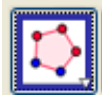



5.4 Discovering Pi

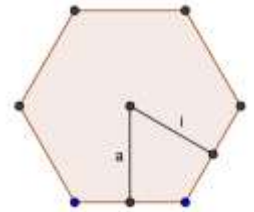
Goal: Discover a relationship between the perimeter of a regular polygon and its apothem and apply that relationship to circles.

Complete the first row of the table below by constructing a regular polygon with the given number of sides as stated in the table below.

1.  Use the regular polygon tool to quickly construct a regular polygon with the given sides.

2.  Use the distance measurement tool to quickly measure the perimeter of the polygon.

3. **Write the definition of an apothem below, or describe its characteristics. (Two examples of apothems have been drawn in the picture at the right for you)**



4. To determine the **apothem length**, you must first construct an apothem segment. Use your definition above in order to construct an apothem on your polygon. **DO NOT JUST GUESS WHERE TO PLACE THE APOTHEM SEGMENT. THIS APPROACH IS WRONG AND WILL CREATE INCORRECT VALUES.** Once you have constructed the apothem, determine its length and record it below in the table
5. To fill in the last column, determine the ratio of the length of the perimeter to the length of the apothem by simply dividing the two numbers in your calculator.
6. Complete the remainder of the table and then answer the questions on the back of this paper.

Number of Sides	Perimeter Length	Apothem Length	$\frac{\text{Perimeter}}{\text{Apothem}}$
6			
8			
16			
24			
48			
96			

7. Describe the trend that you observe in the values in the last column of the table.
8. Describe what you think would happen to the value of the ratio of perimeter to apothem if the table had not stopped at 96 sides. (Example: Would it continue to get smaller and eventually get very close to zero, would it eventually start to get larger, or would it approach a certain numerical value? **Explain the reasoning behind your response.**)

9. If you quickly glanced at the 96-sided polygon on your screen, you would likely think it was a circle. In terms of the circle, how could you classify the perimeter and apothem?

Perimeter = _____

Apothem = _____

For the 96-sided regular polygon, Mr. Deal found the following results:

$$\frac{\textit{perimeter}}{\textit{apothem}} = 6.299$$

By using the multiplicative property of equality, Mr. Deal rewrote the equation to say

$$\textit{perimeter} = 6.299 \cdot \textit{apothem}$$

10. Based on your response from question number 9, what well known mathematical formula does this represent?
11. Answer question number 8 again. If your response is different from above, please write your amended answer below. (DO NOT ERASE YOUR FIRST RESPONSE FROM #8. I WANT TO SEE YOUR ORIGINAL ANSWER) If you are not going to amend your original response, you may leave this question blank.