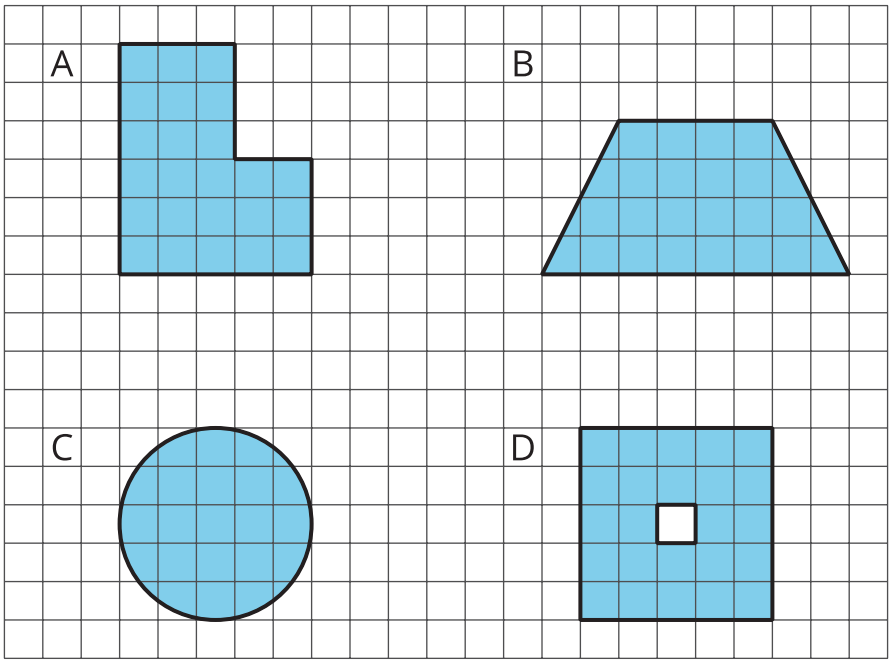
Unit 3, Lesson 7

Exploring the Area of a Circle

Let's investigate the areas of circles.

7.1 Which Three Go Together: Figures on a Grid

Which three go together? Why do they go together?



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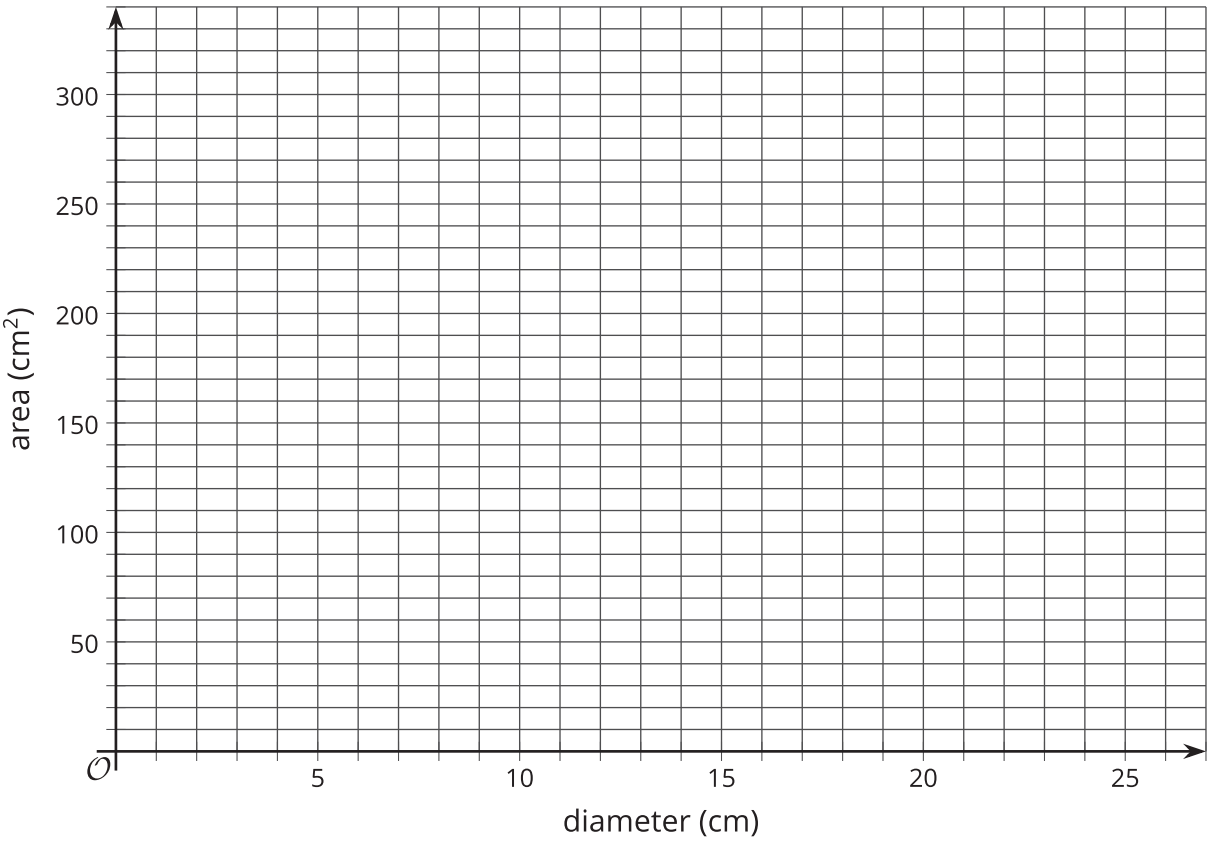
7.2 Estimating Areas of Circles

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

1. For each circle,
   a. Use the grid squares to determine the diameter of the circle.
   b. Estimate the **area of the circle**.
   c. Record your measurements in the first two rows of the table.

diameter (cm)	estimated area (cm^2)

2. Plot your diameter and area values on the coordinate plane. What do you notice?



3. Find out the measurements from another group that measured different circles. Record their values in your table, and plot them on your same coordinate plane.

4. Earlier, you graphed the relationship between the diameter and circumference of a circle. How is this graph the same? How is it different?

Are you ready for more?

How many circles of radius 1 unit can you fit inside each of the following so that they do not overlap?

1. a circle of radius 2 units?

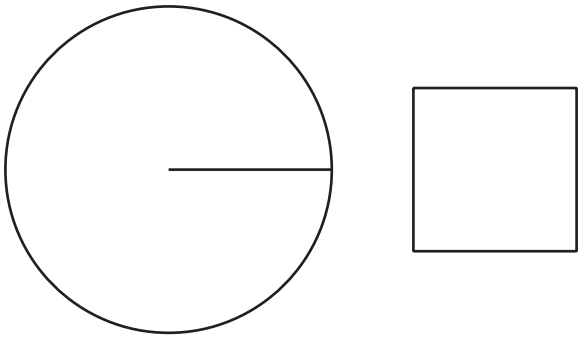
2. a circle of radius 3 units?

3. a circle of radius 4 units?

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 these squares do you think it would take to cover the circle exactly?

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.