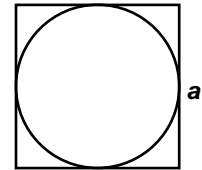Name: _____   Date: _____

Student Exploration: Circumference and Area of Circles

Vocabulary: area, circle, circumference, diameter, perimeter, pi, radius

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)

1. The distance around a figure is its **perimeter**. What is the perimeter of a

   square with side length *a*, as shown to the right? _____

2. The figure inside the square is a **circle**. The distance around a circle is its **circumference**.

   Estimate the circumference of the circle based on the perimeter of the square. _____

3. The **area** of a figure is the number of square units inside of it.

   A. What is the area of the square shown above? _____

   B. Estimate the area of the circle based on the area of the square. _____

Gizmo Warm-up
In the *Circumference and Area of Circles* Gizmo, you will explore how a
diameter (like $\overline{CD}$ in the circle to the right) and a **radius** (like $\overline{AC}$ and $\overline{AD}$
in the circle to the right) can be used to find the circumference and area of a
circle.
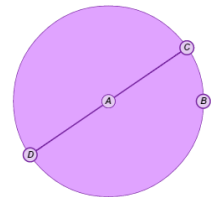
1. Drag the **Radius (*r*)** slider. What happens to the circumference and area of the circle as the
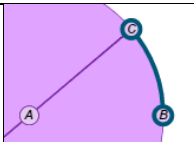
   radius changes? _____

2. Select **Show diameter**, and then drag the **Radius (*r*)** slider.

   A. How is the length of the diameter (*d*) related to the length of the radius (*r*)?

      _____

   B. Write an equation about the relationship between *d* and *r*.   *d* = _____

Activity A: **Circumference of circles**	Get the Gizmo ready: • Be sure **Show diameter** is selected.	

1. Set **Radius (*r*)** to 6.0. (To quickly set a value, click on the number in the text field next to the slider, type a new value, and hit **Enter**.)

   A. Select **Show arc length tool**. Measure the circumference of the circle by dragging the "donuts" until they both snap onto the same point on the circle.

   What is the circumference of this circle? _____ units

   B. Find the ratio of the circumference of this circle to its diameter ($\frac{C}{d} = \frac{C}{2r}$) as a

   decimal. _____

   C. Fill in the first row of the table for the circle above. Then create three new circles and fill in the rest of the table, using the Gizmo ruler to find the circumference.

Radius (*r*)	Diameter (*d*)	Circumference (*C*)	$\frac{C}{d} = \frac{C}{2r}$

   D. Compare the ratios in the last column of the table above. What do you notice?

   _____

   The ratio $\frac{C}{d}$ is **pi** (π). Pi is irrational, and has a value of 3.14159… .

   E. In the question above, you should have seen that $\frac{C}{d} = \frac{C}{2r} = \pi$. Use this to write 2 formulas for the circumference of a circle, one in terms of *d* and one in terms of *r*.
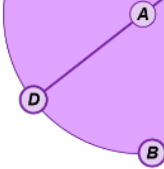
   C = _____   C = _____

2. Use a calculator to find the circumference of each circle to the nearest hundredth. Show your work, and check in Gizmo.

   A. *d* = 8 in.   B. *r* = 10.2 cm

Activity B: Area of circles	Get the Gizmo ready: • Turn off **Show diameter** and **Show circumference info**. • Turn on **Show area info**.	

1. Set **Radius (r)** to 7.0.

   A. Fill in the first row of the table below for the circle with a radius of 7.0 units. (Use a calculator to find the ratios in the last two columns. Then check the last ratio in the Gizmo.) Then create three new circles of your choice, and fill in the rest of the table.

Radius (r)	Area (A)	$\dfrac{A}{r}$	$\dfrac{A}{r^2}$

   B. Compare the ratios in the last two columns of the table above. What do you notice?

   _____

   _____

   C. What seems to be true about $\dfrac{A}{r^2}$? _____

   D. In the question above, you should have seen that $\dfrac{A}{r^2} = \pi$. Use this to write a formula

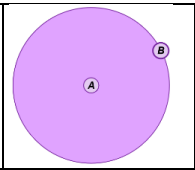   for the area of a circle. $A = $ _____

2. Use a calculator to find the area of each circle to the nearest hundredth. Show your work. Then check your answer in Gizmo.
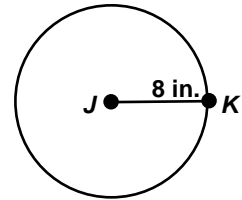
   A. r = 9 ft   B. r = 3.5 cm   C. d = 14 m

Activity C: **Using circumference and area**	Get the Gizmo ready: • Turn off **Show area info**.	

1. Use 3 for π to quickly estimate the circumference and area of circle *J* shown to the right. Show your work below. Then check your answers in the Gizmo. (Your answers should be close to the Gizmo answers.)

2. Use a calculator to find the circumference and area of each circle to the nearest hundredth. Show your work. Then check your answer in the Gizmo.

   A.
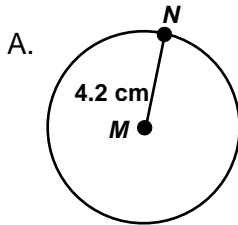
   B. A circle with a diameter of 13.4 ft.

3. Amy has circular flower garden with an area of 250 square feet. Find the radius of the garden to the nearest hundredth and circumference to the nearest tenth. Show your work.

4. Raul has a circular koi pond in a 30-foot square patio. Find the area of the patio that is *not* part of the pond to the nearest hundredth. Show your work.

30 ft