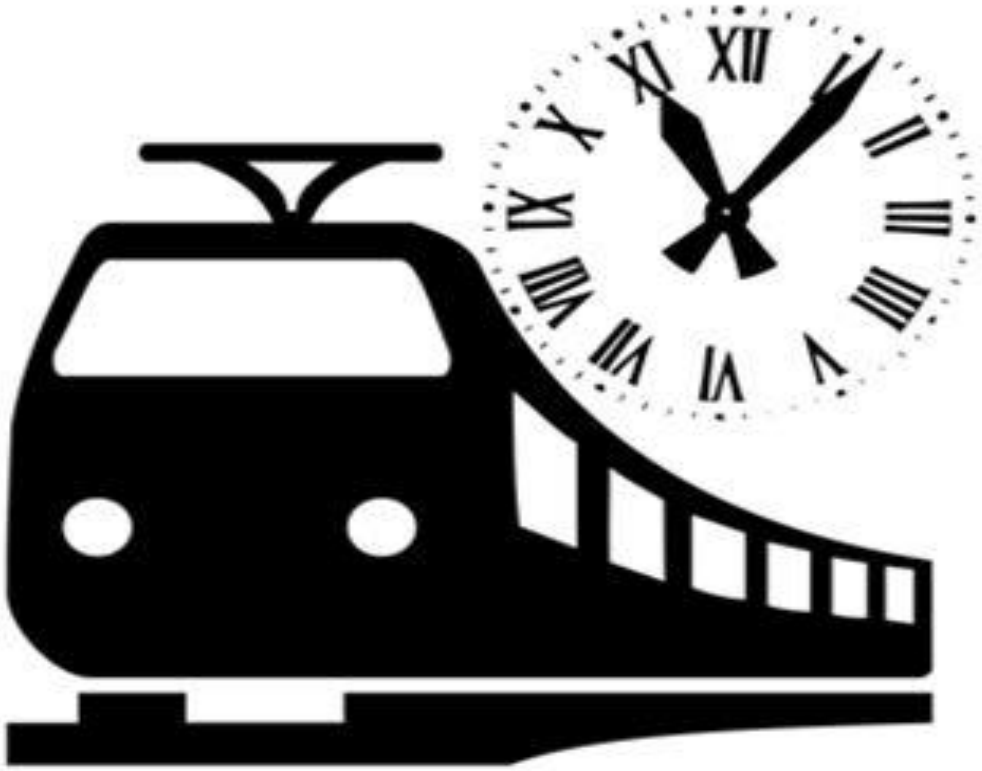
Trains



While studying the chapter "Trains", we are required to deal with following scenarios

1. Two trains moving in opposite direction.
2. Two trains moving in same direction.
3. A train crossing a stationary object of a given length like a platform or bridge.
4. A train crossing a stationary object like a pole or a man which can be considered as a point object.

Keep same units for all values mentioned in the problem i.e. as per the units of the given answers convert kilometre per hour (km/hr) to meters per second (m/s) and vice versa. In a similar way, convert meter (m) into centimetre (cm) and vice versa. See the examples given below:

Formula to convert Km/hr into m/s:

- 1km is equal to 1000 meters
- 1 hours is equal to 3600 seconds
- 1Km/hr is equal to $\frac{1000\ meters}{3600\ Sec}$ or $\frac{5}{18}$ meter/sec or m/s

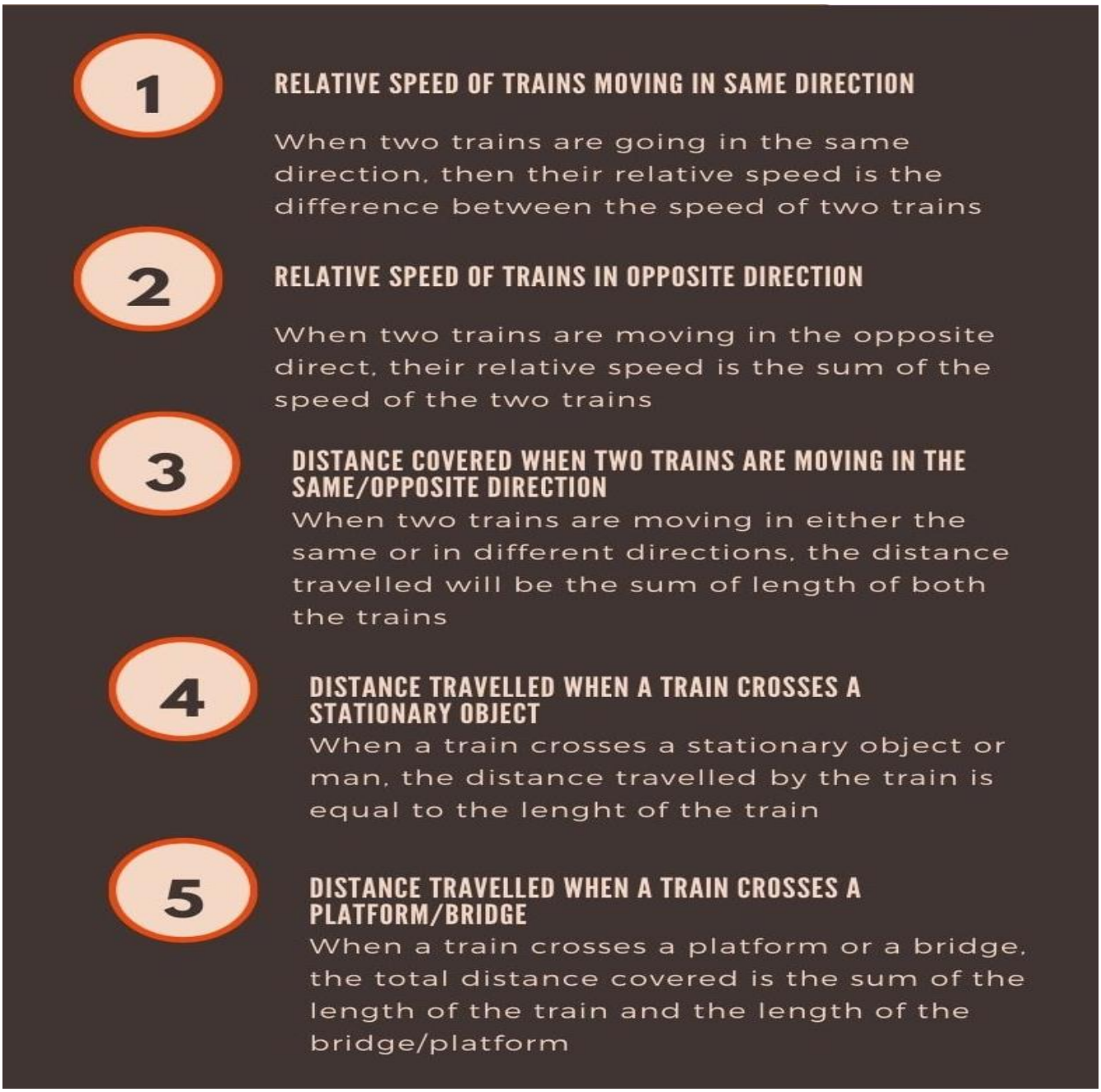
So, to convert a value in Km/hr to m/s, we need to multiply it with $\frac{5}{18}$

Formula to convert m/s to Km/hr

- 1 meter is equal to 1/1000 km
- 1 sec is equal to 1/3600 hours
- 1 m/s is equal to $\frac{1/1000}{1/3600}$ km/hr or $\frac{3600}{1000} = \frac{18}{5}$ km/hr

So, to covert a value in m/s to Km/hr, we will multiply it with 18/5.

Points to remember



Formulas

- **Speed of the Train = Total distance covered by the train / Time taken**
- If the length of two trains is given, say a and b, and the trains are moving in **opposite directions** with speeds of x and y respectively, then the **time taken by trains to cross each other = (a + b) / (x + y)**

- If the length of two trains is given, say a and b, and they are moving in the **same direction**, with speeds x and y respectively, then the

  time is taken to cross each other = (a + b) / (x-y)

- When the **starting time of two trains is the same from x and y towards each other** and after crossing each other, they took t1 and t2 time in reaching y and x respectively, then the **ratio between the speed of two trains = √t2 : √t1**
- If two trains leave x and y stations at time t1 and t2 respectively and travel with speed L and M respectively, then distanced from x, where two trains meet is = **(t2 – t1) × {(product of speed) / (difference in speed)}**
- The average speed of a train without any stoppage is x, and with the stoppage, it covers the same distance at an average speed of y, then

  Rest Time per hour = (Difference in average speed) / (Speed without stoppage)

- If two trains of equal lengths and different speeds take t1 and t2 time to cross a pole, then the

  time taken by them to cross each other if the train is moving in opposite direction= (2×t1×t2) / (t2+t1)

- If two trains of equal lengths and different speeds take t1 and t2 time to cross a pole, then the

  time taken by them to cross each other if the train is moving in the same direction = (2×t1×t2) / (t2-t1)