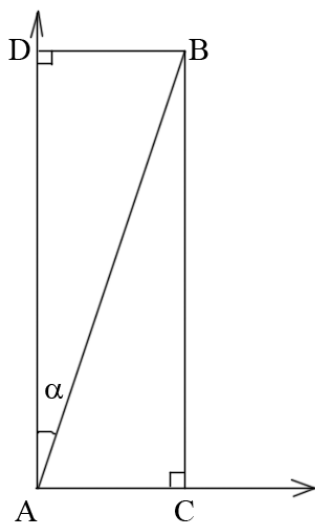


Question #58829, Physics / Mechanics | Relativity

You drive 7.50 km in a straight line in a direction 15° east of north. (a) Find the distances you would have to drive straight east and then straight north to arrive at the same point. (This determination is equivalent to find the components of the displacement along the east and north directions.) (b) Show that you still arrive at the same point if the east and north legs are reversed in order.

Solution.



The given displacement is represented by the segment AB:

$$AB = 7.5 \text{ km}; \alpha = 15^\circ.$$

a) The angle ABC is equal to the angle BAD.

The distance straight east is equal to the segment AC:

$$AC = AB \cos(90^\circ - \alpha) = AB \sin \alpha;$$

$$AC = 7.5 \times 0.2588 = 1.94 \text{ km}$$

The distance straight north is equal to the segment CB:

$$CB = AB \cos \alpha;$$

$$CB = 7.5 \times 0.9659 = 7.24 \text{ km}$$

b) If the east and north legs are reversed in order, the total route will be A – D – B instead of A – C – B. as it can be seen from the diagram, the resulting displacement will be still equal to AB.