Objective

· Investigate the limit of the area of regular polygons with constant perimeter as the number of sides increase.

Ryan's Puppy Problem Part 2

Introduction

Recall Ryan's dilemma to design and build a rectangular shaped pen to hold his new puppy. Ryan has now decided to explore other shapes for the pen, shapes that from regular polygons. Ryan increases his amount of fencing material to 15 meters.

Construction and Exploration

Part I: Construct model for the polgyons.

1. Construct a circle, so that the circumference is approximately 16 meters.

2. Construct two points on the circle. Use the two points and the center of the circle to form a triangle.

3. Measure the central angle. Adjust the central angle so that it measure 120º.
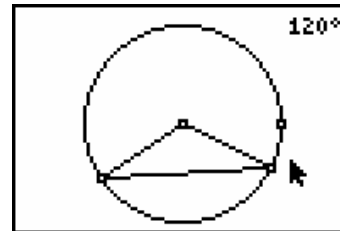
4. Rotate the chord in the circle about the center of the circle using the degree of the central angle.

5. Repeat until a regular triangle is formed.

6. Find the perimeter of the triangle by measuring one side and multiplying that side by the quotient of $360/centralangle$.
   You will have to type 360 on the working screen.
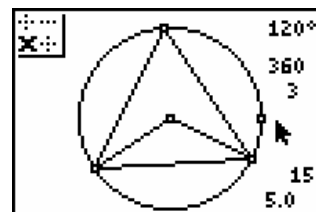
7. Find the area of the triangle by using the formula for a regular polygon $A = \dfrac{Pa}{2}$, where a is the apothem, and P is the perimeter.

8. Hide all the values except the central angle, area, side length, and perimeter.
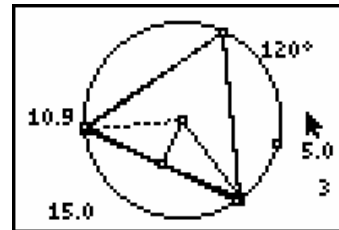

Part II: Data Collection

1. Other regular polygons can be formed by moving the original point placed on the circle until the central angle corresponds to the desired regular polygon. Repeat the rotation to close the polygon. The point that defines the size of the circle can be moved to adjust the perimeter so that it stays constant for all of the polygons listed in the table below.

Number of sides	Area
3	
4	
5	
6	
8	
10	
12	

2. Pictured below is a octagon.
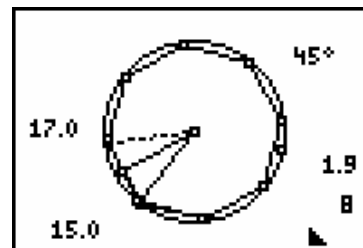
Questions and Conjectures.

1. Make a scatterplot of the number of sides and the area.

2. Describe the graph, especially what appears to occur with the area as the number of sides increase.

3. How does your response to question 3 relate to what was occurring to the polygon as the number of sides increased?

4. What shape will give Ryan the maximum area? What is that area?