**Time, Speed & Distance**

The speed of a body is defined as the distance covered by it in unit time.

Speed = Distance/Time;

Time = Distance/Speed;

Distance = Speed X Time

Important Points:-

1. If a body travels d1, d2,d3…..dn distances at a speed of s1,s2,s3……sn km/hr, in time t1, t2,t3……tn, then the average speed = =
2. If a certain distance d, from A to B, is covered at ‘a’ km/hr and the same distance is covered again from B to A in ‘b’ km/hr, then the average speed during whole journey

= km/hr

Also, if t1 and t2 is the time taken to travel from A to B and B to A, respectively, the distance ‘d’ from A to B is given by:

d= (t1+t2)

d= (t1-t2)

d= (a-b)

1. While travelling a certain distance , if a man changes his speed in the ratio m:n, then the ratio of time becomes n:m
2. If two person A and B start at the same time in opposite directions from two points and arrive at the two points in ‘a’ and ‘b’ hrs, respectively after having met, then

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1. To convert km/hr to m/s, multiply by 5/18 and to convert m/s to km/hr, multiply by 18/5.

Relative Speed:-

Relative speed means the speed of an object A with respect to another object B, which may be staitionary, moving (in the same direction or opposite direction)

Case 1(When one object is stationary and other is moving)

Relative speed of stationary object and moving object = Speed of the moving object

Case 2(When two objects are moving in opposite direction)

Relative speed = Sum of their speeds

Case 3(When two objects are moving in same direction)

Relative speed = Difference of their speeds

Important Points

1. Time taken by a moving object ‘x’ meters long in passing a stationary object ‘y’ meters long from the time they meet, is same as the time taken by the moving object to cover ‘x+y’ meters with its own speed.
2. If two objects of length ‘x’ and ‘y’ meters move in the same direction or in opposite direction at ‘a’ and ‘b’ m/s, then the time taken to cross each other from the time they meet

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= (In case of same direction)

= (In case of opposite direction)

1. If the speed of a boat in still water is x km/hr and the speed of the stream is y km/hr

speed while travelling with the stream i.e., speed downstream = (x+y) km/hr

speed while travelling against the stream i.e., speed upstream = (x-y) km/hr

1. speed of the boat in still water =(Speed with Stream + Speed against stream)

speed of the river =(Speed with Stream - Speed against stream) (See Example 2)

Examples:

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| Example 1 | In travelling from city A to city B, John drove for 1 hour at 50 mph and for 3 hours at 60 mph.  What was his average speed for the whole trip? |
| Solution | The total distance is 1\*50+3\*60=230. And the total time is 4 hours.  Hence, Average Speed =  The answer is **57.5**   Note, the answer is not the mere average of 50 and 60. Rather the average is closer to 60 because he travelled longer at 60 mph (3 hrs) than at 50 mph (1 hr). |

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| Example 2 | A person can raw 7 ½ km/hr in still water. It takes him twice as long to row up a distance as to row down the same distance. Find the speed of stream |
| Solution | Speed up-stream + Speed down-stream = 2 X 7 ½ = 15 km/hr  Since the time taken are in the ratio 2 : 1, the speeds will be in the ratio 1 : 2  So Speed up-stream = (1/3) X 15 = 5 km/hr  Speed down – stream = (2/3) X 15 = 10 km/hr  Speed of stream = ½ (10 – 5) = 2.5 km/hr |