## Lesson 6.5: The Circumference/Diameter Ratio

In this lesson you will:

- discover the relationship between the diameter and the circumference of a circle

Remember that the distance around a polygon is called the $\qquad$ . The distance around a circle is called the $\qquad$ .

## Investigation 6.5: "A Taste of Pi"

In this investigation you will find an approximate value of $\pi$ (pi) by calculating the ratio of the circumference to the diameter of several circular objects.
A.) Given the circumference ( $C$ ) and diameter ( $d$ ) measurements for several circular objects, calculate the ratio $\frac{C}{d}$ for each object. Record your answers in the table.

| Object | Circumference (C) | Diameter (d) | Ratio $\frac{C}{d}$ |
| :--- | :---: | :---: | :---: |
| Quarter | 7.8 cm | 2.5 cm |  |
| CD | 37.7 cm | 12.0 cm |  |
| Mug | 25.9 cm | 8.2 cm |  |
| Small plate | 47.4 cm | 15.1 cm |  |
| Tennis ball | 21.3 cm | 6.8 cm |  |

B.) Calculate the average of your ratios of $\frac{C}{d}$. $\qquad$
C.) We define $\pi$ as the ratio $\frac{C}{d}$. Solve this equation for $C$.

$$
\pi=\frac{C}{d}
$$

The diameter is twice the radius ( $d=2 r$ ) so you can also get a formula for the circumference in terms of the radius. Substitute $2 r$ for $d$ in your equation above. What is this new equation? $C=$ $\qquad$
D.) Complete the following conjecture.

## Circumference Conjecture (C-65)

If $C$ is the circumference and $d$ is the diameter of a circle, then there is a number $\pi$ such that $C=$ $\qquad$ . If $d=2 r$ where $r$ is the radius, then $C=$ $\qquad$ .

The number $\pi$ is an $\qquad$ number, so its decimal form never ends and its digits follow no pattern. Your calculator probably gives an approximation of $\pi$ to eight or nine decimal places. If you are asked to give an exact answer, state your answer in terms of $\pi$.
-Example 1: If a circle has a diameter of 3.0 meters, what is the circumference? Give your answer in both exact form and as an approximation.
-Example 2: If a circle has a circumference of $12 \pi$ meters, what is the radius?
-Example 3: A circle has a radius of 6.5 meters. What is the circumference? Give your answer both in terms of $\pi$ and to the nearest 0.1 meter.
-Example 4: To find your hat size, you measure the circumference of your head in inches, and then use the circumference formula to find the diameter to the nearest eighth of an inch. The circumference of Tameka's head is about $231 / 2$ in. What is her hat size?

