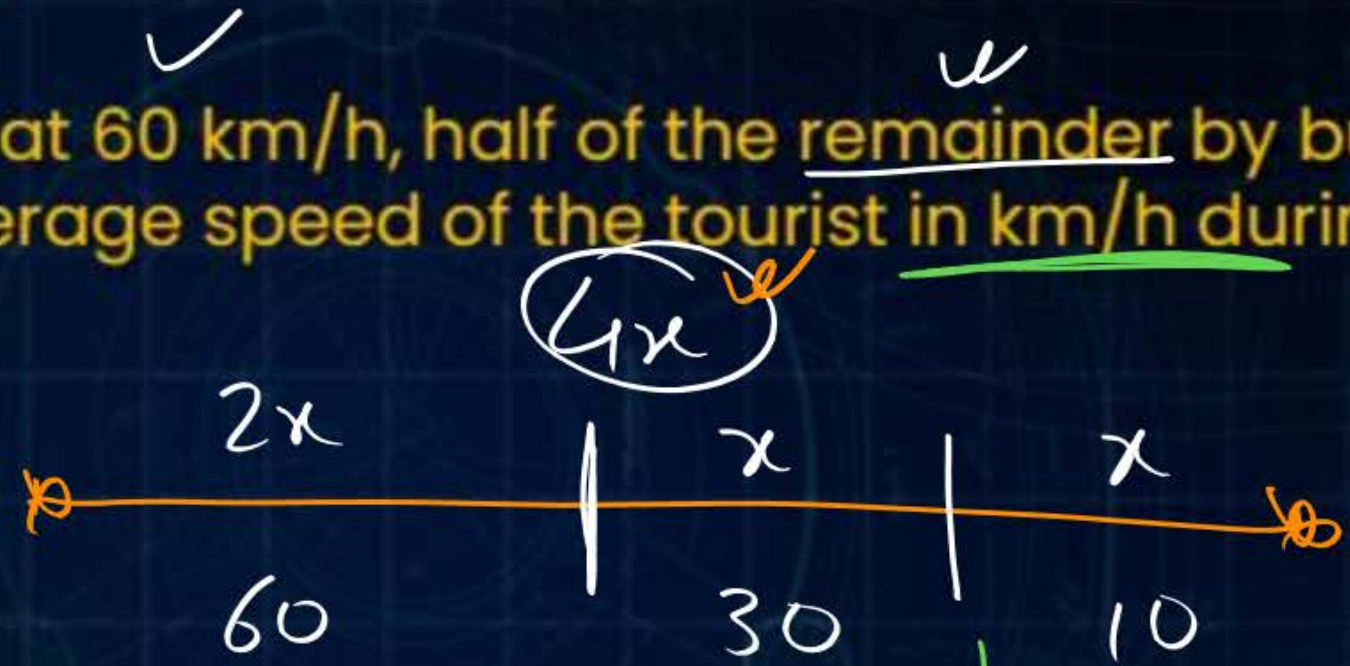
A tourist covers half of his journey by train at 60 km/h, half of the remainder by bus at 30 km/h and rest by cycle at 10 km/h. The average speed of the tourist in km/h during his entire journey is?

A 36

B 30

C 24

D 18



$$\frac{2x}{60} + \frac{x}{30} + \frac{x}{10} = \frac{4x}{\text{A.S.}}$$

$$\Rightarrow \frac{2x + 2x + 6x}{60} = \frac{4x}{\text{A.S.}}$$

$$\frac{10x}{60} = \frac{4x}{\text{A.S.}}$$

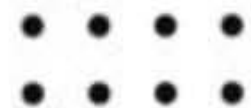
$$\text{A.S.} = 24 \text{ km/h}$$



Summary



TIME & DISTANCE

The word 'Thank' is written in a large, yellow, cursive script. A yellow arrow starts at the top of the 'T', extends horizontally to the right, and then curves downwards to follow the stem of the 'T'. Below the cursive word, the word 'THANK' is written in a bold, white, sans-serif, all-caps font.

Keep Hustling!