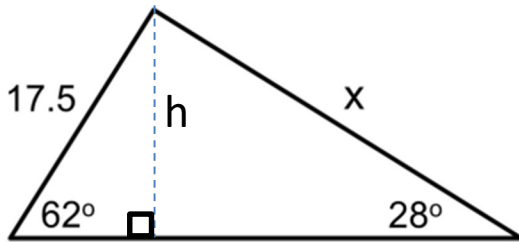


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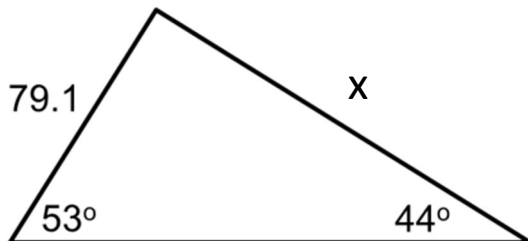
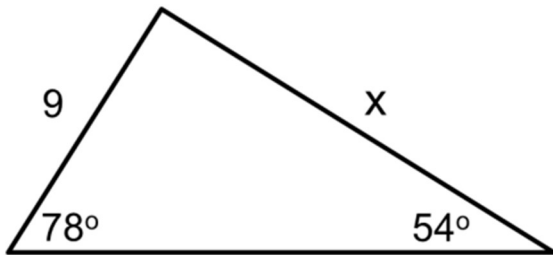
Trigonometry: Law of Sines Discovery

**Part I:** Solve for the side labeled  $x$  in each triangle. You may need to draw an altitude first in order to create a right triangle.

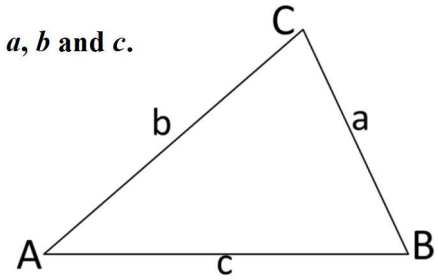
a)



HINT: Solve for  $h$  first!



**Part II:** The triangle below has angles A, B and C, with opposite sides  $a$ ,  $b$  and  $c$ .



- 1) Draw an altitude to side  $c$ . Label it  $h$ .
- 2) Find  $\sin A$  and  $\sin B$  in terms of these letters.  
What do both of these have in common?

$$\sin A =$$

$$\sin B =$$

- 3) Solve for  $h$  in both equations and set them equal.

- 4) Rearrange this equation into a proportion in this format:

$$\frac{\sin(\quad)}{(\quad)} = \frac{\sin(\quad)}{(\quad)}$$

OK, same triangle.

- 1) Now draw an altitude to side  $a$ . Label it  $k$ .
- 2) Find  $\sin B$  and  $\sin C$  in terms of these letters.  
What do both of these have in common?

$$\sin B =$$

$$\sin C =$$

- 3) Solve for  $k$  in both equations and set them equal.

- 4) Rearrange this equation into a proportion in this format:

$$\frac{\sin(\quad)}{(\quad)} = \frac{\sin(\quad)}{(\quad)}$$

**CONGRATULATIONS!** You have just discovered the Law of Sines! This is useful for finding side lengths in triangles that are *not right triangles*. Specifically, it states:

In any Triangle ABC, the ratio of the sine of an angle to its opposite side is always equal.

$$\frac{\sin \square}{\square} = \frac{\sin \square}{\square} = \frac{\sin \square}{\square}$$

In equation form, it is: