

KEY

Section 9.5: Applications of Trigonometry to Navigation and Surveying

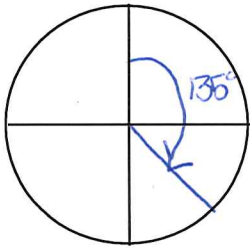
Essential Question:

What type of application uses law of sines & cosines?

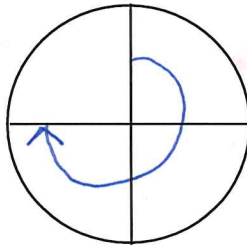
The course of a ship or plane can be measured clockwise from the North.

For example...

A ship heading 135°

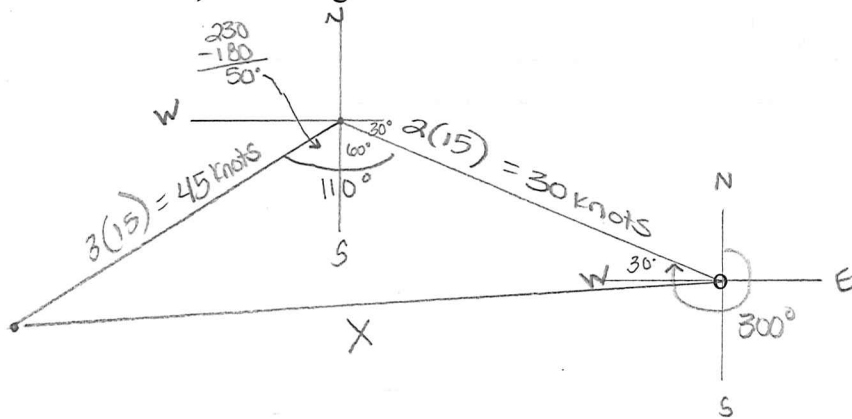


A plane flying 270°



Example 1

A ship proceeds on a course of 300° for 2 hours at a speed of 15 knots. Then the ship changes course to 230°, continuing at 15 knots for 3 more hours. At that time, how far is the ship from its starting point?



$$X^2 = 45^2 + 30^2 - 2(45)(30)\cos(110^\circ)$$

$$X^2 = 3848.45$$

$$X \approx 62.04 \text{ kn}$$

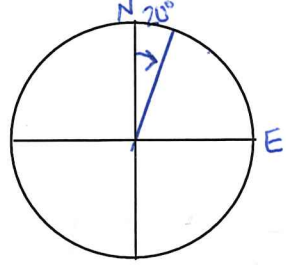
* 1 Knot = 1.151 mph

OR $62.04 \text{ knots} \times \frac{1.151 \text{ miles}}{\text{hour}}$

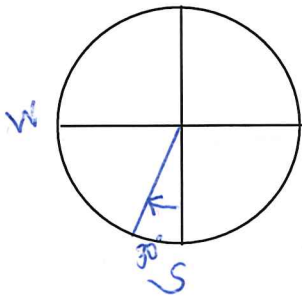
71.4 miles

Other Measurements

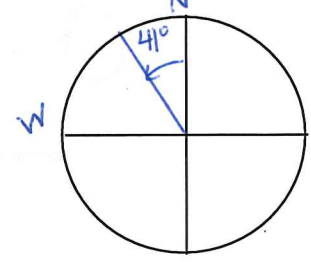
N20°E
20° East of North



S30°W
30° West of South



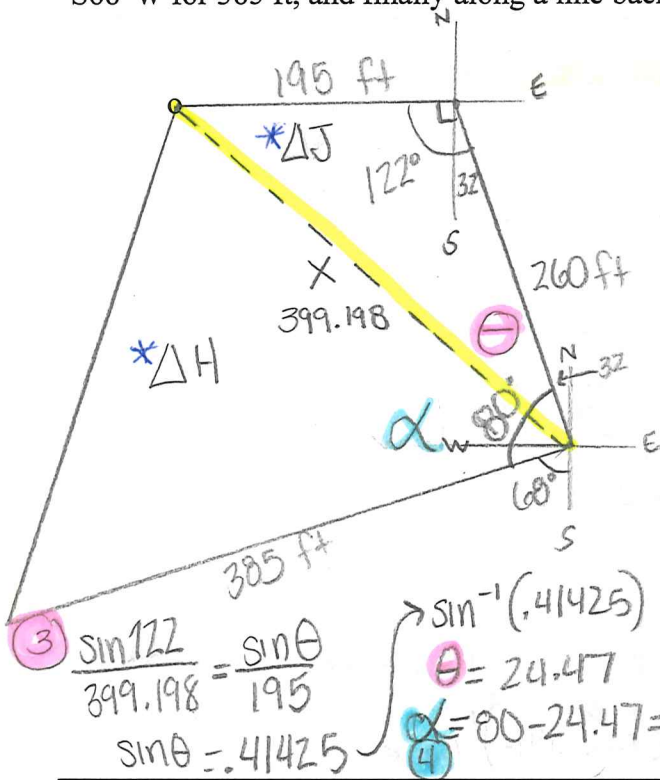
N41°W
41° West of North



Example 2

Sketch the plot of land described, then find its area.

From a metal post, proceed 195 ft east, then along a bearing of S32°E for 260 ft, then along a bearing of S68°W for 385 ft, and finally along a line back to the metal post.



① $X^2 = 195^2 + 260^2 - 2(195)(260)\cos(122^\circ)$

$X^2 = 159,358.8$

$X \approx 399.198$

*② Area $\Delta J = \frac{1}{2}(195)(260)\sin 122^\circ$

$\Delta J = 21498.02 \text{ ft}^2$

*③ $+\Delta H = 63,353.26 \text{ ft}^2$

Total Area = $84,851.29 \text{ ft}^2$

$\frac{180}{-68}$
 $\frac{-32}{80}$

$\sin^{-1}(.41425)$

$\theta = 24.47$

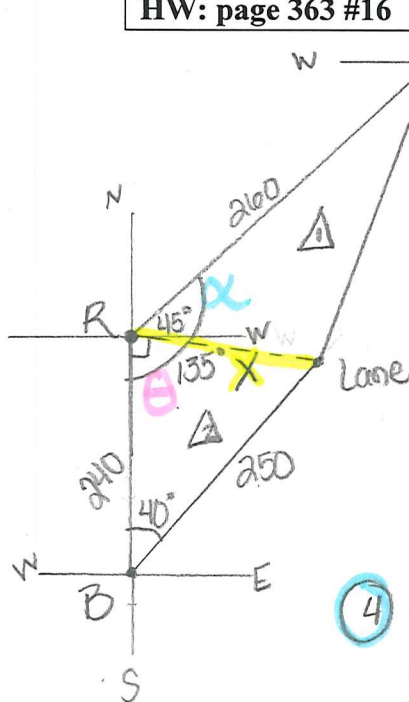
④ $\alpha = 80 - 24.47 = 55.53$

*⑤ Area $\Delta H = \frac{1}{2}(399.198)(385)\sin(55.53)$

Section 9.5 Summary:

Law of cosines and sines can be used to find areas of large masses by dividing the area into triangles. After finding missing sides and angles use the area formula for triangles $\frac{1}{2} \cdot a \cdot b \cdot \sin C$

HW: page 363 #16



① $X^2 = 240^2 + 250^2 - 2(240)(250)\cos(40^\circ)$

$X^2 = 33,043.627 \rightarrow X \approx 181.78$

② $\frac{\sin 40^\circ}{181.78} = \frac{\sin \theta}{250}$

$\sin \theta = .884$

③ $\theta = \sin^{-1}(.884)$

$\theta = 62.13^\circ$

④ $\alpha = 135 - 62.13^\circ$

$\alpha = 72.87^\circ$

Area

⑤ $\Delta = \frac{1}{2}(260)(181.78)\sin(72.87)$

$\Delta = 22,582.97 \text{ m}^2$

⑥ $\Delta = \frac{1}{2}(240)(250)\sin(40^\circ)$

$\Delta = 19,283.63 \text{ m}^2$

⑦ Total = $41,866.6 \text{ m}^2$