Speed of the train = Distance Travelled / Time Taken i.e. S = D/T
Units of speed are m/sec or km/hr.
A km/hr = $\left(A \times \frac{5}{18}\right)$ m/sec
A m/sec = $\left(A \times \frac{18}{5}\right)$ km/hr

1) Time taken by a train of length L meters, travelling at a speed of S m/sec to cross a pole/a standing man/a signal post/any other object(of negligible length) is $\frac{L}{S}$ **sec**
Example: A train covers 85 m in passing a signal post. What is the length of the train?
Length of the train = 85 m

2) Time taken by a train of length L meters, travelling at a speed of S m/sec to cross/pass a stationary object (platform/a standing train/a bridge) of length P meters is $\frac{L+P}{S}$ **sec**
Example: A 28 m long train passes a platform which is 85 m long. Find the distance covered by the train in passing the platform
Required distance = Length of train + Length of platform = 28 + 85 = 113 m

3) If two trains are moving in opposite directions, then their relative speed is equal to the sum of the speeds of both the trains.
Example: Two trains are moving in opposite directions with speeds of 4 m/sec and 7 m/sec, respectively. Find their relative speed.
Required relative speed = 4 m/sec + 7 m/sec = 11 m/sec

4) If two trains are moving in same directions, then their relative speed is equal to the difference of the speeds of both the trains.
Example: Two trains are moving in same directions with speeds of 19 km/hr and 25 km/hr, respectively. What will be the relative speed of the train running at 25 km/hr in respect of the train running at 19 km/hr?
Required relative speed = 25 km/hr – 19 km/hr = 6 km/hr

5) Time taken by a train of length L meters, travelling at a speed of S_1 m/sec to cross a man travelling at a speed S_2 m/sec in the same direction is $\frac{L}{S_1 - S_2}$ **sec**

6) Time taken by a train of length L meters, travelling at a speed of S_1 m/sec to cross a man travelling at a speed S_2 m/sec in the opposite direction is $\frac{L}{S_1+S_2}$ **sec**

7) Time taken by a train of length L_1 meters, travelling at a speed of S_1 m/sec to cross a man sitting in another train of length L_2 meters, travelling at a speed of S_2 m/sec in the same direction is $\frac{L_1}{S_1-S_2}$ **sec** where $\mathbf{S_1 > S_2}$

8) Time taken by a train of length L_1 meters, travelling at a speed of S_1 m/sec to cross a man sitting in another train of length L_2 meters, travelling at a speed of S_2 m/sec in the opposite direction is $\frac{L_1}{S_1+S_2}$ **sec**

9) Time taken by a train of length L_1 meters, travelling at a speed of S_1 m/sec to cross another train of length L_2 meters, travelling at a speed of S_2 m/sec in the same direction is $\frac{L_1+L_2}{S_1-S_2}$ **sec** where $\mathbf{S_1 > S_2}$

10) Time taken by a train of length L_1 meters, travelling at a speed of S_1 m/sec to cross another train of length L_2 meters, travelling at a speed of S_2 m/sec in the opposite direction is $\frac{L_1+L_2}{S_1+S_2}$ **sec**

Q1) A train 200 m long is running with a speed of 72 km/hr. In what time will it pass a platform 160 m long?

1) 18 sec **2) 15 sec** **3) 21 sec** **4) 20 sec**

Solution:

Speed = 72 km/hr = 20 m/sec
Distance travelled = Length of the train + Length of the platform
200 + 160 = 20t
t = 18 sec

Q2) A train running at 35 km/hr takes 18 sec to pass a platform. Next, it takes 12 sec to pass a man walking at the rate of 5 km/hr in the same direction. Find the length of the train and that of the platform.

1) 50 m, 75 m **2) 100 m, 75 m** **3) 75 m, 25 m** **4) 85 m, 55 m**

Solution:

Length of the train = L meters; Length of the platform = P meters

$$L + P = 35 \times \frac{5}{18} \times 18 = 175$$

Now check options, only option 2 satisfies.

Q3) Two stations A and B are 110 km apart on a straight line. One train starts from A at 7 AM and travels towards B at 20 km/hr. Another train starts from B at 8 AM and travels towards A at 25 km/hr. At what time will they meet?

1) 9 AM **2) 10 AM** **3) 11 AM** **4) 11:30 AM**

Solution:

From 7 AM to 8 AM the train travels 20 km. Now, distance between the two trains is 110 – 20 = 90 km. Time required to travel these 90 km is t hours.
90 = 20t + 25t i.e. t = 2 hours (from 8AM)
So the two trains meet at 10 AM.

Q4) A train travelling at a uniform speed, clears a platform 200 m long in 10 sec and passes a telegraph post in 6 sec. Find the length of the train and its speed.

1) 300 m, 180 km/hr **2) 200 m, 180 km/hr**
3) 300 m, 50 km/hr **4) 200 m, 50 km/hr**

Solution:

Let L m be the length and S m/sec be the speed of the train.
L + 200 = 10S (Train clears a platform 200 m long in 10 sec)
L = 6S (Train clears a telegraph post in 6 sec)
From above two equations
6S +200 = 10S i.e. S = 50 m/sec = $50 \times \frac{18}{5}$ = 180 km/hr
As L = 6S so, L = 300 m

Q5) 2 trains of length 100 m and 150 m respectively but with different speeds pass a static pole in 1 min and 3 min respectively. In what time will they cross each other when they are moving in the opposite direction?

1) 5/3 sec **2) 100 sec** **3) 120 sec** **4) 50 sec**

Solution:

Speed of train 1 and train 2 (in m/min) be s_1, s_2 respectively.
100 = s_1 (1) = s_1
150 = s_2 (3) i.e. s_2 = 50
Distance travelled = Length of train 1 + Length of train 2 = 100 + 150 = 250 m
250 = 150t i.e. t = 5/3 min = 100 sec

Q6) Two trains 130 m and 110 m long while going in the same direction, the faster takes 1 min to cross the other train completely. If they are moving in the opposite direction, they pass each other completely in 3 sec.
Find the speed of the trains

1) 24 m/sec, 19 m/sec **2) 42 m/sec, 38 m/sec**
3) 40 m/sec, 36 m/sec **4) Data Inadequate**

Solution:

Speed of train 1 and train 2 (in m/min) be s_1, s_2 respectively.
Distance travelled = Length of train 1 + Length of train 2 = 110 + 130 = 240 m
When trains are travelling in the same direction then relative speed ($s_1 - s_2$) = 240/60 = 4 m/sec
When trains are travelling in the opposite direction then relative speed ($s_1 + s_2$) = 240/3 = 80 m/sec
On solving the above 2 equations, s_1 = 42 m/sec, s_2 = 38 m/sec

Q7) Two trains running at 45 km/hr and 36 km/hr respectively, on parallel rails in opposite directions, are observed to pass each other in 8 sec, and when they are running in the same directions at the same rate as before, a person sitting in the faster train observes that he passes the other train in 30 sec. Find the length of the trains

1) 105 m, 75 m **2) 50 m, 25 m**
3) 120 m, 90 m **4) Data Inadequate**

Solution:

As trains are travelling in the opposite direction so, relative speed is sum of the speeds of the trains = 45 + 36 = 81 km/hr = $81 \times \frac{5}{18} = \frac{45}{2}$ m/sec
Distance travelled = Length of train 1 + Length of train 2 = $8 \times \frac{45}{2}$ = 180 m

When trains are travelling in the same direction so, relative speed is difference of the speeds of the trains = 45 – 36 = 9 km/hr = $9 \times \frac{5}{18} = \frac{5}{2}$ m/sec
A person sitting in the faster train passes the other train in 30 sec i.e.
Distance travelled = Length of train 2 = $\frac{5}{2} \times 30$ = 75 m
Length of train 1 = 180 – Length of train 2 = 105 m

Q8) A train passes 2 men walking in the direction opposite to the train at 7 m/sec and 12 m/sec in 5 sec and 4 sec respectively. Find the length of the train

1) 100 m 2) 120 m 3) 75 m 4) 120 m

Solution:

Length of train = (s + 7) 5 = (s + 12) 4
On solving, s = 13 m/sec
Length of train = (13 + 7) 5 = 100 m

Q9) A trains covers a distance between A and B in 2 hours. If the speed is reduced by 6 km/hr, it will cover the same distance in 3 hours. What is the distance between A and B (in km)? Also, find the speed of the train.

1) 36 km, 18 km/hr 2) 42 km, 21 km/hr
3) 18 km, 9 km/hr 4) 28 km, 14 km/hr

Solution:

Let Y km be the distance between A and B and S km/hr be the speed of the train.
Y = 2S = 3(S – 6) on solving S = 18 km/hr, Y = 36 km

Q10) P and Q are 92 km apart. A train leaves P for Q and at the same time another train leaves Q for P. Both the trains meet 4 hours after they start moving. If the train travelling from P to Q travels 7 km/hr faster than the other train, find the speed of the two trains.

1) 15 km/hr, 8 km/hr 2) 12 km/hr, 8 km/hr
3) 12 km/hr, 9 km/hr 4) 15 km/hr, 9 km/hr

Solution:

Let S, S+7 be the speed of the trains (in km/hr)
As the two trains travel 92 km in 4 hours so, 4S + 4(S+7) = 92
On solving, S = 8 km/hr, S+7 = 15 km/hr

Q11) The speed of the 2 trains are in the ratio of 2:3. They are moving on the opposite directions on parallel tracks. The first train crosses the telegraph pole in 10 sec whereas the second train crosses the pole in 15 sec. Find the time taken by the trains to cross each other completely.

1) 23 sec **2) 14 sec** **3) 13 sec** **4) 16 sec**

Solution:

Speeds of the trains are 2y, 3y.
Length of train 1 = 2y(10) = 20y
Length of train 2 = 3y(15) = 45y
As the two trains cross each other so, Distance travelled = Length of train 1 + Length of train 2 = 20y + 45y = 65y
As trains are travelling in the opposite direction so, relative speed is sum of the speeds of the trains = 2y + 3y = 5y
65y = (5y) T
T = 13 sec

Q12) A train 110 m long travels at 60 km/hr. How long does it take to cross another train 170 m long, running at 54 km/hr in the same direction?
1) 2 min 40 sec **2) 2 min 48 sec** **3) 3 min 48 sec** **4) 3 min 40 sec**

Solution:

Distance travelled = Length of train 1 + Length of train 2 = 110 + 170 = 280 m
As trains are travelling in the same direction so relative speed is difference of the speeds of the trains = 60 – 54 = 6 km/hr = $6 \times \frac{5}{18} = \frac{5}{3}$ m/sec

$280 = \frac{5}{3}t$
T= 168 sec = 2 min 48 sec

Q13) Two trains are moving in opposite direction at 30 km/hr and 24 km/hr. The faster train crosses a man in the slower train in 6 sec. Find the length of the faster train.
1) 80 m **2) 100 m** **3) 110 m** **4) 90 m**

Solution:

As trains are travelling in the opposite direction so relative speed is sum of the speeds of the trains = 30 + 24 = 54 km/hr = 15 m/sec
As faster train crosses a man in the slower train so,
Distance travelled = Length of the faster train = 15(6) = 90 m

Q14) 250 m long train crosses a platform of length 350 m in 50 sec. Find the time of the train to cross a bridge of 230 m.

1) 45 sec 2) 50 sec 3) 40 sec 4) 54 sec

Solution:

Let s m/sec be the speed of the train
Distance travelled = Length of train + Length of platform = 250 + 350 = 600 m
600 = 50s i.e. s = 12 m/sec
Let t sec be the time taken by the train to cross the bridge of 230 m
Distance travelled = Length of train + Length of bridge = 250 + 230 = 480 m
480 = 12t i.e. t = 40 sec

Q15) 2 trains of same length but with different speeds pass a static pole in 5 sec and 6 sec respectively. In what time will they cross each other when they are moving in the same direction?

1) 45 sec 2) 50 sec 3) 1 min 4) 90 sec

Solution:

As ratio of time is 5:6 so, ratio of speeds is 6:5
Speed of train 1 and train 2 be 6y, 5y respectively.
Length of the train = 6y(5) = 30y
Time taken to cross each other = 60y/y = 60 sec

Q16) A goods train and a passenger train are running on a parallel track in the same direction. The driver of the goods train observes that the passenger train coming from behind overtakes and crosses his train completely in 30 sec whereas a passenger on the passenger train marks that he crosses the goods train in 20 sec. If the speeds of the trains be in the ratio of 1:2, find the ratio of their lengths

1) 3:2 2) 3:1 3) 2:1 4) 4:1

Solution:

Length of goods train and a passenger train (in meters) is g, p respectively and their respective speeds be a, b.
As the two trains are running in the same direction so, distance travelled = Length of goods train + Length of passenger train = g + p
As the passenger train overtakes the goods train in 30 seconds so,
g + p = (b – a) 30 equation 1

Passenger on the passenger train crosses the goods train in 20 sec so, distance travelled = Length of the goods train

g = (b – a) 20 equation 2

On solving equation 1, 2

$$\frac{g}{p} = \frac{2}{1}$$