Question #45259 - Physics - Mechanics | Kinematics | Dynamics

A person walks 29 m East and then walks 38 m at an angle 45◦ North of East. What is the magnitude of the total displacement?

Solution:
We have two displacements: r_1 (when person walks 29 m East), r_2 (when person walks 38 m at an angle $45°$) ant total displacement r.

Displacement along the X-axis:
$r_{1x} = 29\ m$
$r_{2x} = 38m \cdot \cos(45°) = 26.9\ m$
$r_x = r_{1x} + r_{2x} = 29\ m + 26.6\ m = 55.6\ m$

Displacement along the Y-axis:
$r_{1y} = 0$
$r_{2y} = 38m \cdot \sin(45°) = 26.9\ m$
$r_y = r_{1y} + r_{2y} = 0 + 26.9\ m = 26.9\ m$
Using the Pythagorean Theorem:

$$r^2 = r_y^2 + r_x^2$$

$$D = \sqrt{r_y^2 + r_x^2} = \sqrt{(55.6\ m)^2 + (26.9\ m)^2} = 61.8\ m$$

Answer: the magnitude of total displacement is equal to 61.8 m.