Train & Distance : 7 Important Shortcuts Explained

Concept: Problems on trains and 'Time and Distance' are almost same. The only difference is we have to consider the length of the train while solving problems on trains.

A train is said to have crossed an object (stationary or moving) only when the last coach (end) of the train crosses the said object completely. It implies that the total length of the train has crossed the total length of the object.

Hence, the distance covered by the train = length of train + length of object

Points To Remember

1. Time taken by a train of length of L meters to pass a stationary pole is equal to the time taken by train to cover L meters.
2. Time taken by a train of length of L meters to pass a stationary object of length P meters is equal to the time taken by train to cover (L + P) meters.
3. Relative speeds :

i. If two trains are moving in same direction and their speeds are x km/h and y km/h (x > y) then their relative speed is (x –y) km/h.

ii. If two trains are moving in opposite direction and their speeds are x km/h and y km/h then their relative speed is (x + y) km/h.

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 Shortcut Methods

Trick-1:

A train has leangth 'L' and its speed is 'S'.Time taken to cross a constant object/man is

= (Leangth/Speed)

Ex: A train has leangth of 180 meters and is going with 54 km/hr. time taken to cross a pole/man ?

a. 12 s b. 10/3 s c. 18 s d. 20 s

Sol: = 180/(54*5/18) = 20 sec

Trick-2:

A train having length 'L' and its speed is 'S'. To cross a platform having length 'X' is given by

= (L + X)/S

Ex: A train's length is 240 m and its speed is 36 Km/hr.To cross a platform having length is 160 m in how much time ?

a. 40 s b. 30 s c. 36 s d. 54 s

Sol: [250+160]/(36*5/18) = 40 sec

Trick-3:

If two trains of p meters and q meters are moving in same direction at the speed of x m/s and y m/s (x > y) respectively then time taken by the faster train to overtake slower train is given by

= (p + q)/(x - y)

Ex: If two trains of 360 and 140 meters are moving in same direction at speed of 54 m/s and 44 m/s.how much time taken by faster train to overcome slower train ?

a. 50 s b. 54 s c. 44 s d. 10 s

Sol: = (360+140)/(54-44) = 50 sec

Trick-4:

If two trains of p meters and q meters are moving in opposite direction at the speed of x m/s and y m/s respectively then time taken by trains to cross each other is given by

= (p + q)/(x + y)

Ex: If two trains of 360 and 140 meters are moving in same direction at speed of 54 m/s and 46 m/s.how much time taken by faster train to overcome slower train ?

a. 50 s b. 5 s c. 63.3 s d. 10 s

Sol: = (360+140)/(54+46) = 5 sec :

Trick-5:

Two trains of length 'p' m and 'q' m respectively. When running in the same direction the faster train passes the slower one in 'a'seconds, but when they are running in opposite directions with the same speeds as earlier, they pass each other in 'b' seconds.

Then, Speed of the faster train

= [(p + q)/ 2] x[(a+b) / (a xb)] Speed of the slower train
= [(p-q) / 2] x[(a-b) / (a xb)]

Note : The speeds obtained using the above formula are in mts/ sec, if the speeds are to be expressed in kmph, they have to be multiplied by 18/5.

Ex: Two trains of length 100 m and 250 m run on parallel lines. When they run in the same direction it will take 70 seconds to cross each other and when they run in opposite direction, they take 10 seconds to cross each other. Find the speeds of the two trains?

Sol: Speed of the faster train = [(100 + 250) / 2] [(70 + 10) / (70 x10)]. = 175 x(8 /70) = 20 m/sec.

Speed of the slower train = [(100 + 250) / 2] [(70-10) / (70 x10)] = 175 x(6/ 70) = 15 m/ sec.

Trick-5:

If a train passes by a stationary man in 'p' seconds and passes by a platform /bridge, the length of which is 'm' mts, completely in 'q' sec. Then Length of the train
= (m * p) / (q-p).

Ex: A train crosses by a stationary man standing on the platform in 7 seconds and passes by the platform completely in 28 seconds. If the length of the platform is 330 meters, what is the length of the train?

a. 100m b. 110m c. 200m d. 210m

Sol: Length of the train = (330 x7) / (28-7) = 330x 7 / 21 = 110 mts.

Trick-6:

The two trains that start at their points: A for the first train and B for the second train that travels at a speed of 'u' and 'v' respectively to reach their destination after crossing each other.The time taken by two trains is given by
= square root of v : square root of u

Ex: What is the time taken by the two trains that start at their points: A for the first train and B for the second train that travels at a speed of '4' and '9' respectively to reach their destination after crossing each other?

Sol: = (9)^0.5 : (4)^0.5 = 3 : 2

Trick-7:

The two trains that start at their points: A for the first train and B for the second train that travels at a speed of 'u' and 'v' respectively to reach their

destination. The distance between A and B is 'X' .The time taken by two trains to meet is given by

From A side : (X * u)/(u + v)

From B side : (X * v)/(u + v)

Ex: What is the time taken by the two trains to meet from first train side, that start at their points: A for the first train and B for the second train that travels at a speed of '4' km/hr and '9' km/hr respectively.The distance between A and B is 13 km?

a. 4 km b. 5 km c. 6 km d. 7 km

Sol: = (13*4)/(4+9) = 4 km