

Answer on Question #64990, Physics / Other

You drive due east at 77 km/h for 55 min . Then you follow a road going 60° south of east, going 96 km/h for another 28 min . Find your total displacement.

Enter the x and y components of the displacement separated by a comma. Assume that the positive x and y axes are directed to the east and north, respectively.

Solution:

Given:

$$v_1 = 77 \text{ km/h,}$$

$$v_2 = 96 \text{ km/h,}$$

$$t_1 = 55 \text{ min} = \frac{55}{60} \text{ hour,}$$

$$t_2 = 28 \text{ min} = \frac{28}{60} \text{ hour,}$$

The x and y components of the displacement are

$$d_x = d_{1x} + d_{2x} = v_1 t_1 + v_2 t_2 \cos 60^\circ = 77 \cdot \frac{55}{60} + 96 \cdot \frac{28}{60} \cdot \cos 60^\circ = 92.98 \text{ km} \approx 93.0 \text{ km}$$

$$d_y = d_{1y} + d_{2y} = 0 + v_2 t_2 \sin 60^\circ = 96 \cdot \frac{28}{60} \cdot \sin 60^\circ = 38.8 \text{ km}$$

The displacement is

$$d = \sqrt{d_x^2 + d_y^2} = \sqrt{(92.98)^2 + (38.8)^2} = 100.75 \text{ km} \approx 100.8 \text{ km}$$

Answer: $d = 100.8 \text{ km}$; $d_x = 93.0 \text{ km}$, $d_y = 38.8 \text{ km}$.

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