6.2 Law of Cosines

Law of Cosines can be used to solve a triangle when you're given:

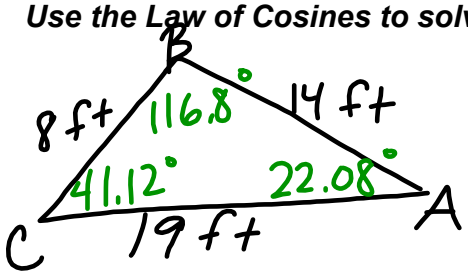
1.) ***Three sides: SSS***

2.) ***Two sides and their included angle: SAS***

Law of Cosines

Standard Form	*Alternative Form*
$a^2 = b^2 + c^2 - 2bc\cos A$	$\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$
$b^2 = a^2 + c^2 - 2ac\cos B$	$\cos B = \dfrac{a^2 + c^2 - b^2}{2ac}$
$c^2 = a^2 + b^2 - 2ab\cos C$	$\cos C = \dfrac{a^2 + b^2 - c^2}{2ab}$

Use the Law of Cosines to solve each triangle.



* find largest angle first

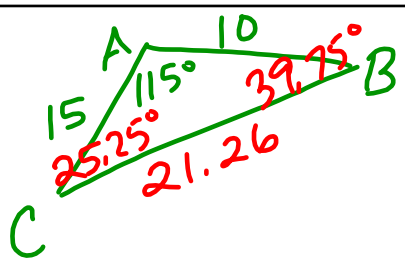
$\cos B = \dfrac{a^2+c^2-b^2}{2ab} = \dfrac{(8^2+14^2-19^2)}{(2(8)(14))} = -0.4509$

$B = 116.8°$

$\dfrac{\sin 116.8°}{19} = \dfrac{\sin A}{8} \rightarrow \sin A = \dfrac{8(\sin 116.8°)}{19}$

$A = 22.08°$

$A = 115°$
$b = 15$ cm
$c = 10$ cm



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

$a^2 = 15^2 + 10^2 - 2(15)(10)\cos 115°$

$a = 21.26$ cm

$\frac{\sin 115°}{21.26} = \frac{\sin B}{15}$

$\sin B = \frac{15\sin 115°}{21.26}$

$B = 39.75°$

$a = 4$ cm
$b = 8$ cm
$c = 10$ cm

$A = 22.33°$
$B = 49.46°$
$C = 108.21°$

$\cos C = \frac{a^2+b^2-c^2}{2ab} = \frac{4^2+8^2-10^2}{2(4)(8)} = -0.3125$

$C = 108.21°$

$\frac{\sin 108.21°}{10} = \frac{\sin A}{4}$

$\sin A = \frac{4\sin 108.21°}{10}$

$A = 22.33°$

The pitcher's mound on a women's softball field is 43 feet from home plate and the distance between the bases is 60 feet. (The pitcher's mound is not halfway between home plate and second base.) How far is the pitcher's mound from first base?

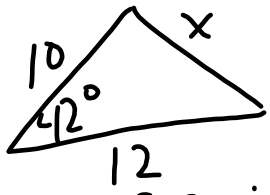
$h^2 = 43^2 + 60^2 - 2(43)(60)\cos 45°$

$h^2 \approx 1800.33$

$h \approx 42.43$ ft

For each triangle shown below, determine whether you would use the Law of Sines or Law of Cosines to find the value of *x*. Then find the value of *x* to the nearest hundredth.

5.

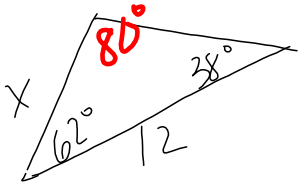


Law of Cosines

$x^2 = 10^2 + 12^2 - 2(10)(12)\cos 42°$

$x = 8.10$

6.



Law of Sines

$\frac{\sin 80°}{12} = \frac{\sin 38°}{x}$

$x = \frac{12 \sin 38°}{\sin 80°}$

$x = 7.50$