Preliminaries and Objectives

Preliminaries:
- Law of Sines

Objectives:
- Given three parts of a triangle (SSA), find the missing three parts. There may be two possibilities.

Example 1

\[
\frac{\sin 49^\circ}{10} = \frac{\sin C}{12} \Rightarrow \sin C \approx .90565
\]

\[C \approx 64.91^\circ \text{ OR } 115.09^\circ\]
**Example 2**

\[ c = 12 \quad 86.84^\circ \quad a = 13 \]

\[ 49^\circ \quad 44.16^\circ \]

\[ A = 49^\circ \quad C = 44.16^\circ \]

\[ B = 86.84^\circ \]

\[
\frac{\sin 86.84^\circ}{b} = \frac{\sin 49^\circ}{13}
\]

\[ \Rightarrow b \approx 17.199 \]

\[ A = 49^\circ \quad C = 135.84^\circ \]

\[ B = 180^\circ - 49^\circ - 135.84^\circ = -4.84^\circ \]

But we can't have a negative angle in a triangle!

**Example 3**

\[ c = 12 \quad a = 5 \]

\[ 49^\circ \]

\[ \frac{\sin 49^\circ}{5} = \frac{\sin C}{12} \Rightarrow \sin C \approx 1.811 \]

**SSA**

Given two sides and an angle opposite one of the two sides

- Try to find the angle opposite the second side by using the Law of Sines. If you are taking the inverse sine of a number bigger than 1, you will get no solution, otherwise.
- Your calculator will give you one possible angle \( \theta \), the second possible angle is \( 180^\circ - \theta \).
- Find the third angle. If the sum of the first two angles is more than \( 180^\circ \), then there will only be one solution.
- Find the third side of all possible triangles using the Law of Sines.