Answer on Question #51545, Physics, Other

7 A man walks 5.0m due east and then 10.0m N30°E. Find his resultant displacement.

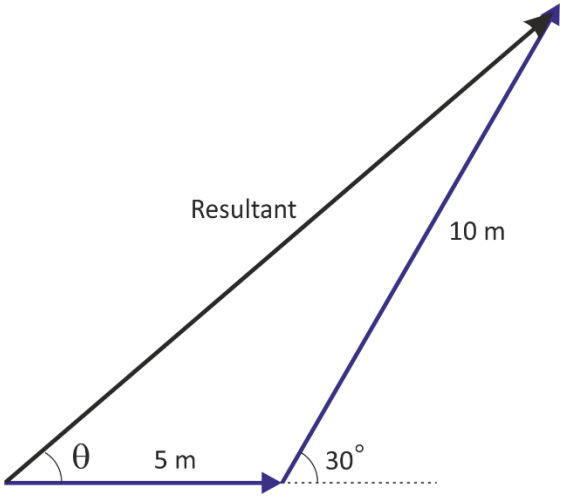
A 13.7 m, N15°E

B 14.6 m, N20°E

C 10.0 m, N15°E

D 14.6m, N70°E

Solution:



The displacement vector d from P_1 to P_2 may be written as

$$\vec{d} = (x_2 - x_1)\hat{\mathbf{i}} + (y_2 - y_1)\hat{\mathbf{j}}$$

$$x_1 = 0; \quad y_1 = 0$$

$$x_2 = 5 + 10 * \cos 30° = 13.66; \quad y_2 = 10 * \sin 30° = 5$$

The magnitude of the displacement is

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{13.66^2 + 5^2} = 14.55 \approx 14.6 \text{ m}$$

The angle we find from

$$\tan\theta = \frac{y_2}{x_2}$$

$$\theta = \tan^{-1}\frac{y_2}{x_2} = \tan^{-1}\frac{5}{13.66} = 20.1° \approx 20°$$

Answer: B 14.6 m, N20°E