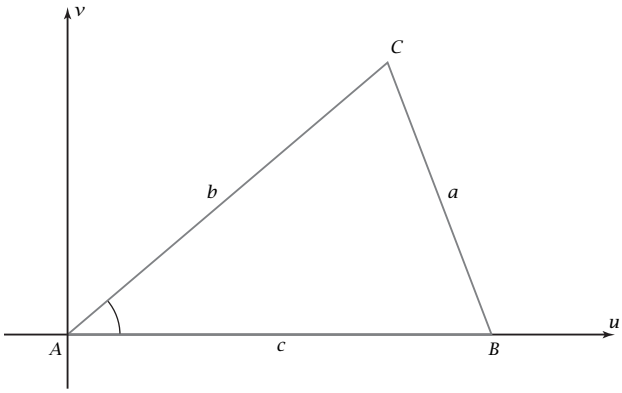
Name: _____ Group Members: _____

Exploration 6-2a: Derivation of the Law of Cosines

Date: _____

Objective: Derive the law of cosines for predicting the third side of a triangle from two sides and the included angle.

The figure shows triangle *ABC*. Angle *A* has been placed in standard position in a *uv*-coordinate system.



1. The sides that include angle *A* have lengths *b* and *c*. Write the coordinates of points *B* and *C* using *b*, *c*, and functions of angle *A*.

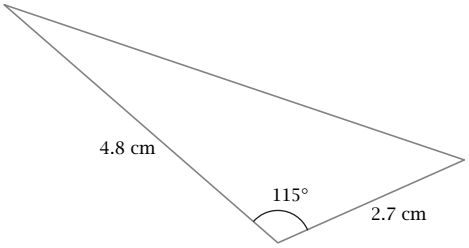
   B: $(u, v) =$ (_____, _____)

   C: $(u, v) =$ (_____, _____)

2. Use the **distance formula** to write the square of the length of the third side, a^2, in terms of *b*, *c*, and functions of angle *A*.

3. Simplify the answer to Problem 2 by expanding the square. Use the **Pythagorean property** for cosine and sine to simplify the terms containing $\cos^2 A$ and $\sin^2 A$.

4. The answer to Problem 3 is called the **law of cosines.** Show that you understand what the law of cosines says by using it to calculate the third side of this triangle.



5. Measure the given sides and the angle of the triangle in Problem 4. Do you agree with the given measurements? Measure the third side. Does it agree with your calculated value?

6. Describe how the unknown side in the law of cosines is related to the given angle and how the given angle is related to the two given sides, using terms you studied in geometry.

7. What have you learned as a result of doing this Exploration that you did not know before?