TIME SPEED AND DISTANCE

Speed:

Speed is simply defined as the distance coveredper unit time. Mathematically, it is defined as :

- **Speed =** Distance Travelled / Time Taken
- Formula of Time in terms of distance andSpeed: **Time =** Distance/ Speed
- Formula of Distance in terms of Speed andTime: **Distance = (Speed X Time)**
- It is very important to know the importanceof unit while solving these kinds of problem.

SI Unit for Speed: Meter per second

SI Unit for Distance: Meter

SI Unit for Time: Second

All the formulas of speed, time and distance areinterrelated. One needs to connect the information given in the problems wisely and this can be doneeasily with a good practice. Let us now discuss thevarious types of Speed, Distance & Time questions. **TYPE 1**

Now, we will discuss the most frequently used concept in this chapter i.e. questions based on the unit conversion. So, in order to learn this concept, we need to know how these questions are framedin the question paper.

Question: A train runs at X km/hr and it takes

18 seconds to pass a pole. The length of the train is 180m.Find the speed of the train in km/hr.

Solution:

Speed = distance /TimeTherefore, S=180m/18s= 10m/s

Now we need the answer in km/hr and for that, we will multiply the given speed with (18/5) in order toget the answer in *km/h*

Therefore, S= 10*(18/5)=36*km/h*.So here the trick for the same is :

- **Convert metre per second (m/sec) to km per hr (km/h)**

  For converting **(meter per**

  second) to **(kilometer per hour)** we usefollowing formula *s **m/sec**=* S

  *(18/5) **km/h***

- **Convert km per hr (km/h) to metre persecond (m/sec)**

  For converting kph (kilometre per hour) to mps(meter per second) we use following formula *S*

  km/hr**=(s∗5/18) **m/sec

Question: A boy covers a distance of 600m in 2min 30sec. What will be the speed in km/hr?

Solution:

Speed = Distance / Time = Distance covered = 600m, Time taken = 2min 30sec = 150sec Therefore, Speed = 600 / 150 = 4 m/sec = 4m/sec

= (4*18/5) km/hr = 14.4 km/ hr

Type 2

Considering 2 objects *A* and *B* having the speed x,y.

- If the ratio of the speeds of A and B is x:y, then the ratio of the times taken by then to cover the same distance is: **1/x:1/y or y:x**

Question: The ratio of the speed of a bike and a motor is 4:5 then what will be the ratio for the time taken by both the vehicles for the same destination?

Solution:

As the destination is the same so distance will be same for both Car and bike.

Let the Distance be d

And the speeds for both the vehicles be 4s and 5s Now, t1 = d/4s   (1)

t2 = d/5s -- (2)

so, t1/t2 = 5/4 = 5:4

Type 3

- Average Speed is another very important concept. It is defined as:

    Average Speed = Total Distance Travelled

/Total Time Taken

Question: Dewansh travels 320 kms at 64

km/hr and returns at 80 km/hr. Calculate the average speed of Dewansh?

Solution:

We know that speed = Distance/ time taken

⇒ ∴Total time taken = 320/64 + 320/80 = 9

⇒ Average Speed = (320 + 320)/9

⇒ Average speed = 71.11 km/hr

Question: A car moving with a uniform speed of 50km/h covers half the distance with this speed. Half of the time of the remaining distance is covered with speed 35km/h and the other half time at 10km/h. If the total distance travelled is 90 km then What was the car's average speed

(approximately) duringhis entire journey?

Solution:

Half of total distance = 45km, Speed = 50km/h Time taken = 45km/50 = 0.9 hr = 0.9 x 60 = 54 minutes

Let time taken for remaining 45 km be TAnd, distance via speed 10km/hr by D Then, ATQ,

$T/2 = (45 - D) / 35$ …(1) And, $T/2 = (D) / 10$ …(2)

Equating equations 1 & 2,

$(45 - D) / 35 = (D) / 1010(45 - D) = 35D$

$45D = 450$ or,

D = 10 km, T= 2 hour

Total time = 2+.9= 2.9 hour Average speed= 90/2.9=31km/hr**Type 4**

- Suppose a Person covers a certain distance at **x km/hr** and an equal distance at**y km/hr.** Then, the average speed for the completeJourney: **2xy/(x + y)**

Question: A train goes from Ballygunge to Sealdah at an average speed of 20 km/hour and comes back at an average speed of 30 km/hour. The average speed of the train for the whole journey is?

Solution:

Let x and y be the average speed for the samedistance in two different times.

Then, average speed = $(2xy)/(x + y)$

A train goes from Ballygunge to Sealdah at an average speed of 20 km/hour and comes back at an average speed of 30 km/hour.

The average speed of train = $(2 \times 20 \times 30)/(20 +30) = 24$ km/hr

Question: A boy goes to school at a speed of 3 km per hr and returns to the village at a speedof 2 km per hr. If he takes 5 hrs in all, what is the distance between the village and the school?

Solution:

Let the required distance be x km.

Then time taken during the first journey = x/3 hr. and time taken during the second journey = x/2 hr.

$x/3 + x/2 = 5 => (2x + 3x) / 6 = 5$

$=> 5x = 30.$

$=> x = 6$

Required distance = 6 km.

Type 5

- In this type, we will discuss the formulas related to Train problems which are most common in the competitive exams.