

NAME

DATE

PERIOD

## Unit 3, Lesson 7: Exploring the Area of a Circle

Let's investigate the areas of circles.

### 7.1: Estimating Areas

Your teacher will show you some figures. Decide which figure has the largest area. Be prepared to explain your reasoning.

NAME \_\_\_\_\_

DATE \_\_\_\_\_

PERIOD \_\_\_\_\_

## 7.2: Estimating Areas of Circles

m.openup.org/1/7-3-7-2

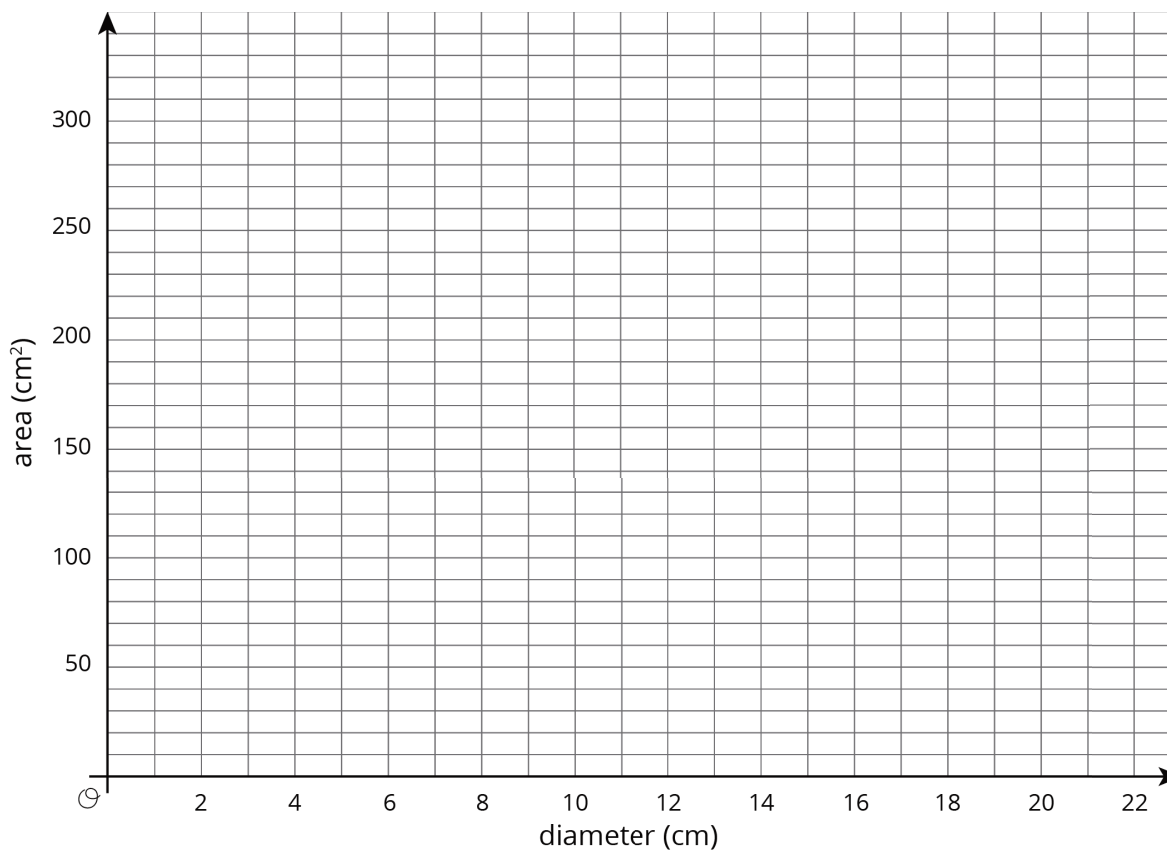
Your teacher will give your group two circles of different sizes.



1. For each circle, use the squares on the graph paper to measure the diameter and estimate the **area of the circle**. Record your measurements in the table.

diameter (cm)	estimated area (cm <sup>2</sup> )

2. Plot the values from the table on the class coordinate plane. Then plot the class's data points on your coordinate plane.



3. In a previous lesson, you graphed the relationship between the diameter and circumference of a circle. How is this graph the same? How is it different?

NAME

DATE

PERIOD

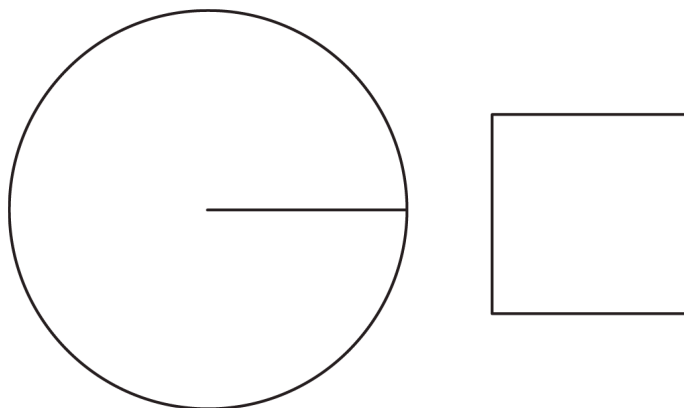
**Are you ready for more?**

1. How many circles of radius 1 unit can you fit inside a circle of radius 2 units so that they do not overlap?
2. How many circles of radius 1 unit can you fit inside a circle of radius 3 units so that they do not overlap?
3. How many circles of radius 1 unit can you fit inside a circle of radius 4 units so that they do not overlap?

If you get stuck, consider using coins or other circular objects.

**7.3: Covering a Circle**

Here is a square whose side length is the same as the radius of the circle.



How many of the squares do you think it would take to cover the circle exactly?

NAME

DATE

PERIOD

## Lesson 7 Summary

The circumference  $C$  of a circle is proportional to the diameter  $d$ , and we can write this relationship as  $C = \pi d$ . The circumference is also proportional to the radius of the circle, and the constant of proportionality is  $2 \cdot \pi$  because the diameter is twice as long as the radius. However, the **area of a circle** is *not* proportional to the diameter (or the radius).

The area of a circle with radius  $r$  is a little more than 3 times the area of a square with side  $r$  so the area of a circle of radius  $r$  is approximately  $3r^2$ . We saw earlier that the circumference of a circle of radius  $r$  is  $2\pi r$ . If we write  $C$  for the circumference of a circle, this proportional relationship can be written  $C = 2\pi r$ .

The area  $A$  of a circle with radius  $r$  is approximately  $3r^2$ . Unlike the circumference, the area is not proportional to the radius because  $3r^2$  cannot be written in the form  $kr$  for a number  $k$ . We will investigate and refine the relationship between the area and the radius of a circle in future lessons.

## Lesson 7 Glossary Terms

- area of a circle

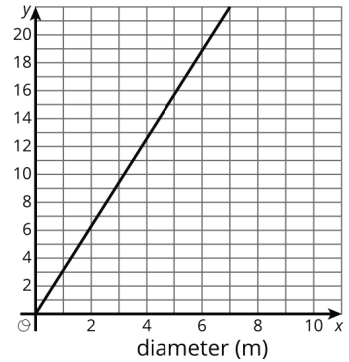
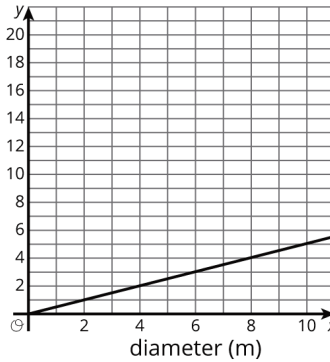
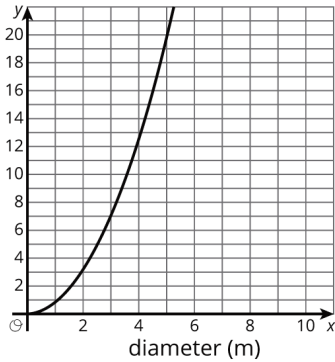
NAME \_\_\_\_\_

DATE \_\_\_\_\_

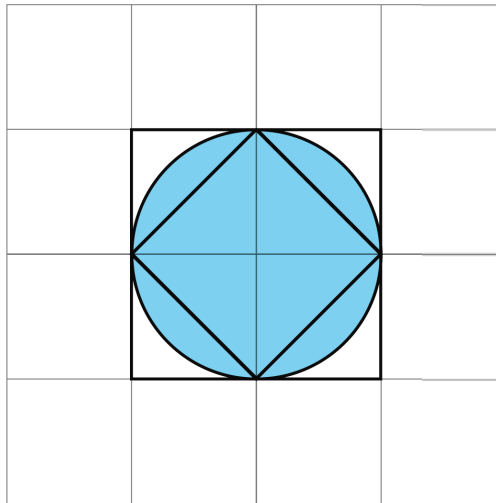
PERIOD \_\_\_\_\_

## Unit 3, Lesson 7: Exploring the Area of a Circle

1. The  $x$ -axis of each graph has the diameter of a circle in meters. Label the  $y$ -axis on each graph with the appropriate measurement of a circle: radius (m), circumference (m), or area ( $m^2$ ).



2. a. Here is a picture of two squares and a circle. Use the picture to explain why the area of this circle is more than 2 square units but less than 4 square units.

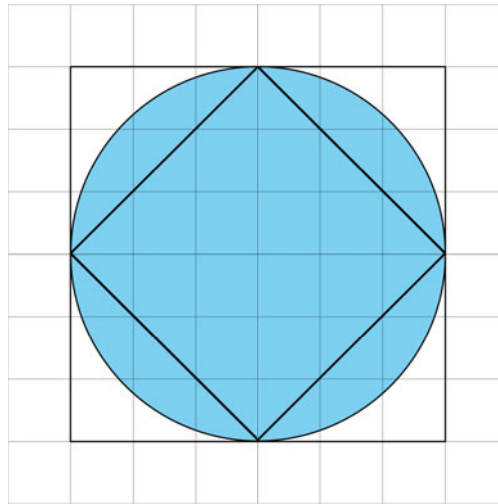


- b. Here is another picture of two squares and a circle. Use the picture to explain why the area of this circle is more than 18 square units and less than 36 square units.

NAME \_\_\_\_\_

DATE \_\_\_\_\_

PERIOD \_\_\_\_\_

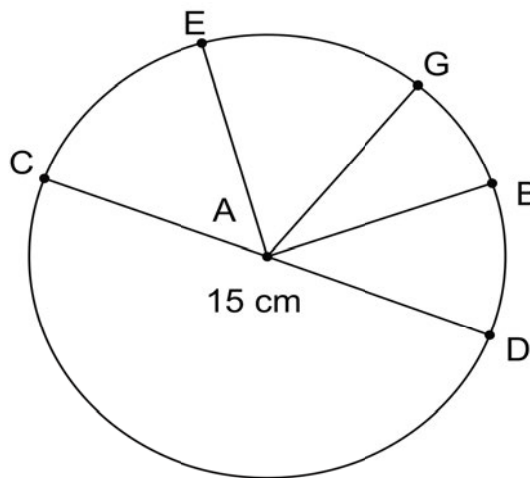


3. Circle A has area  $500 \text{ in}^2$ . The diameter of circle B is three times the diameter of circle A. Estimate the area of circle B.

4. Lin's bike travels 100 meters when her wheels rotate 55 times. What is the circumference of her wheels?

(from Unit 3, Lesson 5)

5. Find the circumference of this circle.



(from Unit 3, Lesson 3)

6. Priya drew a circle whose circumference is 25 cm. Clare drew a circle whose diameter is 3 times the diameter of Priya's circle. What is the circumference of Clare's circle?

---

NAME

DATE

PERIOD

(from Unit 3, Lesson 3)