**Word Problems with the Law of Sines and Cosines**

### 7.2 #41
The rectangular box in the figure measures 6.50 feet by 3.25 feet by 4.75 feet. Find the measure of the angle \( \theta \) that is formed by the union of the diagonal shown on the front of the box and the diagonal shown on the right side of the box.

![Diagram of a rectangular box with diagonals and angles labeled](image)

\[
\begin{align*}
a &= \sqrt{6.5^2 + 4.75^2} = 8.05 \\
b &= \sqrt{3.25^2 + 4.75^2} = 5.76 \\
c &= \sqrt{6.5^2 + 3.25^2} = 7.27 \\
c^2 &= a^2 + b^2 - 2ab \cos \theta \\
2ab \cos \theta &= a^2 + b^2 - c^2 \\
\cos \theta &= \frac{a^2 + b^2 - c^2}{2ab} \\
\theta &= \cos^{-1} \left( \frac{a^2 + b^2 - c^2}{2ab} \right) \\
&= \cos^{-1} \left( \frac{8.05^2 + 5.76^2 - 7.27^2}{2 \times 8.05 \times 5.76} \right) \\
&= 60.86^\circ
\end{align*}
\]

### 7.1 #32
Three roads intersect in such a way as to form a triangular piece of land. Find the lengths of the other two sides of the land.

![Diagram of a triangle with angles and sides labeled](image)

\[
\begin{align*}
b &= \frac{320}{\sin 47^\circ} = \frac{320 \sin 47^\circ}{\sin 54^\circ} = 289.3 \text{ ft} \\
c &= \frac{320 \sin 79^\circ}{\sin 54^\circ} = 388.3 \text{ ft} \\
c &= 320 \sin 79^\circ = 390 \text{ ft}
\end{align*}
\]
7.1 #34
Two fire lookouts are located on mountains 20 miles apart. Lookout B is at a bearing of S65°E from A. A fire was sighted at a bearing of N50°E from A and at a bearing of N8°E from B. Find the distance of the fire from lookout A.

\[ \frac{x}{\sin 73°} = \frac{20}{\sin 42°} \]
\[ x = \frac{20 \sin 73°}{\sin 42°} \]
\[ = 28.6 \text{ mi} \]

7.1 #36
The navigator on a ship traveling due east at 8 mph sights a lighthouse at a bearing of S55°E. One hour later it is sighted at a bearing of S25°W. Find the closest the ship came to the lighthouse.

\[ \sin 65° = \frac{x}{y} \]
\[ x = y \sin 65° \]
\[ = 4.2 \text{ mi} \]
7.2 #37
A plane leaves airport A and travels 560 miles to airport B at a bearing of N32°E. The plane leaves airport B and travels to airport C 320 miles away at a bearing of S72°E. Find the distance from airport A to airport C.

\[
x = \sqrt{560^2 + 320^2 - 2(560)(320)\cos 104°}
\]

7.2 #45
A regular hexagon is inscribed in a circle with a radius of 40 centimeters. Find the length of one side of the hexagon.
7.2 #52
A ship leaves a port at a speed of 16 mph at a heading of 32°. One hour later another ship leaves the port at a speed of 22 mph at a heading of 254°. Find the distance between the ships 4 hours after the first ship leaves the port.
Homework:

- 7.1 #1-21 odd solving triangles with Law of Sines
- 7.1 #29,30,33,34,35 word problems with Law of Sines
- 7.2 #9-19 odd solving triangles with Law of Cosines
- 7.2 #25-29 odd area
- 7.2 #38,43,46,47,48 word problems with Law of Cosines
- 7.3 #37,41,43 word problems with Law of Sines/Cosines