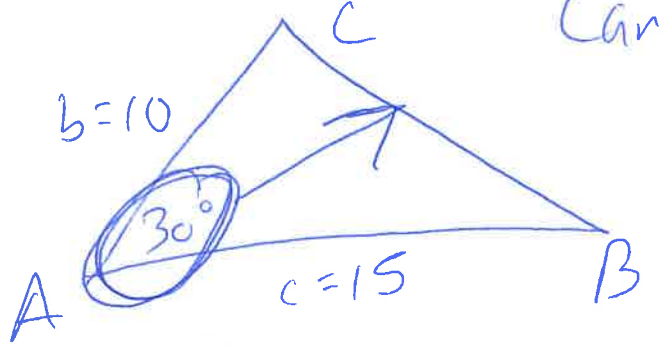
Name: Hansen 1/30/20

HansenMath Pre-calc: 6.2 Law of Cosines lesson

Warm it up, class

1.) Solve the triangle

A = 30° b = 10 feet c = 15 feet



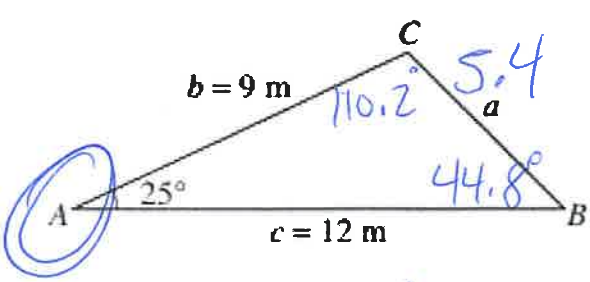
Can't use L.o.S

Law of Sines works great for working with given triangles of the ASA, AAS, and SSA (ambiguous) variety. But it will not help with SAS or SSS Triangles. Thus, we need another strategy!

Law of Cosines (See the proof on page 469.)

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

An SAS scenario (use standard form of L.o.C)



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

$a^2 = 9^2 + 12^2 - 2(9)(12)\cdot\cos 25°$

$\sqrt{a^2} = \sqrt{29.24}$

$a = 5.4$

$\frac{9}{\sin B} = \frac{5.4}{\sin 25°}$

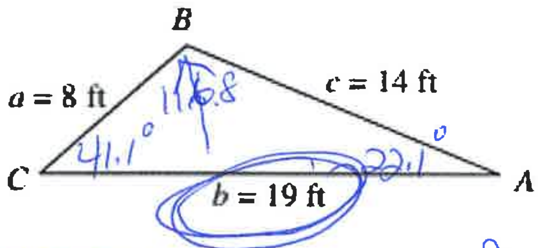
$\sin B = .704$

$B = 44.8$

* Check: Is largest side opposite largest Angle, etc.

An SSS scenario (use alternative form of L.o.C)

Note: It's wise to begin with the longest side. Geometry class taught us that the longest side MUST be opposite the largest Angle. *Thus, if the largest angle turns out to be obtuse, you'll know the remaining two angles must be* both Acute. *On the other hand, if the largest angle turns out to be acute, then the remaining two angles must be* both acute.

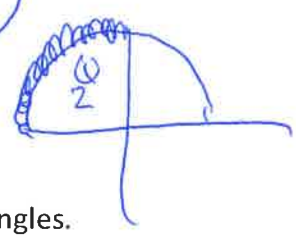


$$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

$$\cos B = \frac{8^2 + 14^2 - 19^2}{2(8)(14)}$$

$$\cos B = -.45$$

$$B = 116.8$$



$$= \frac{19}{\sin 116.8} = \frac{8}{\sin A}$$

$$A = 22.1^\circ$$

In section 6.1: Law of Sines, we saw that we could derive an Area Formula for SAS oblique triangles.

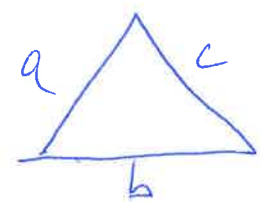
Similarly, the Law of Cosines provides us an Area formula for SSS Triangles, called **Heron's Formula.**

Heron's Area Formula (See the proof on page 470.)

Given any triangle with sides of lengths a, b, and c, the area of the triangle is given by

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

where $s = \dfrac{a+b+c}{2}$.



$$S = \frac{43+53+72}{2}$$

$$S = 84$$

$$\frac{a+b+c}{2}$$

S = semiperimeter

Find the area of a triangle having sides of lengths $a = 43$ meters, $b = 53$ meters, and $c = 72$ meters.

$$A = \sqrt{84(84-43)(84-53)(84-72)}$$

$$= 1131.9 \text{ m}^2$$

Section 6.2 Assignment: **Page 421 #1, 2, 6, 10, 12, 13, 28, 29, 49, 50, 51**