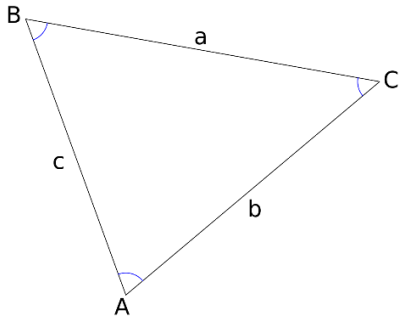
Law of Sines and Law of Cosines

Law of Sines and Law of Cosines are special trigonometry rules because they work even on non-right (acute and obtuse) triangles.

Note: The convention when working with triangles is to label the angles with capital letters and the sides opposite them with the corresponding lower-case letter.



Tip: If it is not given, draw the triangle first!

Law of Sines:

Use if there is one known angle-side pair.

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Careful! Only two fractions are needed to form the proportion, and do not forget to include the "sin" in each.

Law of Cosines:

Use if there is a known angle adjacent to two known sides (and the question asks for the side across from the known angle) or if there are three known sides (and the question ask for one of the unknown angles).

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

Careful! Notice that in the final term in the polynomial expression ($2bc \cdot \cos A$ or $2ac \cdot \cos B$ or $2ab \cdot \cos C$) the values are all being multiplied together, so keep the Order of Operations in mind when solving for the unknown variable.

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Law of Sines – Solving for an **Unknown Side**:
In $\triangle ABC$, $m\angle A = 22°$, $m\angle C = 13°$, $a = 9$. Solve for c.

Law of Sines – Solving for an **Unknown Angle**:
In $\triangle ABC$, $m\angle A = 70°$, $a = 25$, $b = 26$. Solve for $m\angle B$.

Law of Cosines – Solving for an **Unknown Side**:
In $\triangle ABC$, $m\angle B = 97°$, $a = 16$, $c = 25$. Solve for b.

Law of Cosines – Solving for an **Unknown Angle**:
In $\triangle ABC$, $a = 10$, $b = 17$, $c = 11$. Solve for $m\angle C$

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