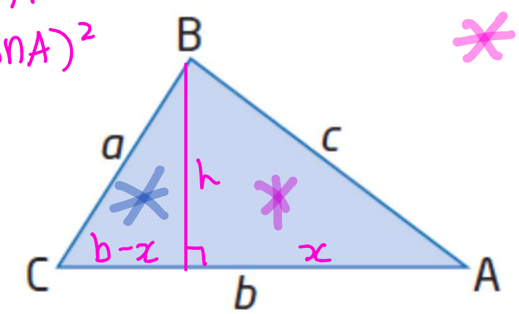
Name: ___________________________________ Date: _______________________

Learning Goal 2.3	Use of sine and cosine laws to solve non-right triangles, including ambiguous cases.

$\sin^2 A = (\sin A)^2$



$c \times \sin A = \frac{h}{c} \times c$ $\quad$ $c \times \cos A = \frac{x}{c} \times c$

$h = c \times \sin A$ $\quad$ $x = c \times \cos A$

$$a^2 = h^2 + (b-x)^2$$

$$a^2 = (c \times \sin A)^2 + (b - c \times \cos A)^2$$

$$a^2 = c^2 \sin^2 A + (b - c\times\cos A)(b - c \times \cos A)$$

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

$$a^2 = c^2(\underbrace{\sin^2 A + \cos^2 A}_{\left(\frac{h}{c}\right)^2 + \left(\frac{x}{c}\right)^2}) + b^2 - 2bc \times \cos A$$

$$= \frac{h^2}{c^2} + \frac{x^2}{c^2}$$

$$= \frac{h^2 + x^2}{c^2}$$

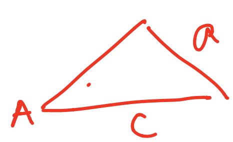
$$= \frac{c^2}{c^2} = 1$$

Cosine Law

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

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

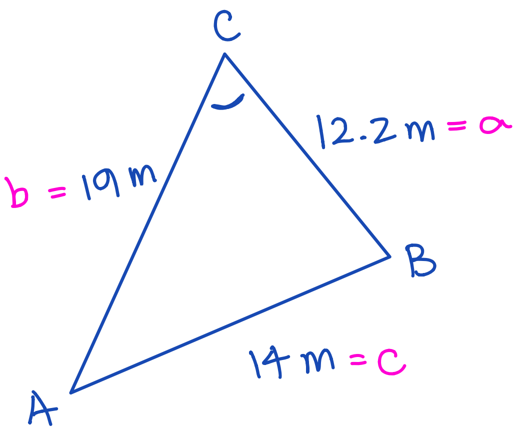
$$c^2 = a^2 + b^2 - 2ab \times \cos C$$



Sine Law versus Cosine Law	
when your given a single angle - side pair - SSA - ASA	- only sides SSS - SAS (side-angle-side)

Assignment p. 119 #1 – 6, 8, 12, 13, 15, 16, 23 Quiz Next Day!

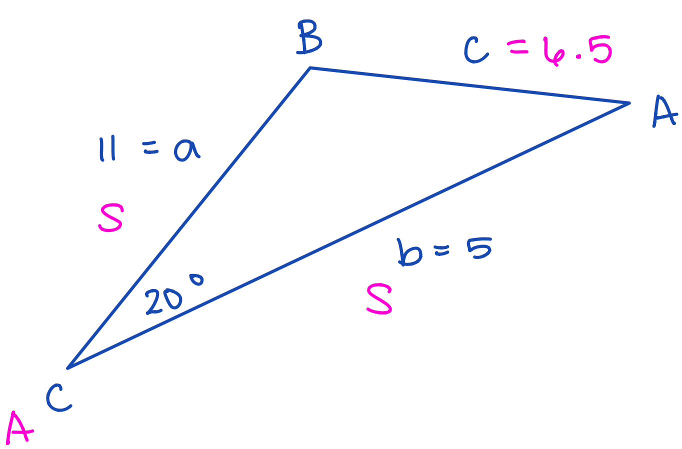
Example Lions Gate Bridge has been a Vancouver landmark since it opened in 1938. It is the longest suspension bridge in Western Canada. The bridge is strengthened by triangular braces. Suppose one brace has side lengths $14\text{ m}, 19\text{ m}$ and 12.2 m. Determine the measure of the angle opposite the $14-\text{m}$ side to the nearest degree.



$$c^2 = a^2 + b^2 - 2ab \times \cos C$$
$$(14)^2 = (12.2)^2 + (19)^2 - 2(12.2)(19)\cos C$$
$$196 = 148.84 + 361 - 463.6\cos C$$
$$-148.84 \quad -148.84 \quad -361$$
$$-361$$
$$\frac{-313.84}{-463.6} = \frac{-463.6\cos C}{-463.6}$$
$$\cos^{-1}(0.67696) \doteq (\cos C) \; \cos^{-1}$$
$$C \doteq 47^\circ$$

Example In $\Delta ABC, a = 11, b = 5$ and $\measuredangle C = 20^\circ$. Sketch a diagram and determine the length of the unknown side and the measures of the unknown angles to the nearest tenth.

SAS $\Rightarrow$ cosine law



① $c^2 = a^2 + b^2 - 2ab\cos C$
$$= (11)^2 + (5)^2 - 2(11)(5)\cos 20$$
$$= 121 + 25 - 110\cos 20$$
$$= 146 - 110\cos 20$$
$$\sqrt{c^2} \doteq \sqrt{42.6}$$
$$c = \cancel{\pm} 6.5$$

② $\frac{\sin B}{b} = \frac{\sin C}{c}$
$$5 \times \frac{\sin B}{5} = \frac{\sin 20}{6.5} \times 5$$
$$\sin B = \frac{5 \times \sin 20}{6.5}$$
$$B = \sin^{-1}\left(\frac{5 \times \sin 20}{6.5}\right) \doteq 15^\circ$$

③ $A + B + C = 180^\circ$
$$A + 15 + 20 = 180^\circ$$
$$A = 180^\circ - 20^\circ - 15^\circ$$
$$= 145^\circ$$