Chord Lengths and Polygon Sides

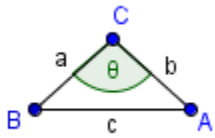
Worksheet

In an earlier worksheet, you used this formula to determine the lengths of the sides of a regular, inscribed polygon: $\sqrt{2 * (1 - \cos(\theta))}$. In this worksheet, we'll explore where that formula came from.

1. Let's say we have a triangle. We know the lengths of two sides and the angle between them. What is the name of the Law we use to determine the length of the other side?

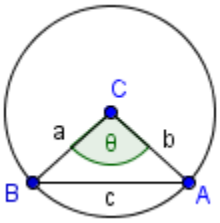
   The Law of _____.

2. Call the two sides we *know* a and b. Call the angle we *know* θ ("theta", a Greek letter often used to mean an unknown angle). Call the side we *don't know* c. Write the Law from #1 with these variables:



   c^2 = _____

3. Now imagine the triangle is contained in a circle. The vertex of θ is the center of the circle. The sides a and b are radii of the circle. What kind of triangle is this: Isosceles, scalene, or equilateral?



   _____

4. This circle has a radius of 1 unit. Rewrite #2, replacing a and b with 1:

   c^2 = _____

5. Solve for c and simplify:

   c = _____

   Questions to consider:

   - What happens if we move A and B to different spots on the circle, but keep θ the same?
   - What happens if we make the circle bigger, but keep θ the same?
   - What happens if we make θ bigger?