

Answer on Question #43265 – Physics - Mechanics | Kinematics | Dynamics

A person walks 23 m East and then walks 33 m at an angle 22° North of East. What is the magnitude of the total displacement?

Solution:

We have two displacements: r_1 (when person walks 23 m East), r_2 (when person walks 33 m at an angle 22°) and total displacement r .

Displacement along the X-axis:

$$r_{1x} = 23 \text{ m}$$

$$r_{2x} = 33 \text{ m} \cdot \cos(22^\circ) = 30.6 \text{ m}$$

$$r_x = r_{1x} + r_{2x} = 23 \text{ m} + 30.6 \text{ m} = 53.6 \text{ m}$$

Displacement along the Y-axis:

$$r_{1y} = 0$$

$$r_{2y} = 33 \text{ m} \cdot \sin(22^\circ) = 12.36 \text{ m}$$

$$r_y = r_{1y} + r_{2y} = 0 + 12.36 \text{ m} = 12.36 \text{ m}$$

Using the Pythagorean Theorem:

$$r^2 = r_y^2 + r_x^2$$
$$D = \sqrt{r_y^2 + r_x^2} = \sqrt{(53.6 \text{ m})^2 + (12.36 \text{ m})^2} = 55 \text{ m}$$

Answer: the magnitude of total displacement is equal to 55 m.