

$$\begin{array}{c} D \\ \swarrow \quad \searrow \\ S \quad T \end{array} \stackrel{(ob)}{=} \begin{array}{c} D \\ \swarrow \quad \searrow \\ T \quad S \end{array} \quad D = S \times T$$

### Four types

- ① Distance same
- ② Speed " "
- ③ Time " "
- ④ Avg speed.

① A boy increases his speed to  $\frac{9}{5}$  times of his original speed. by this he reaches his school 20 minutes before the usual time. how much time does he takes usually.

$$D = D$$

$$S_1 \times T_1 = S_2 \times T_2$$

$S \rightarrow$  usual speed



$\downarrow$   
usual = Fast

$$S \times T = \frac{9}{5} S \times (T - 30)$$

$$5T = 9T - 270$$

$$270 = 4T$$

$$T = 67.5 \text{ min}$$

2) Ramesh sees a thief at a distance 80m:

Ramesh starts chasing the thief who is fleeing at a speed of  $5\text{ m/s}$ . Ramesh is chasing him with a speed of  $7\text{ m/s}$ . How much distance does the thief cover before Ramesh catches him:

Catches him:

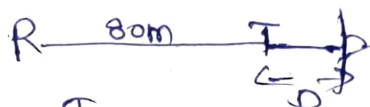
$$T_R = T_T$$

$$\frac{D_R}{S_R} = \frac{D_T}{S_T}$$

$$\frac{80+D}{7} = \frac{D}{5} = 400 + 5D = 7D$$

$$400 = 2D$$

$$D = 200\text{ m} \quad \checkmark$$



$$T = D$$

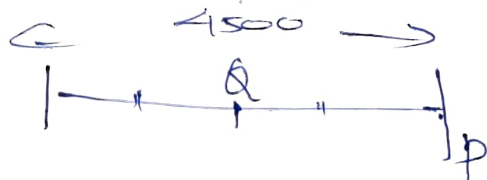
$$R = 80 + D$$



3) P, Q and R are in cycle race of 4500 meters.

P cycles twice as fast as Q. R cycles  $\frac{1}{3}$ rd as fast as Q. R completes the race in 45 minutes.

Then where was Q from the finishing line when P finished the race.



$$P = 2Q$$

$$S_P = 2S_Q$$

$$Q = \frac{P}{2} \quad P = 4500$$

$$Q = 2250\text{ m}$$

## Unit-I

Time, Speed, Distance.

If a distance  $D$  is covered in time  $T$ , then the speed is given by.

$$\boxed{S = \frac{D}{T}} \Rightarrow T = \frac{D}{S} \quad \& \quad D = S \times T$$

$S = \text{Speed}$

$T = \text{Time}$

$D = \text{Distance.}$

$$\boxed{\text{Avg Speed} = \frac{\text{Total Distance}}{\text{Total Time taken}}}$$

If  $D = \text{constant}$ , then

$$\textcircled{1} \quad \boxed{\text{Avg speed} = \frac{2S_1 S_2}{S_1 + S_2}}$$

If  $T = \text{constant}$ , then

$$\boxed{\text{Avg speed} = \frac{S_1 + S_2}{2}}$$

Avg = Average

Ex:-

1) A lorry travels 600 km in 15 hrs and another 300 km in 10 hours. Find the average speed.

Sol:

$$\text{Avg speed} = \frac{\text{Total Distance}}{\text{Total Time}} = \frac{600 + 300}{15 + 10}$$
$$= \frac{900}{25} = 36 \text{ kmph}$$

Ex-2 A van moves 300 km at a speed of 45 kmph and then it increases its speed to 60 kmph to travel another 500 km. Find the avg speed.

$$\text{Avg speed} = \frac{D_1 + D_2}{\frac{D_1}{S_1} + \frac{D_2}{S_2}}$$

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

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

$$= \frac{300 + 500}{\frac{300}{45} + \frac{500}{60}} = \frac{800 \times 3}{45} = 53 \frac{1}{3} \text{ kmph}$$

~~$$\Rightarrow \frac{300}{45} + \frac{500}{60} = \frac{20}{3} + \frac{50}{6} = \frac{10}{3} + \frac{50}{6} = \frac{20}{6} + \frac{50}{6} = \frac{70}{6} = \frac{35}{3}$$~~

~~$$\Rightarrow \frac{800}{20} = \frac{20}{3} + \frac{50}{6} = \frac{120 + 150}{6} = \frac{270}{6} = 45$$~~

~~$$\Rightarrow \frac{800 \times 3}{45} = \frac{2400}{45}$$~~

H.W.:- Ramesh, travelling from Mumbai to Pune covered the first 50 km of the distance at 100 km/hr, the next 100 km at 50 km/hr and the rest of the distance at 60 km/hr. If the distance between Mumbai & Pune is 270 km then what is the average speed of Ramesh for the entire journey?

- a) 60 kmph    b) 50 kmph    c) 100 kmph  
 d) 75 kmph

Ans:

$$\text{Avg. speed} = \frac{\text{Total Distance}}{\text{Total Time}}$$

$$\Rightarrow \frac{270}{\dots}$$

$$\frac{50\text{km}}{100\frac{\text{km}}{\text{hr}}} + \frac{100\text{km}}{50\frac{\text{km}}{\text{hr}}} + \frac{120\text{km}}{60\frac{\text{km}}{\text{hr}}}$$

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

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

$$\frac{270}{150} = \frac{120}{120}$$

$$\Rightarrow \frac{270}{\dots}$$

$$\frac{270}{\frac{1}{2} + 2 + 2} = \frac{270}{\frac{1}{2} + 4}$$

$$\Rightarrow \frac{270}{\frac{9}{2}} = \frac{270 \times 2}{9} = \frac{540}{9}$$

Ans: 60 km/hr