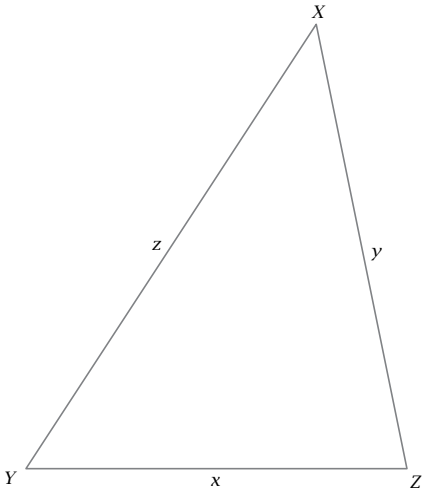
Name: _____ Group Members: _____

Exploration 6-4a: The Law of Sines

Date: _____

Objective: Use the ratio of a side length to the sine of the opposite angle to find other parts of a triangle.



1. In $\triangle XYZ$, are the following measurements correct?

   $y = 6.0$ cm _____ $z = 7.0$ cm _____

   $Y = 57°$ _____ $Z = 78°$ _____

2. Assuming that the measurements in Problem 1 are correct, calculate these ratios:

   $\frac{y}{\sin Y} =$ _____

   $\frac{z}{\sin Z} =$ _____

3. The **law of sines** states that within a triangle, the ratio of the length of a side to the sine of the opposite angle is constant. Do the calculations in Problem 2 seem to confirm this property? _____

4. Measure angle X. _____

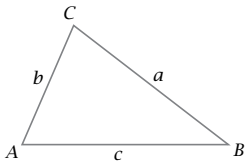
5. Assuming that the law of sines is correct,

   $$\frac{x}{\sin X} = \frac{y}{\sin Y}$$

   Use this information and the measured value of X to calculate the length x.

6. Measure side x. Does your measurement agree with the calculated value in Problem 5? _____

The law of sines can be derived **algebraically.**



7. For $\triangle ABC$, use the area formula to write the area *three* ways: one involving angle A, one involving angle B, and one involving angle C.

   _____

   _____

   _____

8. The area of a triangle is *independent* of the way you *measure* that area, so all three area expressions in Problem 7 are equal to each other. Write a *three*-part equation expressing this fact.

9. Divide all three "sides" of the equation in Problem 8 by whatever is necessary to leave only the sines of the angles in the numerators. Simplify.

10. The equation you should have gotten in Problem 9 is the **law of sines.** Explain why it is equivalent to the law of sines as written in Problem 5.

11. What did you learn as a result of doing this Exploration that you did not know before?