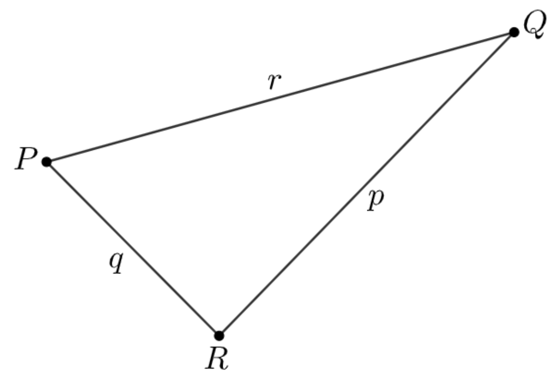
Name: ____________________

Lesson 4.08
Law of Sines

Geometry GT

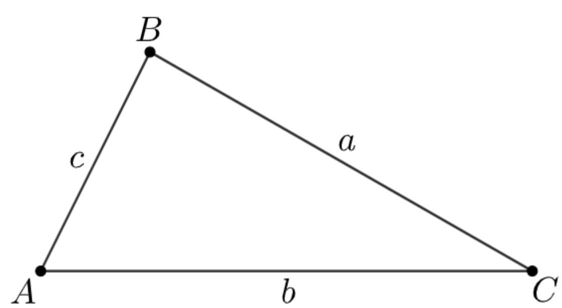
Experiment

Draw an altitude from point R and label the length as s. Then, set up a trigonometric ratio that includes s.



Explore

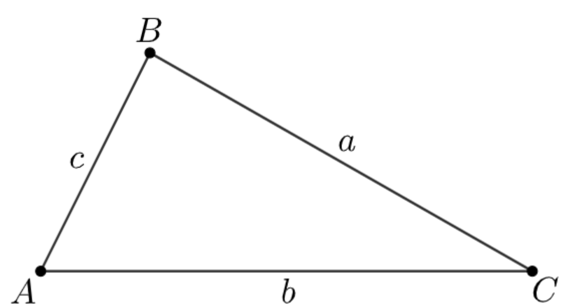
Consider the oblique (non-right) triangle ΔABC. Draw an altitude from point B, mark the intersection with $\overline{AC}$ as D, and label the length as h.



In ΔABD, set up a trigonometric function that could be used to solve for h. Do the same for ΔCBD. For each equation, get h isolated.

The transitive property states that if $a = b$ and $b = c$, then $a = c$. How can this be applied to the equations above?

If, instead of drawing an altitude from point B, an altitude is drawn from point C, how would the equations change?



The **Law of Sines** allows trigonometry to be applied to triangles that do not have a right angle, provided certain information is known about the triangle.

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

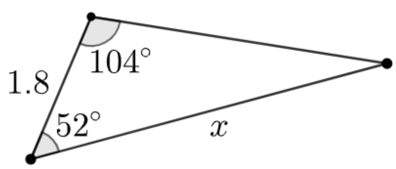
Additionally, an alternative form of the Law of Sines exists using the reciprocals of each fraction.

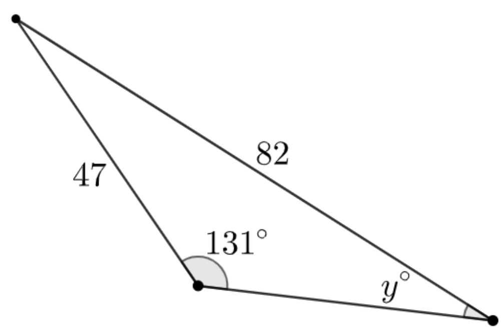
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

The best form to use depends on what information you are trying to find: if you are solving for a missing angle, use the first form; if you are solving for a missing side, use the alternative form. Your unknown variable should always be in the numerator.

Discuss

In the following triangles, find the missing variable. Round answers to the nearest hundredth.



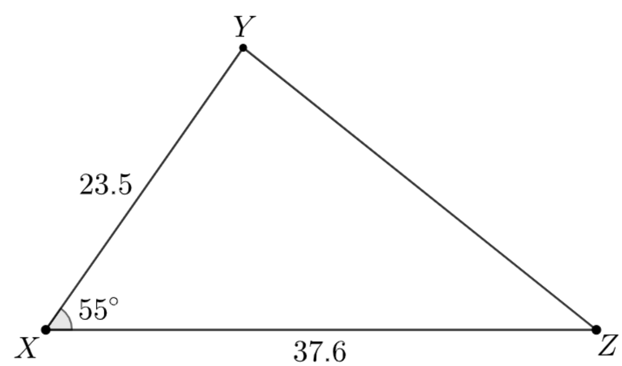


Demonstrate

What is the value of $\sin 56°$? What about $\sin 124°$? How does this impact the Law of Sines?

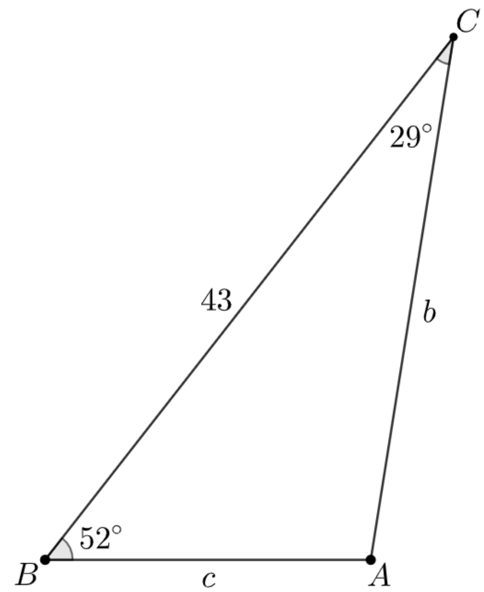
Practice

1. The area of a triangle can be found by the equation $A = \frac{1}{2}bh$, where b is the base of the triangle and h is the height. Find the area of ΔXYZ.



2. Using your method from above, write an equation that could potentially be used to find the area of any triangle, even if the height is unknown.

3. Find all missing sides and angles.



4. In ΔKLM, $LM = 2.6$, $KL = 5.8$, and $m\angle M = 28°$. Find the measure of $\angle K$.