

SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai
Accredited by NAAC-UGC with 'A++' Grade (Cycle III) &
Accredited by NBA (B.E - CSE, EEE, ECE, Mech & B.Tech.IT)
COIMBATORE-641 035, TAMIL NADU



VQAR-II

UNIT- 1

QUANTITATIVE ABILITY III

Time, Speed and Distance:

Speed: The rate at which a body or an object travels to cover a certain distance is called **speed** of that body.

Time: The duration in hours, minutes or seconds spent to cover a certain distance is called the **time**.

Distance: The length of the path travelled by any object or a person between two places is known as **distance**.

Relation between Speed, Time and Distance

Speed is the distance covered by an object in unit time. It is calculated by dividing the distance travelled by the time taken.

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

Note: Units of Speed, time and distance should be in the same metric system.

Example: 1 A car covers 125 km in 5 h, then find the speed of the car.

Solution: We know that, $\text{Speed} = \frac{\text{Distance}}{\text{Time}}$

$$\text{Required speed} = \frac{125}{5} = 25 \text{ km/h.}$$

Example: 2 A train covers a distance of 200 km with a speed of 10 km/h. What time is taken by the train to cover this distance?

Solution: Speed = 10 km/h and distance = 200 km

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}} = \frac{200}{10} = 20$$

$$\text{Required time} = 20 \text{ h.}$$

Example: 3 A bike crosses a bridge with a speed of 108 km/h. What will be the length of the bridge, if the bike takes 8 h to cross the bridge?

Solution: Here, length of the bridge = Distance travelled by bike in 8 h
= Speed \times Time

Given that, Speed = 108 km/h

$$\text{Time} = 8 \text{ h then length of the bridge} = 108 \times 8 = 864 \text{ km.}$$

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Basic Formulae Related to Speed, Time and Distance

Formula: 12

$$\text{Conversion of units } a \text{ km/h} = \frac{a \times 1000 \text{ m}}{3600 \text{ s}} = \frac{5a}{18} \text{ m/s}$$

$$a \text{ m/s} = \frac{a \times 1/1000 \text{ km}}{1/3600 \text{ h}} = \frac{18a}{5} \text{ km/h}$$

Example: 4 Convert 72 km/h into m/s.

Solution: We know that, $a \text{ km/h} = \left(a \times \frac{5}{18}\right) \text{ m/s}$

$$72 \text{ km/h} = \left(72 \times \frac{5}{18}\right) \text{ m/s} = 4 \times 5 = 20 \text{ m/s.}$$

Example: 5 Convert 25 m/s into km/h.

Solution: We know that, $a \text{ m/s} = \left(a \times \frac{18}{5}\right) \text{ km/h}$

$$25 \text{ m/s} = \left(25 \times \frac{18}{5}\right) \text{ km/h} = 5 \times 18 = 90 \text{ km/h.}$$

Formula: 2

If speed is kept constant, then the distance covered by an object is proportional to time.

ie., Distance \propto Time (Speed constant) or $\frac{D_1}{T_1} = \frac{D_2}{T_2}$

Example: 6 A person covers $20 \frac{2}{5}$ km in 3 h. What distance will he cover in 5 h?

Solution: Here, speed is kept constant. Therefore, according to the formula,

$$\frac{D_1}{T_1} = \frac{D_2}{T_2}$$

$$\text{Given that } D_1 = 20 \frac{2}{5} = \frac{102}{5} \text{ km}$$

$$T_1 = 3 \text{ h}, T_2 = 5 \text{ h and } D_2 = ?$$

$$\frac{102/5}{3} = \frac{D_2}{5}$$

$$D_2 = \frac{102 \times 5}{5 \times 3} = 34 \text{ km}$$

Distance covered by the object in 5 h = 34 km.

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Formula: 3

If time is kept constant, then the distance covered by an object is proportional to speed.

ie., Distance \propto Speed (time constant) or $\frac{D_1}{S_1} = \frac{D_2}{S_2}$

Example: 7 A person covers a distance of 12 km, while walking at a speed of 4 km/h. How much distance he would cover in same time, if he walks at a speed of 6 km/h ?

Solution: Given that $D_1 = 12$ km, $S_1 = 4$ km/h, $S_2 = 6$ km/h, $D_2 = ?$

Since, the time is kept constant. Therefore, according to the formula, $\frac{D_1}{S_1} = \frac{D_2}{S_2}$.

$$\Rightarrow \frac{12}{4} = \frac{D_2}{6} \Rightarrow D_2 = 18 \text{ km}$$

Therefore, the person will cover 18 km.

Formula: 4

If distance is kept constant, then the speed of a body is inversely proportional to time.

ie, Speed $\propto \frac{1}{\text{Time}}$ (distance constant) (or) $S_1 T_1 = S_2 T_2 = S_3 T_3 = \dots\dots\dots$

Note: If the ratio of speeds of two objects is $x : y$, then to cover same distance, the ratio of time taken will be $y : x$.

Example: 8 A person covers a certain distance with a speed of 18 km/h in 8 min. If he wants to cover the same distance in 6 min, what should be his speed?

Solution: We know that, Speed = $\frac{\text{Distance}}{\text{Time}} \Rightarrow 18 = \frac{\text{Distance} \times 60}{8}$ [8 min = $\frac{8}{60}$ h]

$$\text{Distance} = \frac{18 \times 8}{60} = \frac{12}{5} \text{ km}$$

$$\text{Speed to cover } \frac{12}{5} \text{ km in 6 min} = \frac{\text{Distance}}{\text{Time}} = \frac{\frac{12}{5}}{\frac{1}{10}} \quad [6 \text{ min} = \frac{1}{10} \text{ h}]$$

$$= \frac{12}{5} \times 10 = 12 \times 2 = 24 \text{ km /h.}$$