

Answer on Question #43667 – Physics - Mechanics | Kinematics | Dynamics

Two trains start at the same time from Delhi and Jalandhar, distance of 400 km, travelling, one at the rate of 48 km/hr and the other at 72 km/hr. Where will they meet and in what time from starting.

Solution:

$S = 400$ km – distance between two trains;

$V_1 = 48 \frac{\text{km}}{\text{hr}}$ – velocity of the first train;

$V_2 = 72 \frac{\text{km}}{\text{hr}}$ – velocity of the first train;

Let trains are moving towards and the distance travelled by the train with slower speed be x . Accordingly the distance travelled by the faster train will be $y = S - x$.
Let the time taken by the trains to travel the distance be t

According to question:

$$\text{first (slower) train : } t = \frac{x}{V_1} \quad (1)$$

$$\text{second (faster) train : } t = \frac{y}{V_2} = \frac{S - x}{V_2} \quad (2)$$

$$(1) = (2):$$

$$\frac{x}{V_1} = \frac{S - x}{V_2}$$

$$V_2 x = S V_1 - V_1 x$$

$$x(V_1 + V_2) = S V_1$$

$$x = \frac{S V_1}{V_1 + V_2} = \frac{400 \text{ km} \cdot 48 \frac{\text{km}}{\text{hr}}}{48 \frac{\text{km}}{\text{hr}} + 72 \frac{\text{km}}{\text{hr}}} = 160 \text{ km}$$

$$y = S - x = 400 \text{ km} - 160 \text{ km} = 240 \text{ km}$$

$$t = \frac{x}{V_1} = \frac{160 \text{ km}}{48 \frac{\text{km}}{\text{hr}}} = 3 \text{ hours } 20 \text{ minutes}$$

Answer: trains will meet 160 km from station where slower train has been started to move; they will meet after 3 hours 20 minutes.