BEFORE WE BEGIN, ARE THERE ANY QUESTIONS FROM LAST DAY'S WORK? 5.1.1

Today's Learning Goal(s):

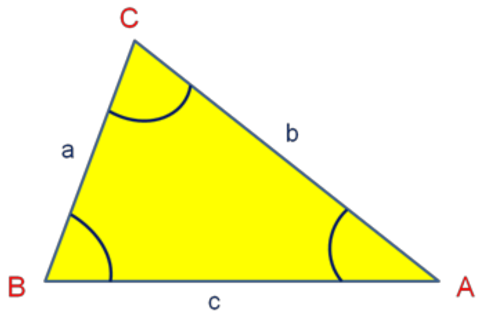
By the end of the class, I will be able to:

a) Correctly write the sine **LAW** and the cosine **LAW** in one of the two forms.
b) Use the sine law and cosine law to solve a non-right triangles.

5.2.1 Reviewing the Sine **LAW** and Cosine **LAW** (to Solve Oblique Triangles)

Date: NOV. 13/19

The Sine Law can be used with any triangle, even if it is not a right triangle.
Given any triangle,



① $$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

and

② $$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\frac{A}{B} = \frac{C}{D}$$

$$AD = BC$$

$$\frac{B}{A} = \frac{D}{C}$$

If you are trying to determine an unknown side, then use the formula given in ①.
If you are trying to determine an unknown angle, then use the formula given in ②.

So why do we need the Cosine Law?

When the triangle we are solving involves 2 known sides and the contained angle (a.k.a. SAS), then we use the formula given in ③. Remember to take the square root of the answer to find *a*.

③ $$a^2 = b^2 + c^2 - 2bc\cos A \qquad \text{(SAS)}$$

When the triangle we are solving involves 3 known sides, but no known angles (a.k.a. SSS), then we use the formula given in ④. Remember to take the inverse cos, (or $\cos^{-1}$) to find the measure of angle A.
Note: In this case, always find the largest angle first, in case it is an obtuse angle.
The largest angle will be located opposite the longest side. [Think about it!]

④ $$\cos A = \frac{b^2 + c^2 - a^2}{2bc} \qquad \text{(SSS)}$$

Show rearrange?

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

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

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

Ex. 1 Solve the triangle. (Round side lengths to 3 decimal places and angles to 2 decimal places.)

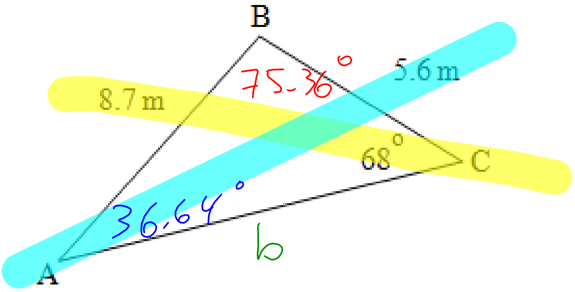
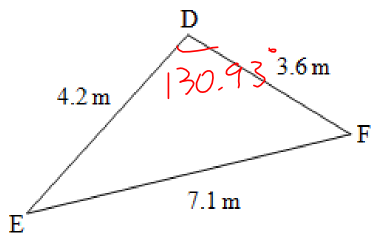


Diagram is not drawn to scale.

$\angle A$	$\angle B$	b
$\frac{\sin A}{5.6} = \frac{\sin 68^\circ}{8.7}$ $\sin A = 5.6 \times \frac{\sin 68^\circ}{8.7}$ $A = \sin^{-1}\left(\frac{5.6 \sin 68^\circ}{8.7}\right)$ $\doteq 36.641$ $\doteq 36.64^\circ$	$B \doteq 180^\circ - 68^\circ - 36.64^\circ$ $\doteq 75.36^\circ$	$\frac{b}{\sin 75.36^\circ} \doteq \frac{8.7}{\sin 68^\circ}$ $b \doteq \sin 75.36^\circ \times \frac{8.7}{\sin 68^\circ}$ $\doteq 9.0786$ $\doteq 9.079$ m

Ex. 2 Solve the triangle. (Round according to our rules.)

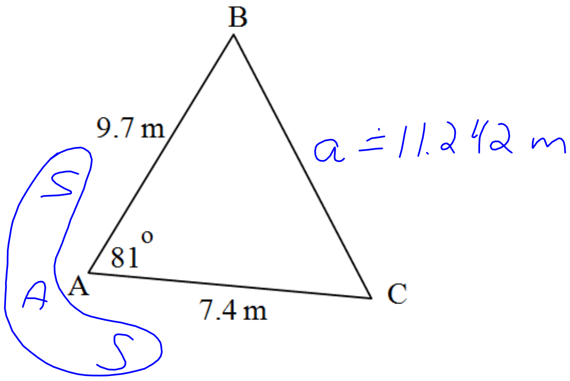
Diagram is not drawn to scale.



$\angle D$	$\angle F$	$\angle E$
Since we have SSS, use ④	Now use the sine law	Now use the triangle sum
$\cos D = \frac{4.2^2 + 3.6^2 - 7.1^2}{2(4.2)(3.6)}$	$\frac{\sin F}{4.2} \doteq \frac{\sin 130.93°}{7.1}$	$\angle E \doteq 180° - 130.93° - 26.55°$
$D = \cos^{-1}\left(\frac{4.2^2 + 3.6^2 - 7.1^2}{2 \times 4.2 \times 3.6}\right)$	$\sin F \doteq \frac{4.2 \sin 130.93°}{7.1}$	$\doteq 22.52°$
$\doteq \cos^{-1}\left(\frac{-19.81}{30.24}\right)$	$F \doteq \sin^{-1}\left(\frac{4.2 \sin 130.93°}{7.1}\right)$	
$\doteq \cos^{-1}(-0.655)$	$\doteq 26.546$	
$\doteq 130.926$	$\doteq 26.55°$	
$\doteq 130.93°$		

Ex. 3 Solve the triangle. (Round according to our rules.)

Diagram is not drawn to scale.



a	$\angle B$	$\angle C$
Since we have SAS, use ③ $a^2 = 9.7^2 + 7.4^2 - 2(9.7)(7.4)\cos 81°$ $\doteq 126.392$ this value is a^2 $a \doteq \sqrt{126.392}$ $\doteq 11.2424$ $\doteq 11.242$ m	Now use the sine law (it's easier) $\frac{\sin B}{b} = \frac{\sin A}{a}$ $\frac{\sin B}{7.4} \doteq \frac{\sin 81°}{11.242}$ $\sin B \doteq \frac{7.4 \sin 81°}{11.242}$ $B \doteq \sin^{-1}\left(\frac{7.4 \sin 81°}{11.242}\right)$ $\doteq 40.552$ $\doteq 40.55°$	Now use the triangle sum $\angle C \doteq 180° - 81° - 40.55°$ $\doteq 58.45°$

Today's Assigned Practice (posted on the class website)

5.2.1 pp.61-62 1,3c,4,6,8 AND pp.69-70 1c,3,5,7,9