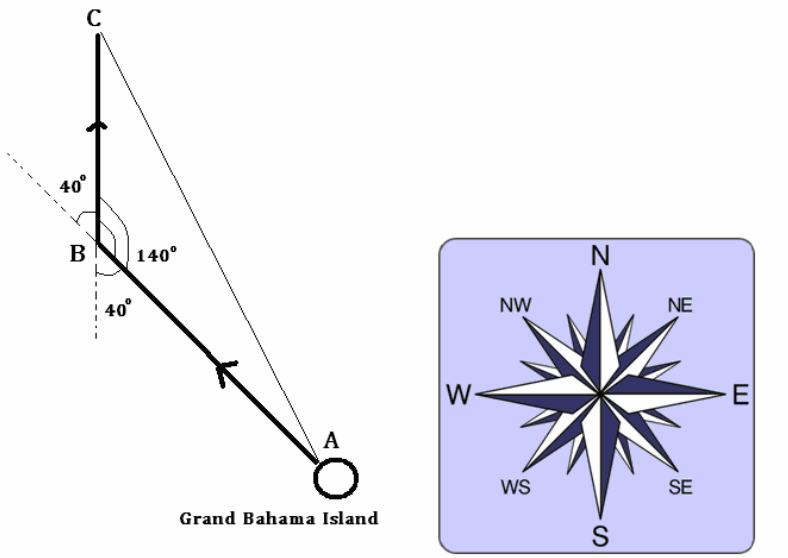
QUESTION:
As it passes over Grand Bahama Island, the eye of a hurricane is moving in a direction 40 north of west with a speed of 79 km/h. Three hours later, it shifts due north, and its speed slows to 15 km/h. How far from Grand Bahama is the eye 4.50 h after it passes over the island? Answer in units of km

SOLUTION
Let's draw a scketch:

ANSWER



The angle ABC is equal to 180-40=140°. AC is the displacement of the hurricane's eye. According to the law of cosines

$$AC^2 = AB^2 + BC^2 - 2AC \cdot BC \cdot \cos(140^\circ)$$

$$AB = \upsilon_1 t_1$$

$$BC = \upsilon_2 t_2$$

$$\upsilon_1 = 79 \ \text{km/h}$$

$$\upsilon_2 = 15 \ \text{km/h}$$

$$t_1 = 3 \ \text{h}$$

$$t_2 = 4.5 - 3 = 1.5 \ \text{h}$$

$$AC = \sqrt{(\upsilon_1 t_1)^2 + (\upsilon_2 t_2)^2 - 2 \cdot \upsilon_1 t_1 \upsilon_2 t_2 \cos(140^\circ)}$$

$$AC = \sqrt{64845.1}$$

$$AC = 254.65 \ \text{km}$$

ANSWER
254.65 km