13-5 Law of Cosines

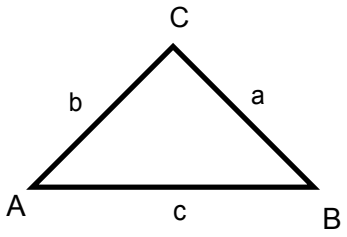
Objective:
Solve problems by using the Law of Cosines
Determine whether a triangle can be solved by first using the law of sines or cosines.

Law of Cosines

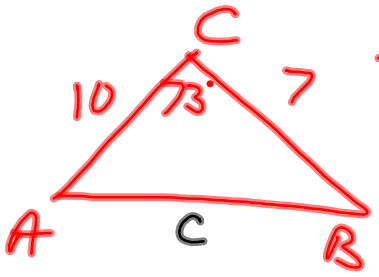
$a^2 = b^2 + c^2 - 2bc \cos A$

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

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



Ex 1) Solve triangle ABC. C = 73, b = 10, a = 7



SAS

$c^2 = 10^2 + 7^2 - 2 \cdot 10 \cdot 7 \cos 73$

$c^2 = 108.1\ldots$

$c = 10.4$

$C = 10.4$
$A = 40^\circ$
$B = 67^\circ$

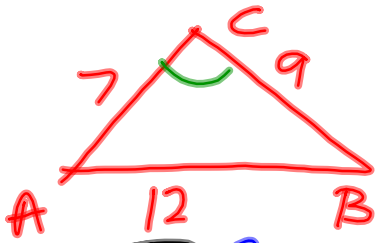
180 − 73 − 67

$\frac{\sin 73}{10.4} = \frac{\sin B}{10}$

$\sin^{-1}\left(\frac{10 \sin 73}{10.4}\right) = B = 67^\circ$

*Important
When you switch to law of Sines, make sure you find the largest angle last by using △ sum!

Ex 2) Solve triangle ABC. a = 9, b = 7, c = 12



SSS

*Start w/ largest angle since using law of cosines. "C"

$12^2 = 7^2 + 9^2 - 2 \cdot 7 \cdot 9 \cos C$

$144 = 130 - 126\cos C$

$-130 \quad -130$

$14 = -126\cos C$

$\frac{14}{-126} = \cos C$ $\quad \cos^{-1}\left(\frac{14}{-126}\right) = 96°$

$\frac{\sin A}{9} = \frac{\sin 96}{12}$

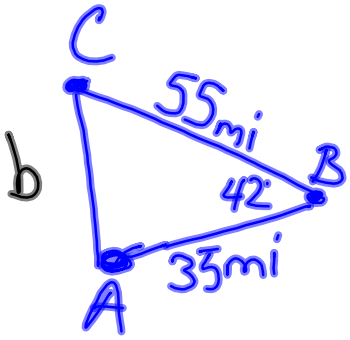
$= \sin^{-1}\left(\frac{9\sin 96}{12}\right)$

$A = 48°$

C = 96°
A = 48°
B = 36°

180
−96
−48

Ex 3) A helicopter flies 55 miles from its base at point C to an accident at point B, then 35 miles to the hospital at point A. Angle B equals 42 degrees. How far will the helicopter have to fly to return to its base from the hospital?



$b^2 = 55^2 + 35^2 - 2 \cdot 55 \cdot 35 \cdot \cos 42°$

$b^2 = 1388.9\ldots$

$b = 37.3 \text{ mi}$