A salesperson leaves the office and drives 26 km due north along a straight highway. A turn is made onto a highway that leads in the direction 30.0° north of east. The driver continues on the highway for a distance of 62 km and then stops. Using graphical methods, what is the total displacement of the salesperson from the office?
Why the answer is 1. Approximately 79 km?

Solution:

Figure out the driven distances (not to scale):
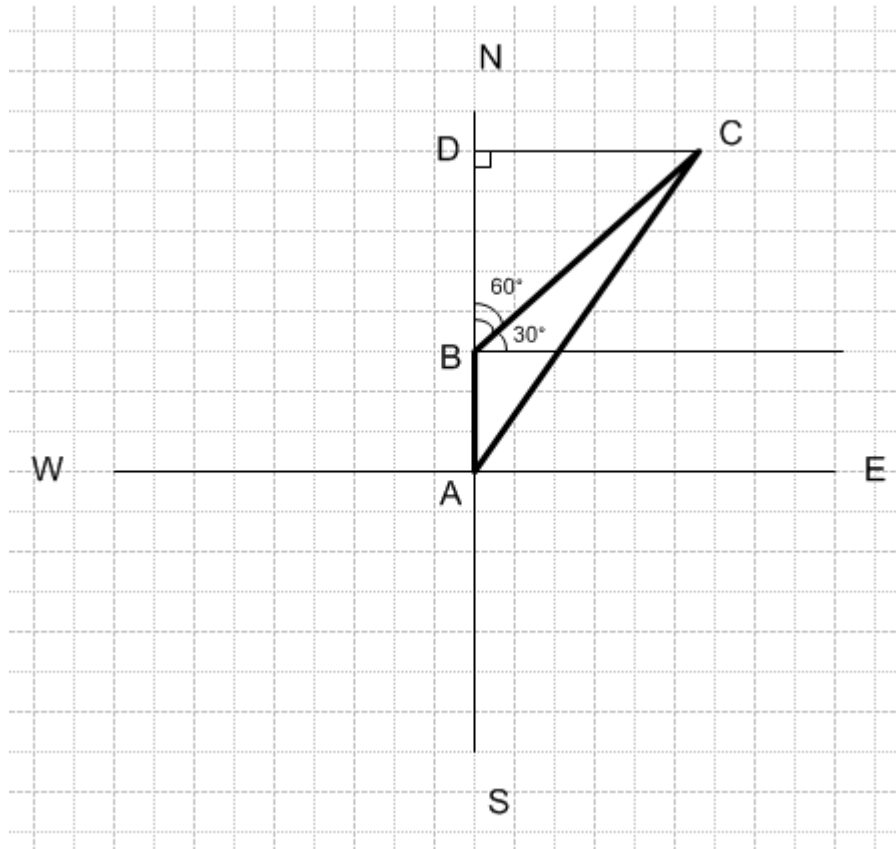
On this figure:

$AB = 26\ km$;

$BC = 62\ km$

AC - the unknown total displacement of the salesperson from the office.

From the rectangular triangle ADC we get

$$AC = \sqrt{(AB + BD)^2 + CD^2}.$$

From the rectangular triangle BDC we get

$$BD = BC \cdot cos60°,$$

$$CD = BC \cdot sin60°.$$

So

$$AC = \sqrt{(AB + BC \cdot cos60°)^2 + (BC \cdot sin60°)^2} = \sqrt{(26 + 62 \cdot 0.5)^2 + (62 \cdot 0.87)^2} = 78.5 \ km$$

Answer: the total displacement of the salesperson from the office is 78.5 km.