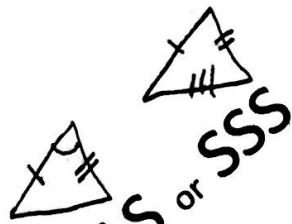


## Solving non-right triangles

The Law of sines and cosines

## The Law of cosines

use for **SAS** or **SSS**

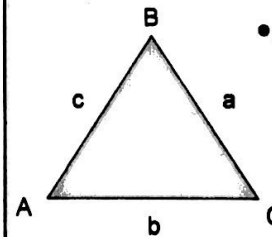


You should know...

- Solving a triangle means finding all sides and angles.
- The Laws of Sines and Cosines work for all triangles – not just right triangles.

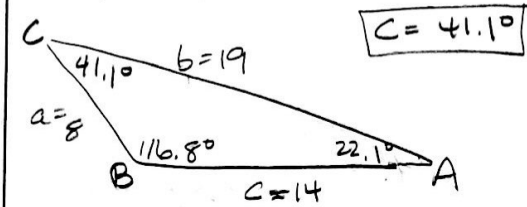
### Law of cosines

- $a^2 = b^2 + c^2 - 2bc\cos A$
- $b^2 = a^2 + c^2 - 2ac\cos B$
- $c^2 = a^2 + b^2 - 2ab\cos C$



Ex. 1: Find all the angles.

• a = 8 ft, b = 19 ft, and c = 14 ft  $C = 180 - 22.1 - 116.8$



$$\text{D) } a^2 = b^2 + c^2 - 2bc \cos A$$

$$8^2 = 19^2 + 14^2 - 2(19)(14) \cos A$$

$$64 = 557 - 532 \cos A$$

$$\begin{array}{r} -557 \\ -557 \hline -493 \end{array} = \begin{array}{r} -532 \cos A \\ -532 \hline \end{array}$$

$$\frac{493}{532} = \cos A$$

$$A = \cos^{-1} \left( \frac{493}{532} \right)$$

$$\boxed{A = 22.1^\circ}$$

$$\text{② } b^2 = a^2 + c^2 - 2ac \cos B$$

$$19^2 = 8^2 + 14^2 - 2(8)(14) \cos B$$

$$361 = 260 - 224 \cos B$$

$$\begin{array}{r} -260 \\ -260 \hline 101 \end{array} = \begin{array}{r} -224 \cos B \\ -224 \hline \end{array}$$

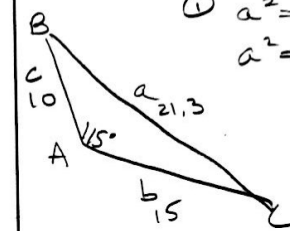
$$\frac{101}{-224} = \cos B$$

$$B = \cos^{-1} \left( -\frac{101}{224} \right)$$

$$\boxed{B = 116.8^\circ}$$

Ex. 2: Find the missing measures.

• A = 115°, b = 15 cm, and c = 10 cm



$$\text{① } a^2 = b^2 + c^2 - 2bc \cos A$$

$$a^2 = 15^2 + 10^2 - 2(15)(10) \cos 115^\circ$$

$$a^2 = 451.8$$

$$\boxed{a = 21.3}$$

$$\text{② } b^2 = a^2 + c^2 - 2ac \cos B$$

$$15^2 = 21.3^2 + 10^2 - 2(21.3)(10) \cos B$$

$$225 = 553.69 - 426 \cos B$$

$$\begin{array}{r} -553.69 \\ -553.69 \hline -328.69 \end{array} = \begin{array}{r} -426 \cos B \\ -426 \hline \end{array}$$

$$\frac{-328.69}{-426} = \cos B$$

$$B = \cos^{-1} \left( \frac{328.69}{426} \right)$$

$$\boxed{B = 39.5^\circ}$$

$$C = 180 - 115 - 39.5$$

$$\boxed{C = 25.5^\circ}$$