

**Example: Law of Cosines****Problem:**

Find the measure of all angles in the triangle below. Triangle TUV has all three sides given, side TU measures 57, side UV measures 75 and side TV measures 42.

**Solution:**

Let's first find the measure of angle T. We are given all three sides, which is a situation that requires the use of the Law of Cosines. The length of the side opposite angle T is 75. This length will go on the left side of the equation.

$75^2 = 57^2 + 42^2 - 2 \cdot 57 \cdot 42 \cdot \cos T$

$5625 = 3249 + 1764 - 4788 \cos T$

Simplify by subtracting the first two terms from the right side.  $612 = -4788 \cos T$

Divide both sides by the value in front of the cosine to get  $-0.1278 = \cos T$

To solve for T, we take the inverse cosine of both sides.

Angle T measures 97.34 degrees.

Now that we have an angle and a side that are opposite each other, we can use the Law of Sines. Let's find the measure of angle U next.

$\frac{\sin U}{42} = \frac{\sin 97.34}{75}$

Cross multiply.

$75 \sin U = 42 \sin 97.34$

Divide by 75 to get  $\sin U = \frac{42 \sin 97.34}{75}$

The sine of U is approximately equal to 0.5554.

Take the inverse sine of both sides.

The measure of angle U is approximately equal to 33.74 degrees.

Now that we have two angle measures, we can find the measure of angle V simply by subtracting from 180.

$180 - 97.34 - 33.74 = 48.92$

The measure of angle V is approximately equal to 48.92 degrees.