Solving Triangles Using the Law of Sines - Part II

Preliminaries and Objectives

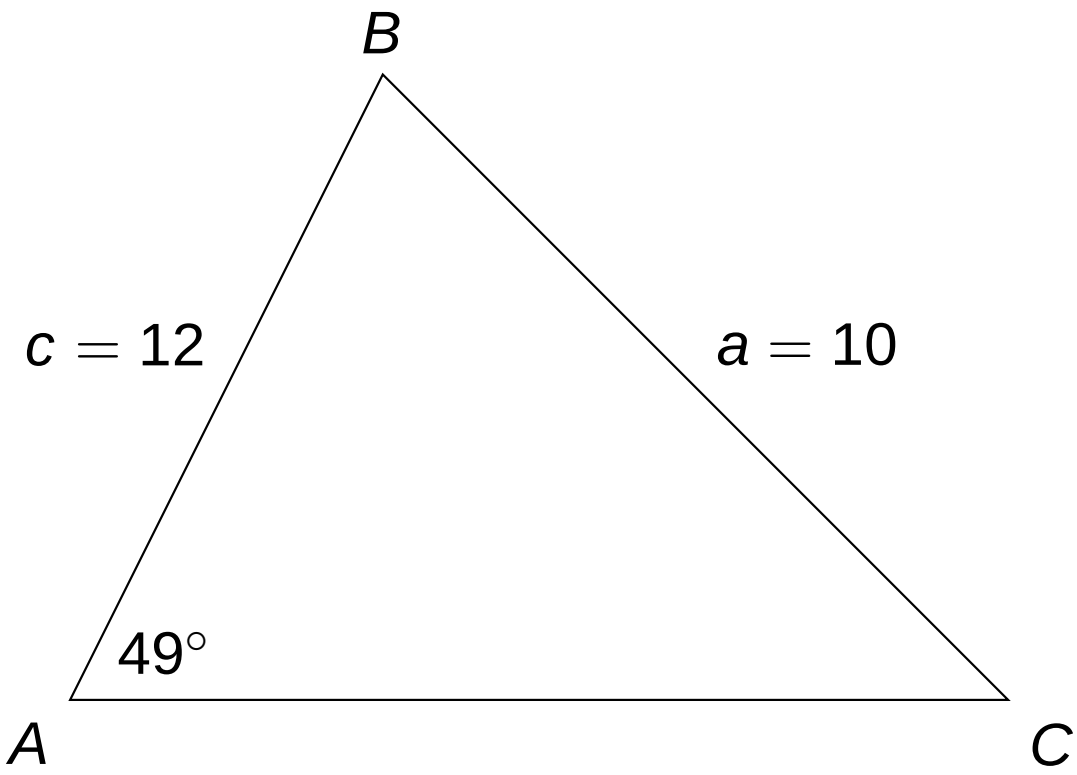
Preliminaries:

- Law of Sines

Objectives:

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

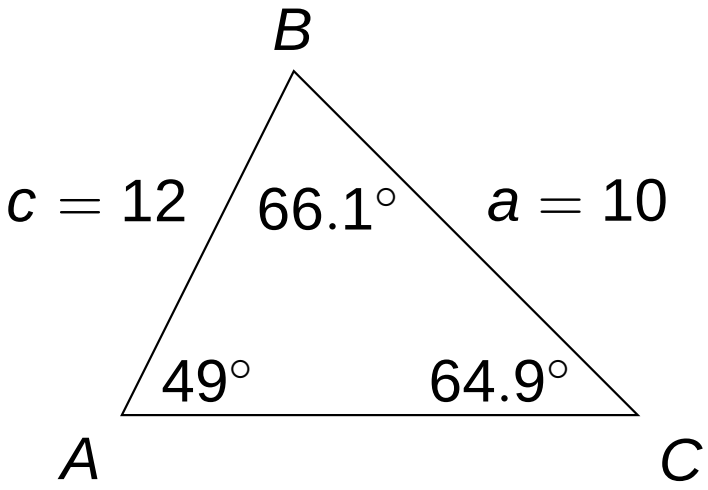
Example 1

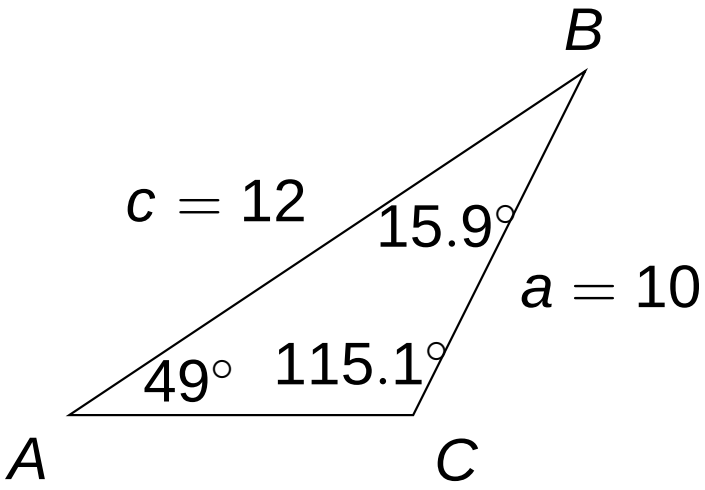


$$\frac{\sin 49^\circ}{10} = \frac{\sin C}{12} \Rightarrow \sin C \approx .90565$$

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

Example 1





$A = 49°$ $C = 64.91°$

$B = 66.09°$

$$\frac{\sin 66.09°}{b} = \frac{\sin 49°}{10}$$

$$\Rightarrow b \approx 12.113$$

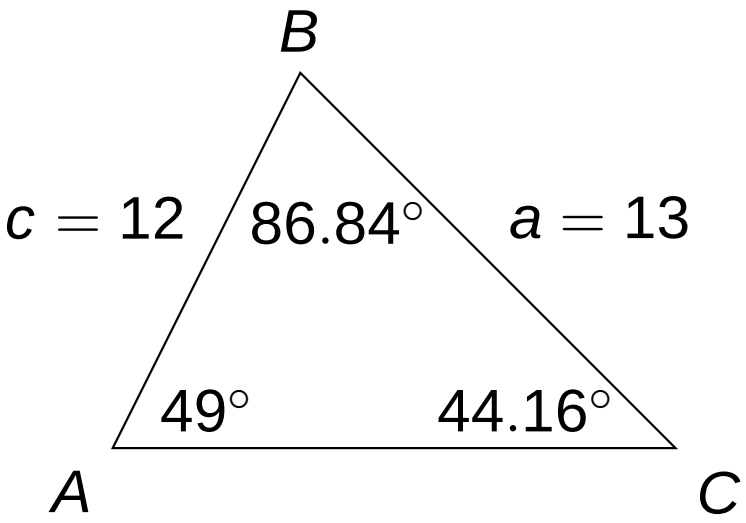
$A = 49°$ $C = 115.09°$

$B = 15.91°$

$$\frac{\sin 15.91°}{b} = \frac{\sin 49°}{10}$$

$$\Rightarrow b \approx 3.632$$

Example 2



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

$$B = 86.84^\circ$$

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

$$\Rightarrow b \approx 17.199$$

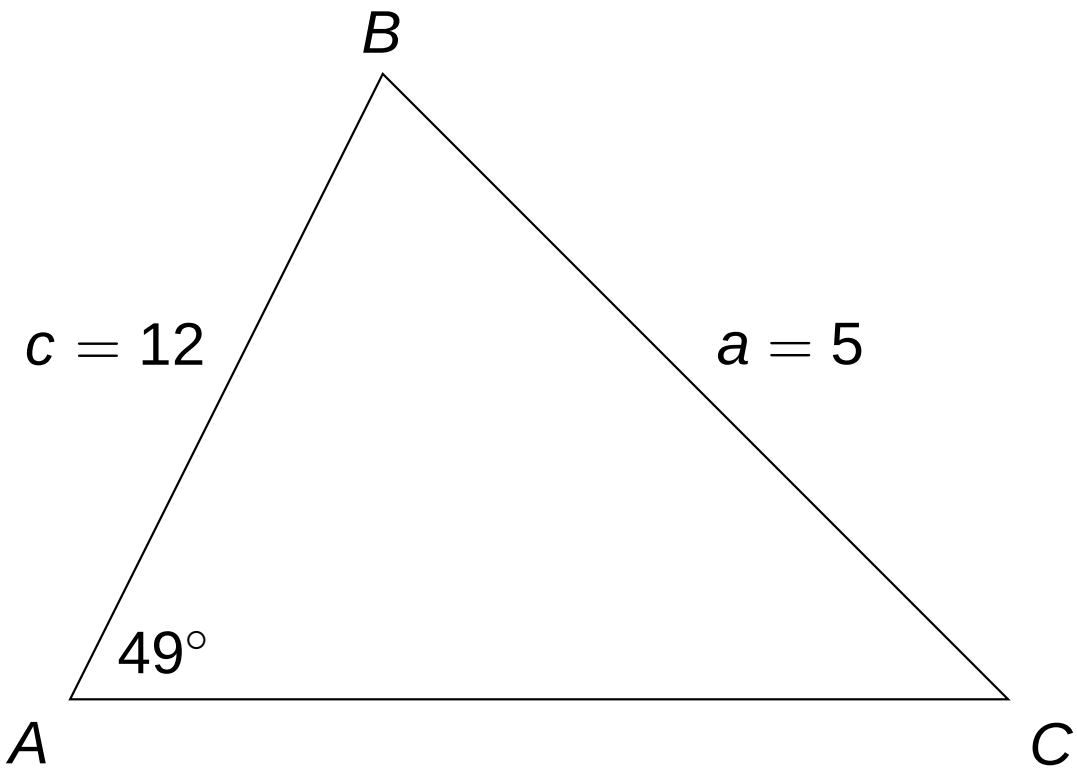
$A = 49^\circ \qquad C = 135.84^\circ$

$$B = 180^\circ - 49^\circ - 135.84^\circ$$

$$= -4.84^\circ$$

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 θ, the second possible angle is $180^\circ - \theta$.
- Find the third angle. If the sum of the first two angles is more than 180°, then there will only be one solution.
- Find the third side of all possible triangles using the Law of Sines.