

Time and Distance: 8 Shortcuts & Tricks explained with solved examples

The terms time and distance are related to the speed of a moving object.

Speed: Speed is defined as the distance covered by an object in unit time.

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

Some Important Facts:

- * Distance travelled is proportional to the speed of the object if the time is kept constant.
- * Distance travelled is proportional to the time taken if speed of object is kept constant.
- * Speed is inversely proportional to the time taken if the distance covered is kept constant.
- * If the ratio of two speeds for same distance is a:b then the ratio of time taken to cover the distance is b:a

Relative Speed:

- i. If two objects are moving in same direction with speeds of x and y then their relative speed is $(x - y)$
- ii. If two objects are moving in opposite direction with speeds of x and y then their relative speed is $(x + y)$

Unit Conversion:

- i. To convert 'X' Km/hr into m/s
 - Multiply X with $5/18$
- ii. To convert 'x' m/s into Km/hr
 - Multiply x with $18/5$

Some Important Shortcut Formulas

Trick-1:

If some distance is travelled at x km/hr and the same distance is travelled at y km/hr then the average speed during the whole journey is given by

$$\text{Average speed} = \frac{2*x*y}{(x+y)}$$

Ex: A person travelled a distance with 8 km/hr and return the journey with 4 km/hr. then, the average speed during the journey ?

- a. 5 km/hr
- b. $16/3$ km/hr
- c. 6 km/hr
- d. 12 km/hr

Trick-2:

If a person travels a certain distance at x km/hr and returns at y km/hr, if the time taken to the whole journey is T hours then the one way distance is given by

$$D = [T * x * y] / (x + y)$$

Ex: If a person travels certain distance at 6 Km/hr and returns at 8 Km/hr, if the time taken to the whole journey in 7 hours. then, the one way distance ?

- a. 16 b. 24 c. 8 d. 32

Sol: $D = (7 * 8 * 6) / (8 + 6) = 24$ km

Trick-3:

If a car does a journey in ' T ' hrs, the first half at ' x ' km/hr and the second half at ' y ' km/hr. The total distance covered by the car is :

$$(2 * \text{Time} * x * y) / (x + y).$$

Ex: A motorcar does a journey in 10 hrs, the first half at 21 kmph and the second half at 24 kmph. Find the distance?

- a. 124 b. 224 c. 225 d. 125

Sol: Distance = $(2 * 10 * 21 * 24) / (21 + 24) = 10080 / 45 = 224$ km.

Trick-4:

If the same distance is covered at two different speeds S_1 and S_2 and the time taken to cover the distance are T_1 and T_2 , then the distance is given by

$$D = [(s_1 * s_2) / (s_1 - s_2)] * (t_2 - t_1)$$

Ex: A person travelled a distance with two different speeds 5 Km/hr and 6 km/hr and time taken to cover distance are 3 hrs and 4 hrs. the distance travelled by person ?

- a. 30 km b. 20 km c. 15 km d. 38 km

Sol: $D = [(5 * 6) / (5 - 6)] * (4 - 3) = 30$ km

Trick-5:

A distance covers in some time with S_1 speed. if it takes T hr more to cover same distance with S_2 speed. So, the distance is

$$D = (T * S_1 * S_2) / (S_1 - S_2)$$

Ex: A person covers a distance with 5 km/hr in some time. if he moves with 3 km/hr speed he covers the distance in 2 hr more. the distance travelled by person ?

- a. 10 km b. 15 km c. 18 km d. 21 km

Sol: $D = (2 \times 5 \times 3) / (5 - 3) = 15 \text{ km}$

Trick-6:

If a distance traveled with S_1 . then, it takes T hrs late. same distance traveled with S_2 . then, it takes T hrs earlier. so, the distance is

$$D = (2 \times S_1 \times S_2 \times T) / (S_2 - S_1)$$

Ex: A person travelled a distance with 5 km/hr then, he will take 2 hrs more. if he travels with 7.5 km/hr then, he will reach 2 hrs earlier. the distance traveled by person ?

a. 55 km b. 60 km c. 65 km d. 70 km

Sol: $D = (2 \times 5 \times 7.5 \times 2) / (7.5 - 5) = 60 \text{ km}$

Trick-7:

If a body covers part of the journey at speed p km/hr and the remaining part of the journey at a speed q km/hr and the distances of the two parts of the journey are in the ratio $m : n$, then the average speed for the entire journey is

$$= (m+n) pq / (mq+np).$$

Ex: If a Manish covers part of the journey at speed 2 km/hr and the remaining part of the journey at a speed 4 km/hr and the distances of the two parts of the journey are in the ratio 3 : 2, then the average speed for the entire journey ?

a. 5 b. 2.5 c. 10 d. 7.5

Sol: $= [(3+2) \times 2 \times 4] / [(3 \times 4) + (2 \times 2)]$

$$= 2.5 \text{ km/hr}$$

Trick-8:

A train travelling at a speed of ' S_1 ' kmph leaves A at ' t_1 ' hrs. and another train travelling at speed ' S_2 ' kmph leaves A at ' t_2 ' hrs in the same direction. Then the meeting point's distance from starting is given by = $(S_1 \times S_2 \times \text{Difference in time}) / \text{Difference in speed}$.

Ex: A train travelling 25 kmph leaves Delhi at 9 a.m. and another train travelling 35 kmph starts at 2 p.m. in the same direction. How many km from will they be together ?

a. 437.5 b. 137.5 c. 237.5 d. 337.5

Sol : Meeting point's distance from the starting point = $[25 \times 35 \times (2 \text{ p.m.} - 9 \text{ a.m})] / (35 - 25) = (25 \times 35 \times 5) / 10 = 4375 / 10 = 437.5 \text{ km}$.