Speed, Time, and Distance Concepts

Speed, distance, and time are essential concepts of mathematics that are used in calculating rates and distances. This is one area every student preparing for competitive exams should be familiar with, as questions concerning motion in a straight line, circular motion, boats and streams, races, clocks, etc. often require knowledge of the relationship between speed, time, and distance. Understanding these inter-relationships will help aspirants interpret these questions accurately during the exams.

Units of Speed, Time, and Distance

The most commonly used units of speed, time, and distance are:

Speed: kilometers per hour (km/h), meters per second (m/s), miles per hour (mph), feet per second (ft/s).

Time: seconds (s), minutes (min), hours (h), days (d).

Distance: kilometers (km), meters (m), miles (mi), feet (ft).

For example, to convert km/h to m/s, multiply by 5/18, and to convert m/s to km/h, multiply by 18/5.

Being familiar with these units and their conversions can help in solving quantitative aptitude questions related to speed, time, and distance efficiently.

Relationship Between Speed, Time & Distance

Understanding the relationship between speed, time, and distance is essential to solve problems.

Speed, Time, and Distance :

Speed = Distance/Time

The speed of an object describes how fast or slow it moves and is calculated as distance divided by time.

Speed is directly proportional to distance and inversely proportional to time.

Distance = Speed X Time

The distance an object travels is directly proportional to its speed – the faster it moves, the greater the distance covered.

Time = Distance / Speed

Time is inversely proportional to speed – the faster an object moves, the less time it takes to

cover a certain distance.

As speed increases, time taken decreases, and vice versa

Speed, Time, and Distance Formulas

Some important speed, distance, and time formulas are given in the table below:-

SPEED : SPEED= DISTANCE/TIME

DISTANCE : DISTANCE= SPEED × TIME

TIME : TIME= DISTANCE/SPEED

AVERAGE SPEED : AVERAGE SPEED= TOTAL DISTANCE TRAVELLED/TOTAL TIME TAKEN

AVERAGE SPEED (WHEN DISTANCE IS CONSTANT) : 2xy/x+y

Speed, Time, and Distance Conversions

The Speed, Time, and Distance Conversions into various units is important to understand for solving problems:-

- To convert from km/hour to m / sec: a Km/hr = a x (5/18) m/s
- To convert from m / sec to km/hour: a m/s = a x (18/5) Km/hr
- If a person travels from point A to point B at a speed of S kilometers per hour (kmph) and returns back from point B to point A at a speed of S2 kmph, the total time taken for the round trip will be T hours. Distance between points A and B = T (S1S2/(S1+S2)).
- If two moving trains, one of length l1 traveling at speed S2 and the other of length l2 going at speed S2, intersect each other in a period of time t. Then their Total Velocity can be expressed as S1+S2 = (l1+l2)/t.
- When two trains pass each other, the speed differential between them can be determined using the equation S1-S2 = (l1+l2)/t, where S1 is the faster train's speed, S2 is the slower train's speed, l1 is the faster train's length and l2 is the slower train's length, and t is the time it takes for them to pass each other.
- If a train of length l1 is travelling at speed S1, it can cross a platform, bridge or tunnel of length l2 in time t, then the speed is expressed as S1 = (l1+l2)/t
- If the train needs to pass a pole, pillar, or flag post while travelling at speed S, then S = l/t.

- If two people A and B both start from separate points P and Q at the same time and after crossing each other they take T1 and T2 hours respectively, then (A's speed) / (B's speed) = $\sqrt{T2} / \sqrt{T1}$