ACTIVITY 11.4

Using Technology

Technology Activity for use with Lesson 11.4

Perimeters of Regular Polygons

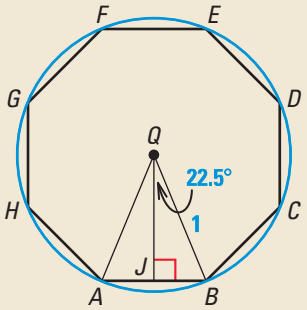
You can use a spreadsheet to explore the perimeters of regular polygons that are inscribed in a circle with radius 1 unit.

STUDENT HELP

INTERNET SOFTWARE HELP

Visit our Web site at www.mcdougallittell.com to see instructions for several software applications.

The regular octagon shown at the right is inscribed in a circle with radius 1 unit.



The measure of the interior angle $\angle AQB$ is $\frac{1}{8} \cdot 360°$ or 45°, so the measure of $\angle JQB$ is 22.5°.

You can find the length of $\overline{JB}$ using a sine ratio.

$$\sin 22.5° = \frac{JB}{QB} = \frac{JB}{1} = JB$$

The length of each side of the octagon is $s = AB = 2(JB) = 2 \cdot \sin 22.5°$. The perimeter of the octagon is $P = 8s = 8(2 \cdot \sin 22.5°) = 16 \cdot \sin 22.5°$.

This procedure used for an octagon can be generalized to conclude that the perimeter of a regular n-gon inscribed in a circle of radius 1 is

$$P = 2n \sin \frac{180°}{n}.$$

CONSTRUCT Use a spreadsheet to construct a table.

1. Use a spreadsheet to make a table with two columns. The first column is for the number of sides, n, of the regular polygon. In cell A3, start with a value of 3. In cell A4 use the formula =A3+1.

Polygon Perimeter

	A	B
1	Number of sides	Perimeter
2	n	2∗n∗sin(180/n)
3	3	=2∗A3∗sin(pi()/A3)
4	=A3+1	=2∗A4∗sin(pi()/A4)

2. The second column is for the perimeter of the regular polygon. In cell B3 use the formula =2∗A3∗sin(180/A3). If your spreadsheet uses radian measure, you may need to use "pi()" instead of "180" so that the formula is =2∗A3∗sin(pi()/A3).

3. Use the Fill Down feature to create more rows. You may need to select Row 4 and drag down to highlight rows before using the Fill Down command.

INVESTIGATE

1. Describe how the perimeter changes as n increases.
2. Explain why the perimeter of a regular hexagon is 6.
3. Find the perimeter of a regular 12-gon, 15-gon, 18-gon, and 24-gon.

EXTENSION

Critical Thinking Modify your spreadsheet so that the number of sides increases by 100 instead of 1. (Use =A3+100 in cell A4.) Does the perimeter of the polygon approach 2π, the circumference of the circle with radius 1 unit?