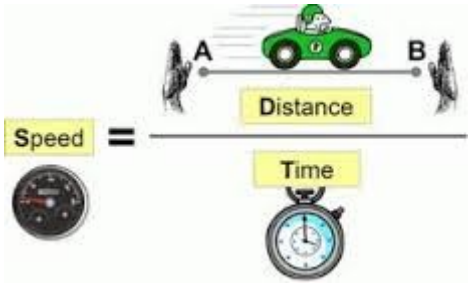
AILET

Quick Revision of Speed And Distance For CLAT

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Speed (S) is the concept which tells us how fast or slow an object is moving. It is always understood with the concept of time (t) as speed cannot be determined without time. Distance (D) is equal to speed multiplied by time.



Time and Distance

Formula 1 – Relation between time, speed and distance

D = S X t

The units of speed in questions coming for CLAT are generally either seconds (s) or hours (hr) and the units of distance are metres (m) or kilometres (km).

Often speed is needed to be converted from km/hr to m/s and vice-versa.

Formula 2 -To convert km/hr to m/s

x km/hr = (x*5/18) m/s

Formula 3 -To convert m/s to km/hr

X m/s = (x*18/5) km/hr

Derivation –

We know that 1km = 1000m and 1hr= 60X60s

If we have to convert 9 km/hr into m/s then the object covers 9 X 1000m in 60 X 60 s.

The speed in m/s = 9 X **(1000/60×60)** m/s

The speed in m/s = 9 X **(5/18)** m/s = 2.5 m/s

Formula 4 – Ratio between time and speed

If the D is kept constant then S is inversely proportional to t.

Therefore, if the S of two objects is in the ratio of x:y then the ratio of the t taken by them to cover the D would be 1/x:1/y.

Formula 5 – Average speed

If an object covers half the distance at x km/hr and half the distance at y km/hr then the average speed will be = 2xy/(x+y)

Derivation –

Let the D be 1

Then ½ D was covered at x km/hr and ½ D was covered at y km/hr.

Time taken = 1/2x + 1/2y = x +y/2xy

(The formula can be modified at this step. For example, If the D covered at x km/hr was 1/3rd and D covered at y km/hr was 2/3rd then Time taken = 1/3x + 2/3y)

As D = 1, S = 1/t which is = 2xy/(x+y)

Illustration 1 –

A man travels from his home to work at 25 km/hr and comes back at 4 km/hr. If his whole journey took 5 hrs 48 min. Find the distance between home and work.

First we need to determine whether the distance travelled at both the speeds is the same or not. As the distance between his home and work and work and home is going to remain the same, the distance travelled at both the speeds is the same.

Average speed = (2xy/x+y) km/hr (Formula 5)

Avg speed = (2*25*4)/ 25+4 =200/29 km/hr

Time = 5 hrs 48min= 29/5 hours

Distance travelled = Average speed * Time (Formula 1)

Distance Travelled = (200/29)*(29/5) = 40 km

Therefore, the distance of work from home = 40/2 = 20km.

Illustration 2 –

A car travels in the shape of an equilateral triangle. It covers the first side at 100 m/s, the second side at 150 m/s and the third at 300 m/s. What is the average speed of the car?

Let the D be 1. Let the speeds be

t = D/S. As D =1, t = 1/S

Distance covered at each speed = 1/3

Time taken = 1/3X100 + 1/3×150 + 1/3X300 = 1/300 + 1/450 + 1/900 s

t = 3+2+1/900 = 6/900 s

Avg. Speed = 900/6 m/s = 150 m/s

Illustration 3 –

A boy travelling from school to home at 5/6th of his usual speed takes 5 more minutes than usual. What is the usual time he takes for reaching home from school?

The D is constant. Let the usual speed be S and usual time be t.

Thus, S X t = 5/6S X (t+5)

6/5 = (t+5)/ t = 1 + 5/t

t = 25 min

The usual time taken by the boy to reach home is 25 mins.

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