Unit - I - Quantitative Ability III

TIME, SPEED AND DISTANCE

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

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$$\text{Distance} = \text{Speed} \times \text{Time}$$

Units of Speed, Time & Distance :

Time = seconds (s), minutes (min), hours (hr).

Distance = meters (m), kilometers (km), miles, feet.

Speed = m/s, km/hr.

SOLVE :

CAR $\longrightarrow$ S = 10km/hr

0km ——————————— 20 km

(i) $D = S \times T$

$20 = 10 \times T$

$T = \frac{20\ km}{10 km/hr}$

$T = 2\ hr$

(ii) $S = D/T$

$S = \frac{20\ km}{2\ hr}$

$S = 10\ km/hr$

(iii) $T = D/S$

$T = \frac{20 km}{10 km/hr}$

$T = 2\ hr$

Conversion :

(i) km/hr → M/S

$\Rightarrow \frac{km}{hr} * \frac{5}{18}$ = Values in M/S

Eg: 60km/hr → m/s

$\frac{60 \times 5}{18} = \frac{300}{18} = 16.67$ m/s

(ii) m/s → km/hr

$\Rightarrow \frac{m}{s} * \frac{18}{5}$ = Values in km/hr

Eg: $16.67 \times \frac{18}{5} = 60$ km/hr

Problems :

1. The road is at the distance of 100 meters. It takes 25 seconds to cross the road. Then what must be the speed ?

$$\text{Speed} = \frac{\text{distance}}{\text{Time}}$$

$$S = \frac{100\ m}{25\ s}$$

$$S = 4\ m/s$$

Shortcuts :

⇒ To find the average speed when time is same.

Average speed = $\frac{\text{Speed 1} + \text{Speed 2}}{2}$

2. A travels 600 km at 50 km/hr, Then again travels another 700 km at 50 km/hr. What is the average speed? And also find the time taken to travel?

Time taken for 600 km = $\frac{600 \text{ km}}{50 \text{ km/hr}}$

= 12 hrs.

Time taken for 700 km = $\frac{700 \text{ km}}{50 \text{ km/hr}}$

= 14 hrs.

Average Speed = $\frac{50 + 50}{2} = \frac{100}{2} = 50$ km/hr

⇒ Average Speed when distances are same

$$S_a = \frac{2 S_1 . S_2}{S_1 + S_2}$$

3. Suraj has travels from his house to park at a speed of 70 km/hr. He suddenly returns home at a speed of 80 km/hr. what is the average speed?

$S_1 = 70$

$S_2 = 80$

$$S_a = \frac{2 . S_1 . S_2}{S_1 + S_2}$$

$= \frac{2 \times 70 \times 80}{70 + 80}$

$= \frac{11200}{150}$

$= 74.67$ km/hr

4. A Person crosses a 600 m long street in 5 mins. What is his speed in km per hour?

$$\text{Speed} = \frac{600}{5 \times 60} \text{ m/s}$$

$$= 2 \text{ m/s}$$

To find in km/hr:

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

$$= 7.2 \text{ km/hr}$$

5. An Aeroplane covers a certain distance at a speed of 240 km/hr in 5 hours. To cover the same distance in $1\frac{2}{3}$ hours, it must travel at a speed of ?

$$\text{Distance} = \text{Speed} \times \text{time}$$

$$= 240 \times 5$$

$$= 1200 \text{ km}$$

$$S = d/T$$

$$= \frac{1200}{1\frac{2}{3}} = \frac{1200}{\frac{5}{3}}$$

$$= 1200 \times \frac{3}{5}$$

$$= 720 \text{ km/hr}$$

$\therefore$ Required Speed = 720 km/hr

6. A man complete a journey in 10 hours. He travels first half of the journey at the rate of 21 km/hr and second half at the rate of 24 km/hr. Find the total journey in km.

$\Rightarrow$ Total hours $= 10$

$$\frac{[1/2]\,x}{21} + \frac{[1/2]\,x}{24} = 10$$

$$\frac{1}{2}\left[\frac{x}{21} + \frac{x}{24}\right] = 10$$

$$\frac{x}{21} + \frac{x}{24} = 20$$

$$\frac{24x + 21x}{504} = 20$$

$$24x + 21x = 10080$$

$$45x = 10080$$

$$x = \frac{10080}{45} = 224 \text{ km}$$

If a person walks at 14 km/hr instead of 10 km/hr, he would have walked 20 km more. The actual distance travelled by him is:

A. 50 km

B. 56 km

C. 70 km

D. 80 km

Answer: Option **A**

Explanation:

Let the actual distance travelled be x km.

Then, $\frac{x}{10} = \frac{x + 20}{14}$

$\Rightarrow 14x = 10x + 200$

$\Rightarrow 4x = 200$

$\Rightarrow x = 50$ km.

A man on tour travels first 160 km at 64 km/hr and the next 160 km at 80 km/hr. The average speed for the first 320 km of the tour is:

A. 35.55 km/hr

B. 36 km/hr

C. 71.11 km/hr

D. 71 km/hr

Answer: Option **C**

Explanation:

Total time taken = $\left(\frac{160}{64} + \frac{160}{80}\right)$ hrs. $= \frac{9}{2}$ hrs.

$\therefore$ Average speed = $\left(320 \times \frac{2}{9}\right)$ km/hr $= 71.11$ km/hr.

In covering a distance of 30 km, Abhay takes 2 hours more than Sameer. If Abhay doubles his speed, then he would take 1 hour less than Sameer. Abhay's speed is:

A. 5 kmph

B. 6 kmph

C. 6.25 kmph

D. 7.5 kmph

Answer: Option **A**

Explanation:

Let Abhay's speed be x km/hr.

Then, $\frac{30}{x} - \frac{30}{2x} = 3$

$\Rightarrow 6x = 30$

$\Rightarrow x = 5$ km/hr.

Robert is travelling on his cycle and has calculated to reach point A at 2 P.M. if he travels at 10 kmph, he will reach there at 12 noon if he travels at 15 kmph. At what speed must he travel to reach A at 1 P.M.?

A. 8 kmph

B. 11 kmph

C. 12 kmph

D. 14 kmph

Answer: Option **C**

Explanation:

Let the distance travelled by x km.

Then, $\frac{x}{10} - \frac{x}{15} = 2$

$\Rightarrow 3x - 2x = 60$

$\Rightarrow x = 60$ km.

Time taken to travel 60 km at 10 km/hr = $\left(\frac{60}{10}\right)$hrs $= 6$ hrs.

So, Robert started 6 hours before 2 P.M. *i.e.*, at 8 A.M.

$\therefore$ Required speed = $\left(\frac{60}{5}\right)$kmph. $= 12$ kmph.

A farmer travelled a distance of 61 km in 9 hours. He travelled partly on foot @ 4 km/hr and partly on bicycle @ 9 km/hr. The distance travelled on foot is:

A. 14 km

B. 15 km

C. 16 km

D. 17 km

Answer: Option **C**

Explanation:

Let the distance travelled on foot be x km.

Then, distance travelled on bicycle = $(61 - x)$ km.

So, $\frac{x}{4} + \frac{(61 - x)}{9} = 9$

$\Rightarrow 9x + 4(61 - x) = 9 \times 36$

$\Rightarrow 5x = 80$

$\Rightarrow x = 16$ km.