

Section 9.4: Law of Cosines

Essential Question:

What is the Law of Cosines used for?

*Used for SAS

If finding a side length...

$$c^2 = a^2 + b^2 - 2(a)(b) \cos(C)$$

this side corresponds to this angle

*Used for SSS

If finding an angle...

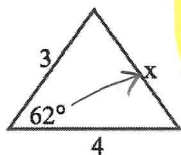
$$\cos(C) = \frac{c^2 - a^2 - b^2}{-2(a)(b)}$$

* Notice the two #s you subtract in numerator are multiplied in denominator

- Step 1) calculate the numerator
- Step 2) calculate the denominator
- Step 3) divide
- Step 4) cosine inverse

Find x in the following problems:

Example 1



x' corresponds to 62°

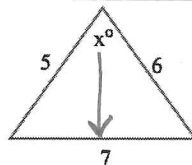
$$x^2 = 3^2 + 4^2 - 2(3)(4) \cos(62^\circ)$$

$$x^2 = 13.7326$$

$$x = \sqrt{13.7326}$$

$$x \approx 3.71 \text{ un}$$

Example 2



* side 7 corresponds to angle X

* Solving for an angle

$$\cos X = \frac{7^2 - 5^2 - 6^2}{-2(5)(6)}$$

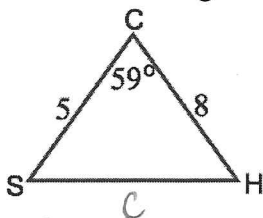
$$\cos X = \frac{-12}{-60} = .2$$

$$X = \cos^{-1}(.2)$$

$$m\angle X = 78.46^\circ$$

Example 3

A triangle has sides of 5cm and 8cm and an included angle of 59°. Find the missing side and angles.



$$c^2 = 5^2 + 8^2 - 2(5)(8) \cos 59^\circ$$

$$c^2 = 47.796$$

$$c = \sqrt{47.796} \approx 6.91 \text{ un}$$

$$\cos H = \frac{5^2 - 8^2 - 6.91^2}{-2(8)(6.91)}$$

$$\cos H = \frac{-86.7481}{-110.56} = .7846$$

$$\cos^{-1}(.7846) = m\angle H = 38.3^\circ$$

3rd Sum \angle 's $\Delta = 180$

$$180 - 59 - 38.3 = 82.7 = \angle S$$

Section 9.4 Summary:

Law of Sines

AAS

ASA

SSA \rightarrow test for # of Δ s

Law of Cosines is used for finding

\rightarrow side length

$$c^2 = a^2 + b^2 - 2ab \cos C$$

\rightarrow an angle

$$\cos C = \frac{c^2 - a^2 - b^2}{-2ab}$$

* take the inverse