

Answer on Question#41019 – Physics – Mechanics

A motorist travels 320 km at a speed of 80 km/h. It then traveled 320 km at a speed of 100 km/h along the same direction. What is the average speed of the motorist for the entire trip?

a) 84 km/h b) 90 km/h c) 89 km/h d) 91 km/h e) 95 km/h

Solution:

The average speed is the total distance divided by the total travel time.

$$V_a = \frac{S}{t} \quad (1)$$

The total distance is

$$S = S_1 + S_2 \quad (2)$$

The total time is

$$t = t_1 + t_2 = \frac{S_1}{V_1} + \frac{S_2}{V_2} = \frac{S_1}{V_1} + \frac{S_2}{V_2} = \frac{S_1 V_2 + S_2 V_1}{V_1 V_2} \quad (3)$$

(3) and (2) in (1):

$$V_a = \frac{S_1 + S_2}{\frac{S_1 V_2 + S_2 V_1}{V_1 V_2}} = \frac{V_1 V_2 (S_1 + S_2)}{S_1 V_2 + S_2 V_1} = \frac{80 \frac{\text{km}}{\text{h}} \cdot 100 \frac{\text{km}}{\text{h}} (320 \text{ km} + 320 \text{ km})}{320 \text{ km} \cdot 80 \frac{\text{km}}{\text{h}} + 320 \text{ km} \cdot 100 \frac{\text{km}}{\text{h}}} = 89 \frac{\text{km}}{\text{h}}$$

Answer: c) 89 km/h