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## 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 squared equals 57 squared plus 42 squared minus 2 times 57 times 42 times the cosine of angle T.

Five thousand six hundred twenty five equals three thousand two hundred forty nine plus one thousand seven hundred sixty four minus four thousand seven hundred eighty eight times the cosine of angle T.

Simplify by subtracting the first two terms from the right side. Six hundred twelve equals negative four thousand seven hundred eighty eight times the cosine of angle T.

Divide both sides by the value in front of the cosine to get negative 0.1278 equals the cosine of angle 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.

The sine of U over 42 equals the sine of 97.34 over 75.

Cross multiply.

75 times the sine of U equals 42 times the sine of 97.34.

Divide by 75 to get the sine of U equals 42 times the sine of 97.34 divided by 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 minus 97.34 minus 33.74 equals 48.92.

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