

Do Now:

Decide if the given measurements determine one triangle, two triangles, or no triangle.

DO NOT SOLVE

1.) $A=71, a=45, c=47$ 2 \triangle 's

2.) $C=85, b=33, c=28$ NO \triangle

Find all the unknown measurements for ABC

3.) $A=96, a=16, b=7$

$B=26^\circ$ ~~$C=58^\circ$~~ $C=13.6$

Unit 9 Day 12
Trigonometry Laws
(9.7) Law of Cosines

Law of Sines-AAS, ASA, SSA

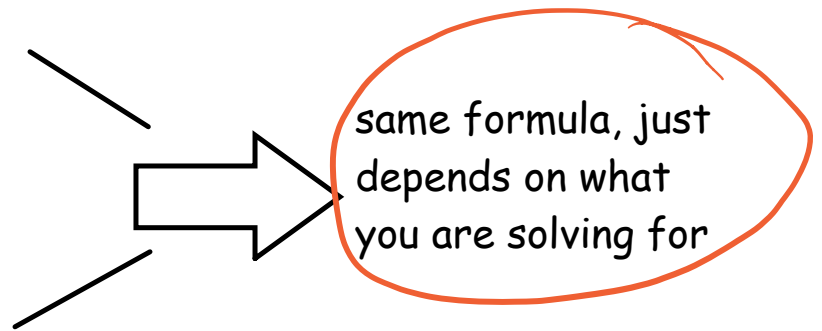
Law of Cosines-SAS, SSS

Law of Cosines Formulas:

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

$$b^2 = a^2 + c^2 - 2accosB$$

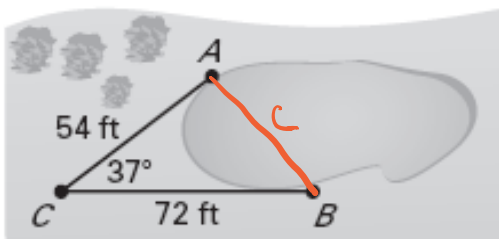
$$c^2 = a^2 + b^2 - 2abc\cos C$$



* Notice what side you are solving for is the angle that goes with cosine.

Example

Measuring a Pond A surveyor is measuring the width of a pond. The transit is setup at point C and forms an angle of 37° from point A to point B . The distance from point C to point A is 54 feet and the distance from point C to point B is 72 feet. How wide is the pond from point A to point B ?



SAS \rightarrow law of cosines

$$c^2 = 72^2 + 54^2 - 2(72)(54)\cos 37$$

$$c^2 = 5184 + 2916 - 7776\cos 37$$

$$c^2 = 8100 - 6210.2$$

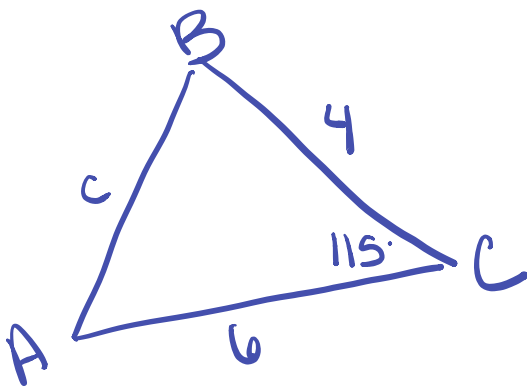
$$c^2 = 1889.8$$

$$c = \sqrt{1889.8}$$

$$c = 43.5 \text{ ft}$$

Example

Given $a=4$, $b=6$, and $C=115$, find c .



$$c^2 = 4^2 + 6^2 - 2(4)(6)\cos 115$$

$$c^2 = 52 - 48 \cos 115$$

$$c^2 = 52 - -20.3$$

$$c^2 = 52 + 20.3$$

$$c^2 = 72.3$$

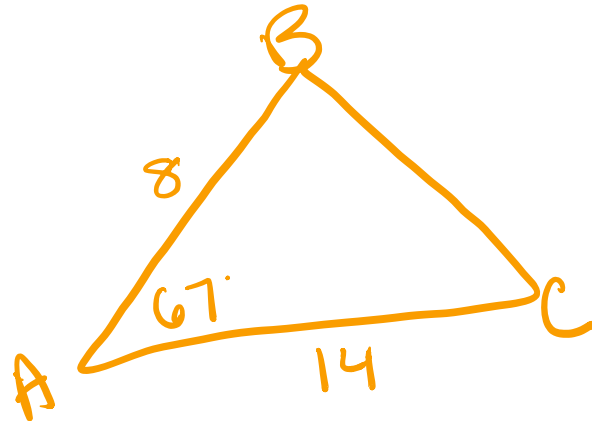
$$c = \sqrt{72.3}$$

$$c = 8.5$$

Example

Given $a=22$, $b=19$, $c=14$, find B.

-SKIP-



Example

Solve.

SAS \rightarrow law of cosines

$$A=67, b=14, c=8$$

$$\textcircled{1} a^2 = 14^2 + 8^2 - 2(14)(8)\cos 67$$

$$a^2 = 260 - 87.5$$

$$a^2 = 172.5$$

$$a = \sqrt{172.5}$$

$$a = 13.1$$

 $\textcircled{2}$ law of sines

$$\frac{8}{\sin C} = \frac{13.1}{\sin 67}$$

$$13.1 \sin C = 8 \sin 67$$

$$\sin C = \frac{8 \sin 67}{13.1}$$

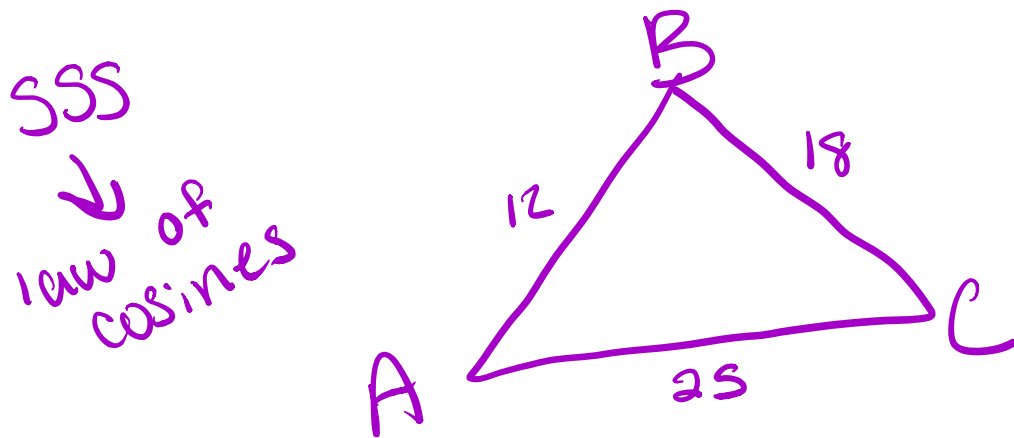
$$C = \sin^{-1}\left(\frac{8 \sin 67}{13.1}\right)$$

$$C = 34$$

 $\textcircled{3}$ Subtract from 180

$$B = 180 - 67 - 34$$

$$B = 79$$



Example

Solve.

*Find the largest angle first!!!

$$a=18, b=25, c=12$$

$$\textcircled{1} 25^2 = 18^2 + 12^2 - 2(18)(12)\cos B$$

$$625 = 468 - 432\cos B$$

$$-468 \quad -468$$

$$\frac{157}{-432} = \frac{-432\cos B}{-432}$$

$$\cos B = \frac{157}{-432}$$

$$B = \cos^{-1}\left(\frac{157}{-432}\right)$$

$$B = 111^\circ$$

$$\textcircled{2} \text{ Law of Sines}$$

$$\frac{18}{\sin A} = \frac{25}{\sin 111}$$

$$25 \sin A = 18 \sin 111$$

$$\sin A = \frac{18 \sin 111}{25}$$

$$A = \sin^{-1}\left(\frac{18 \sin 111}{25}\right)$$

$$A = 42^\circ$$

$$\textcircled{3} \text{ Subtract from } 180$$

$$C = 180 - 111 - 42$$

$$C = 27$$

Example

Tell whether you would use the Law of Sines or Cosines to solve the triangle with the given information.

a.) $B=51, C=65, c=8$ AAS or ASA Law of Sines

b.) $a=10, b=7, c=5$ SSS law of cosines

c.) $A=45, b=10, a=12$ SSA Law of Sines

d.) $A=70, b=11, c=19$ SAS Law of Cosines

Solve

$$A=45, b=10, a=12$$

Example

-SKIP-

Solve.

$$A=70, b=11, c=19$$

Example

-SKIP-

And the homework is...

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Mini Quiz **Wednesday 3/11** **Thursday 3/12**

