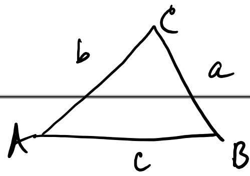
6 Cosine Law Appplications

January 5, 2019 5:55 PM



THE LAW OF COSINES

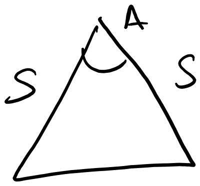
The Law of Cosines: $a^2 = b^2 + c^2 - 2bc\cos A$

$b^2 = a^2 + c^2 - 2bc\cos B$

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

Use the Cosine Law when given:

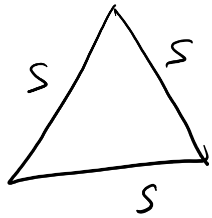
Case 1: two sides and the angle between them ("the included angle")



$\boxed{SAS}$

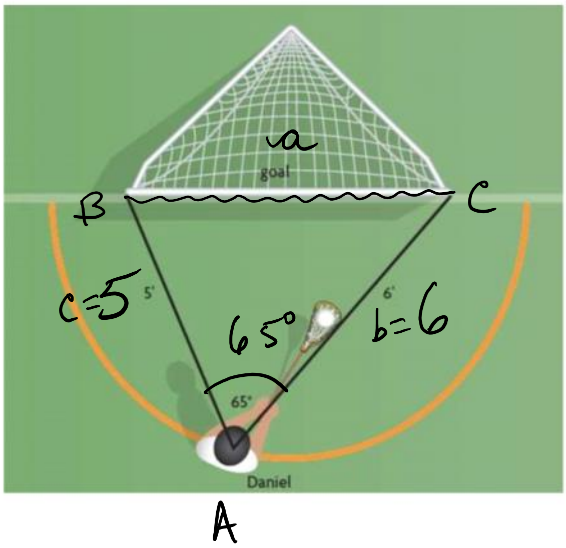
Case 2: all 3 sides

$\boxed{SSS}$



"Sassy sides!"

Example 1: Daniel is about to take a shot at a field lacrosse net. He estimates his current position as shown. Based on his estimates, how wide is the net?



$a^2 = b^2 + c^2 - 2bc\cos A$

$\boxed{SAS}$ $a^2 = 6^2 + 5^2 - 2(6)(5)\cos 65°$

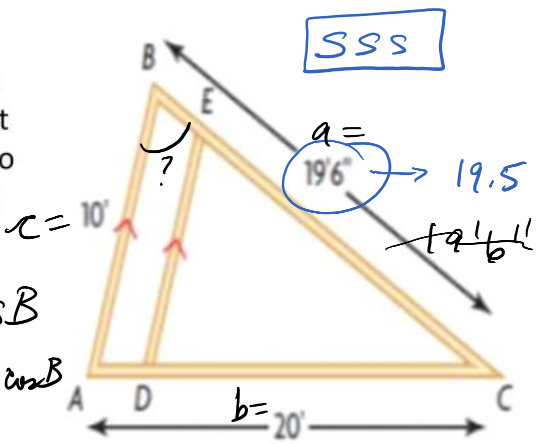
$= 36 + 25 - 60\cos 65°$

$a^2 = 35.6429$

$a^2 = \sqrt{35.64}$

$\boxed{a = 5.97 \text{ feet}}$

Example 2: The diagram shows the plan for a roof, with support beam DE parallel to AB. The local building code requires the angle formed at the peak of a roof to fall within a range of 70° to 80° so that snow and ice will not build up. Will this plan pass the local building code?



$$b^2 = a^2 + c^2 - 2ac\cos B$$

$$20^2 = \underbrace{19.5^2 + 10^2}_{*} - 2(19.5)(10)\cos B$$

$$400 = 480.25 - 390\cos B$$

$$-480.25 \qquad -480.25$$

$$\frac{-80.25}{-390} = \frac{-390\cos B}{-390}$$

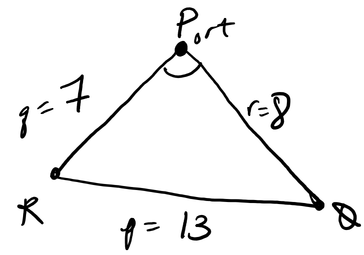
$$\cos B = 0.2058$$

$$B = \cos^{-1}(0.2058)$$

$$B = 78.13^\circ$$

It will pass!

Example 3: Two ships set sail from port P, heading in different directions. The first ship sails 7 km to R and the second ship sails 8 km to Q. If the distance between R and Q is 13 km, what is the angle between the directions of the two ships?



$$p^2 = q^2 + r^2 - 2qr\cos P$$

$$13^2 = 7^2 + 8^2 - 2(7)(8)\cos P$$

$$169 = 113 - 112\cos P$$

$$-113 \qquad -113$$

$$\frac{56}{-112} = \frac{-112\cos P}{-112}$$

$$-0.5 = \cos P$$

$$P = \cos^{-1}(-0.5) = 120^\circ$$

Assignment: Sec 3.3, p. 138 #8, 9, 10, 13, 12, 19,20