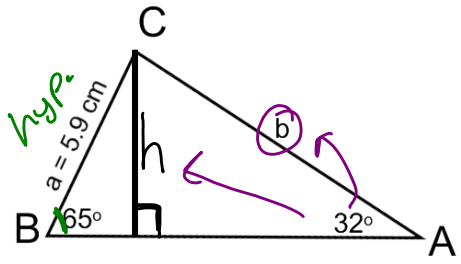
Name: _____ Date: _____

Lesson 1.5 – The Sine Law

- Learning Goals: I can determine an unknown side or angle in an acute triangle using sine law

Can we find the length of side b using trigonometric ratios?



$\sin 65° = \frac{h}{5.9}$

$h = 5.9 \sin 65°$

$= 5.347_{cm}$

$\frac{\sin 32°}{1} = \frac{h}{b}$

$b \sin 32° = h$

$b = \frac{h}{\sin 32°}$

$= \frac{5.347}{\sin 32°}$

$= 10.1 cm$

$5.9 \sin 65° = b \sin 32°$

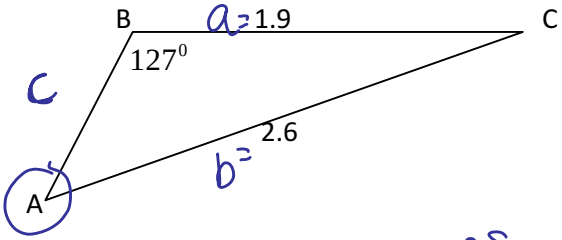
$\frac{5.9 \sin 65°}{\sin 32°} = b$

$b = 10.1 cm$

When we don't have a right angled triangle we have to use other methods to help us solve for side lengths and angles. There are 2 forms of Sine Law that you can use.

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

Example 1) Solve for $\angle A$ to the nearest degree.



$\frac{\sin A}{a} = \frac{\sin B}{b}$

$\frac{\sin A}{1.9} = \frac{\sin 127°}{2.6}$

$2.6 \sin A = 1.9 \sin 127$

$\sin A = \frac{1.9 \sin 127}{2.6}$

$\sin A = \frac{1.9 \sin 127°}{2.6}$

$= 0.5836$

$A = \sin^{-1}(0.5836$

$= 36°$

$\therefore \angle A$ measures $36°$

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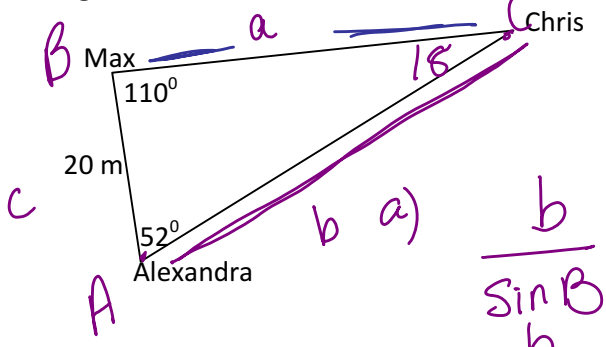
Ex. 2) Alexandra, the quarterback of her football team, is attempting to throw a pass to her receiver, Chris. Max is trying to knock down the pass. Max can run 30 metres before his lungs stop working and he passes out (Max is not fast enough to cut the throw off!).

- How far does Alexandra throw her pass to Chris to the nearest metre?
- Does Max get the ball or does Chris do a celebration dance?



$180° - 110° - 52° = 18°$

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

$\frac{b}{\sin 110°} = \frac{20}{\sin 18°}$

$b \sin 18° = 20 \sin 110°$

$b = \frac{20 \sin 110°}{\sin 18°}$

$= 61$ metres

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

$\frac{a}{\sin 52°} = \frac{20}{\sin 18°}$

$a \sin 18° = 20 \sin 52°$

$a = \frac{20 \sin 52°}{\sin 18°}$

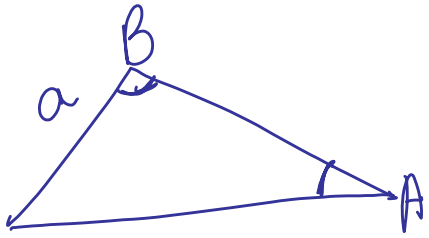
$= 51\text{m} < 30\text{m}$

∴ Max won't get the ball

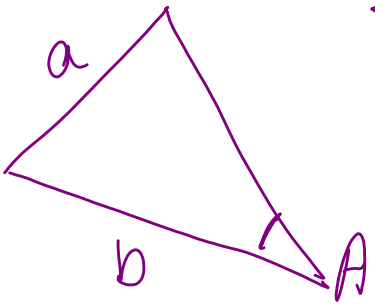
Both forms of the formula will get us the same answer. The only difference is where your unknown will be that we have to solve for.

To use Sine Law we will have 2 scenarios. Draw a sketch of each scenario. What measurement can you find in each case?

a) We are given 2 angles and 1 side.



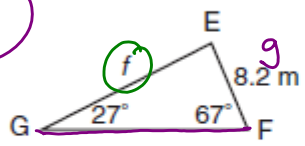
b) We are given 2 sides and 1 angle.



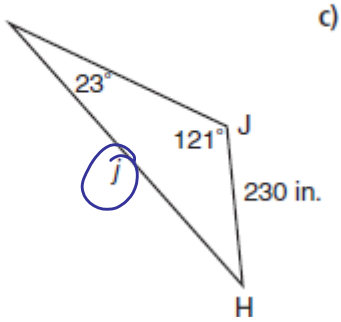
* The angle can't be between the two sides.

3. Use the Sine Law to determine the length of each indicated length.

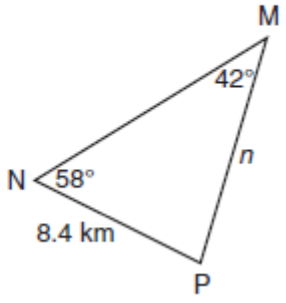
a)



b)



c)



$$\frac{f}{\sin F} = \frac{g}{\sin G}$$

$$\frac{f}{\sin 67^\circ} = \frac{8.2}{\sin 27^\circ}$$

$$f \sin 27^\circ = 8.2 \sin 67^\circ$$

$$f = \frac{8.2 \sin 67^\circ}{\sin 27^\circ}$$

$$= 16.6 \text{ m}$$

b) $$\frac{j}{\sin J} = \frac{k}{\sin K}$$

$$\frac{j}{\sin 121^\circ} = \frac{230}{\sin 23^\circ}$$

$$j \sin 23^\circ = 230 \sin 121^\circ$$

$$j = \frac{230 \sin 121^\circ}{\sin 23^\circ}$$

$$= 505 \text{ in.}$$