

Q – Two cars were moving on parallel lanes in one direction. one car had speed 60 km/hr, while the other had speed of 65 km/hr. At time 8:30 AM, the distance between the cars was 8 km.

(a) How far away from each another they were at 9:20 AM that day?

(b) At what time the cars moved side by side?

Give two answers if needed.

When two bodies are moving in same direction with different speeds, the distance between them is either increase or decrease initially. If the fast-moving car is ahead, the distance between them continuously increases with time but if the fast-moving car is behind the other the distance between them initially decreases, becomes zero and then increases.

Motion of two moving bodies can easily be analyzed using the concept of relative motion. Velocity of body A relative to that of body B is given by $V_{AB} = V_A - V_B$. Here V_A and V_B are the velocities of A and B respectively.

Solution 1

Say the velocity of car A, $V_A = 65$ km/hr and that of B, $V_B = 60$ km/hr.

Case 1: Car A is ahead of B by 8 km.

Velocity of car A relative to car B will be

$$V_{AB} = V_A - V_B = 65 - 60 = 5 \text{ km/hr}$$

The distance covered by A relatively in time 50 min from 8:30 AM to 9:20 AM i.e., $5/6$ hour will be

$$5 \times 5/6 = 25/6 = 4.167 \text{ km}$$

Thus, the distance of A from B will be $8 + 4.167 = \mathbf{12.167 \text{ km}}$.

Case 2: Car B is ahead of A by 8 km.

Velocity of car A relative to car B will be

$$V_{AB} = V_A - V_B = 65 - 60 = 5 \text{ km/hr}$$

The distance covered by A relatively in time 50 min i.e $5/6$ hour will be

$$5 \times 5/6 = 25/6 = 4.167 \text{ km}$$

Thus, the distance of A from B will be $8 - 4.167 = \mathbf{3.833 \text{ km}}$.

Solution 2

The cars move side by side is possible only if the fast-moving car is behind the other. The time required to cover the distance of 8km relatively is given by

$$T = \text{relative distance/ relative velocity} = 8/5 = 1.6 \text{ hr} = 1 \text{ hour } 36 \text{ min.}$$

Thus, the time when the cars are side by side will be $8:30 + 1:36 = \mathbf{10:06 \text{ AM}}$.