## Geometry

## Area of a Circle

## Objective

Find the area of a circle.

## Common Core State Standards

7.G. 4 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

Measurement concepts are closely related to other mathematics topics, such as geometry and algebra. To develop and conceptualize the formula for the area of a circle, students first estimate the area by tracing a circle on grid paper. Moving the parts of the circle to form a shape that resembles the morefamiliar parallelogram helps students justify and internalize the formula.

## Talk About lt

Discuss the Try It! activity.
■ Ask: Why is the area of the circle written in square centimeters?

- Ask: What is the relationship between the radius, diameter, circumference, and area of a circle?
- Ask: How would you find the area of a circle if you know its diameter?


## Solve It

Reread the problem with students. Have students list the information that is needed to find the area of a circle. Then have them explain how to find the area of Maya's rug.

## More Ideas

For other ways to teach about the area of a circle-

- Have students use Centimeter Cubes to estimate the area of a circle. Then, using the cubes, have students estimate the radius and diameter of the circle to calculate the area. Tell students to compare the two methods for finding the area of the circle.
- Have students find the area of the circular base of a solid from a set of Relational GeoSolids ${ }^{\circledR}$. Have students calculate the area two ways, using 3.14 and $\frac{22}{7}$ for $\pi$.


## Formative Assessment

Have students try the following problem.
The radius of a circle is 10 mi . What is the area of the circle to the nearest whole number?
A. 63 mi
B. 100 sq mi
C. 314 mi
D. 314 sq mi

Here is a problem about the area of a circle.
Maya has a circular rug in her bedroom. What is the area of the rug if the radius is 4.4 feet?

Introduce the problem. Then have students do the activity to solve the problem. Distribute the materials. Review the terms radius and diameter. Write the symbol $\pi$ on the board. Have students give the approximate value of $\pi$ as a fraction and as a decimal.


1. Have students trace the red circle on the grid paper. Say: Estimate the area of the circle by counting the squares and parts of squares. Have students share their estimates.

2. Ask: What part of a circle is shown by the base of the arrangement? The height? Show students that the base of the parallelogram is roughly $\frac{1}{2} C$ and that the height is roughly $r$. Write the area of the parallelogram, $A=\frac{1}{2} C \times r$, on the board. Replace $C$ with $2 \pi r$ and simplify to get the formula for the area of the circle, $A=\pi r^{2}$. Have students calculate the area of the red circle using radius 4.4 cm .

## Materials

- Deluxe Rainbow Fraction ${ }^{\circledR}$ Circles (1 set per group)
- BLM 1
- paper (1 sheet per group)
- calculators (1 per group)


2. Guide students to arrange the 12 twelfths in a side-by-side pattern on the grid paper. Ask: What shape does your arrangement resemble? Write $A=b \times h$ on the board. Have students explain how to find the area of a parallelogram and have them estimate the base, height, and area of the figure.

## A Look Out!

Some students may confuse the radius and the diameter of a circle. Have them draw and label the parts of a circle. Point out that area is always measured in square units, even when the shape has curved sides. Watch for students who think that $r^{2}$ means to multiply the length of the radius by two. Review the meaning of exponents with these students.

Use Fraction Circles to model the circle. Use a Centimeter Grid to find the area of the circle.
(Check students' work.)


Draw each circle described. Find the area of the circle. Use 3.14 for $\pi$.
2. $8-\mathrm{cm}$ radius
3. 2-inch diameter

Find the area of each circle. Use 3.14 for $\pi$.
4.

5.

6.


## Answer Key

Challenge! Determine the area of a circle on grid paper by arranging its sections into a figure having a length and width. Describe the length. Describe the width.

Challenge: (Sample) The length of the figure is one-half the circumference because half of the outer edges of the circle make up the edges of the figure. The width of the figure is equal to the radius of the circle.
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Use Fraction Circles to model the circle. Use a Centimeter Grid to find the area of the circle.
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Find the area of each circle. Use 3.14 for $\pi$.
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Name

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