

Answer on Question #77323, Physics / Other

A man travels 10 km 30 degree east of north, then 15 km east, find the resultant displacement.

Solution:

A convenient way to specify the position of an object is with the help of a coordinate system. We choose a fixed point, called the origin and two directed lines, which pass through the origin and are perpendicular to each other. These lines are called the coordinate axes of a two-dimensional rectangular (Cartesian) coordinate system and are labeled the x-, y-axis. Two numbers with units specify the position of a point P. These numbers are the x-, and y-coordinates of the point P.

Suppose the man starts at point

$$x_0 = 0$$

$$y_0 = 0$$

30 degrees "east of north" means you start with the north axis (or Y axis) and rotate clockwise 30 degrees.

Thus,

$$x_1 = 10 \times \sin(30^\circ) = 5$$

$$y_1 = 10 \times \cos(30^\circ) = 8.66$$

Then,

$$x_2 = x_1 + 15 = 5 + 15 = 20$$

$$y_2 = y_1 = 8.66$$

The magnitude of the displacement is

$$d = \sqrt{(x_2 - x_0)^2 + (y_2 - y_0)^2} = \sqrt{20^2 + 8.66^2} = 21.8 \text{ km}$$

Answer: 21.8 km

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