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Approximating Pi with Inscribed Area

Project Goal:
To create an algorithm that approximates pi using the area of inscribed polygons in a unit circle.

Standard:
CCSS.MATH.CONTENT.HSG.SRT.D.9
Derive the formula $A = 1/2\ ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

CCSS.MATH.CONTENT.HSG.SRT.C.8
Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.*

Student Guide

Teacher Suggestions:
Prerequisite: Students should have reasonable mastery of calculating the area of regular polygons, and how to use right triangle trig in that process. They should have exposure to using $A = 1/2\ ab \sin(C)$ and its origin.

Lesson Length: 45-60 minutes

It's recommended that students work in groups of 2. One student should have the guide open on his computer and the other should be programming in Scratch. They can switch on and off between the lesson, ar at least after Step 2. If kids get stuck on the algorithm in step 2, feel free to offer hints after awhile or let the groups that are getting it share their thinking :)

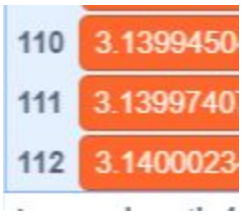
Solutions:

Step 2 possible solution:

*because the leg lengths are both 1, that portion can be simplified out of the formula. 360/n gives the measure of the central angle. n is multiplied in because there are always n isosceles triangles.

** Note that for extension 3, they will need to add in multiplication by radius squared.

Step 2 challenge:



112 times if you start w/ 3 sides.