3.2 Law of Cosines

Trig 3.2 ~ The Law of Cosines

* Prove the law of cosines.
* Use the law of cosines to solve for parts of a triangle.
* Use the law of sines and the law of cosines to solve for parts of a triangle.
* Solve real life problems using these laws.
* Use two ways to find the area of a triangle.

Remembering Geometry Congruence Theorems:
Law of Cosines: In any triangle, ABC with sides a, b, c:

\[ c^2 = a^2 + b^2 - (2ab) \cos C \]

It looks like the Pythagorean theorem!

PROOF: Given: \( \triangle ABC \) with sides a, b, c

Prove: \( a^2 = b^2 + c^2 - (2bc) \cos A \)
Example 1 SAS:

Triangle ABC has $c = 15$ cm, $b = 12$ cm and $\angle A$ measures $85^\circ$. Solve for the remaining three parts of the triangle.

*Draw a picture.
*Label parts.
*Determine which law to use.
*Solve.

Example 2 SSS:

Given $\triangle RST$ with sides $r = 18''$, $s = 15''$, and $t = 10''$. Find the three angles.

Draw
Label
Equation
Solve
Example 3:

A plane flies 280 miles, turns 85° and flies another 350 miles. How far is it from the starting point?

Draw a picture.
Label it.
Determine which law to use.
Solve it.

The area of a triangle in two ways:

Area = \( \frac{1}{2} ab \sin C \)

or

Area = \( \sqrt{s(s-a)(s-b)(s-c)} \) where \( s = \text{semiperimeter,} \frac{a+b+c}{2} \)

The second is called Heron's formula.

Find the area of a triangle with sides 7 cm, 12 cm, and 13 cm.

Use first formula: \( \text{Area} = \frac{1}{2} ab \sin C \)

Use Heron's formula