

## Solving Triangles Using the Law of Sines - Part II

### Preliminaries and Objectives

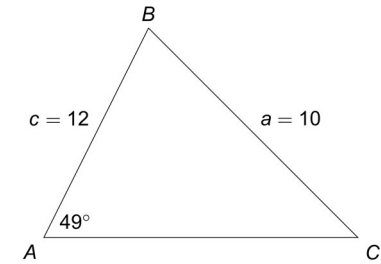
Preliminaries:

- Law of Sines

Objectives:

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

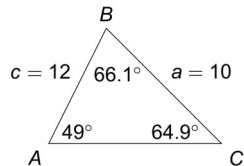
### Example 1



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

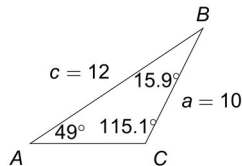
$$C \approx 64.91^\circ \text{ OR } 115.09^\circ$$

### Example 1



$$A = 49^\circ \quad C = 64.91^\circ \\ B = 66.09^\circ$$

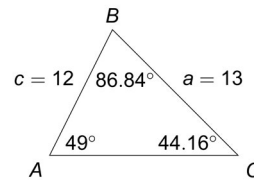
$$\frac{\sin 66.09^\circ}{b} = \frac{\sin 49^\circ}{10} \\ \Rightarrow b \approx 12.113$$



$$A = 49^\circ \quad C = 115.09^\circ \\ B = 15.91^\circ$$

$$\frac{\sin 15.91^\circ}{b} = \frac{\sin 49^\circ}{10} \\ \Rightarrow b \approx 3.632$$

### Example 2



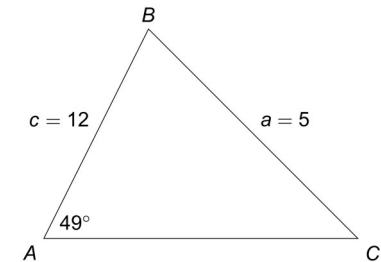
$$A = 49^\circ \quad C = 44.16^\circ$$

$$B = 86.84^\circ \\ \frac{\sin 86.84^\circ}{b} = \frac{\sin 49^\circ}{13} \\ \Rightarrow b \approx 17.199$$

$$A = 49^\circ \quad C = 135.84^\circ \\ B = 180^\circ - 49^\circ - 135.84^\circ \\ = -4.84^\circ$$

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

### Example 3



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

### 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.