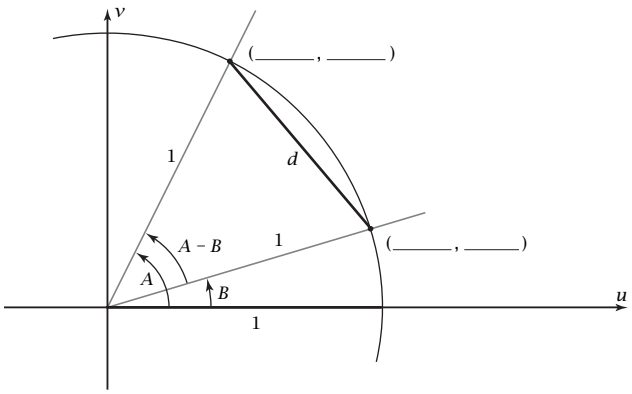
Name: _____ Group Members: _____

Exploration 5-2c: Composite Argument Property Proof Date: _____

Objective: Prove algebraically that $\cos(A - B) = \cos A \cos B + \sin A \sin B$.

The figure shows angles A and B in standard position and angle $(A - B)$ between them. A unit circle cuts the terminal sides of A and B as shown.

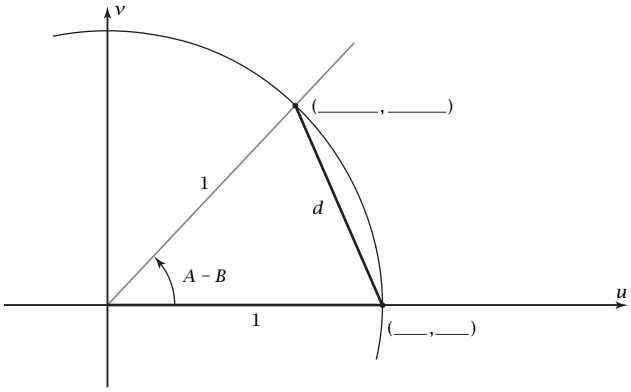


1. On the figure, write the coordinates (u, v) for the two points where the unit circle cuts the terminal side.
2. You recall that the **distance formula** says that if d is the distance between points (u_1, v_1) and (u_2, v_2), then

   $$d^2 = (u_2 - u_1)^2 + (v_2 - v_1)^2$$

   Use the distance formula to express d^2 in the figure in terms of $\cos A$, $\cos B$, $\sin A$, and $\sin B$. Expand the squares, and then use the Pythagorean property to simplify the answer.

The figure shows angle $(A - B)$ from before, rotated so that it is in standard position.



3. Use the distance formula to write the distance d^2 in terms of $\cos(A - B)$ and $\sin(A - B)$. Expand the squares and simplify.

4. Equate the two values of d^2 from Problems 2 and 3. Transform the resulting equation to show that

   $$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

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