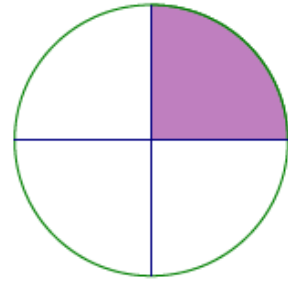


Lesson 22: Area Problems with Circular Regions

Classwork

Example 1

- a. The circle to the right has a diameter of 12 cm. Calculate the area of the shaded region.



- b. Sasha, Barry, and Kyra wrote three different expressions for the area of the shaded region. Describe what each student was thinking about the problem based on their expression.

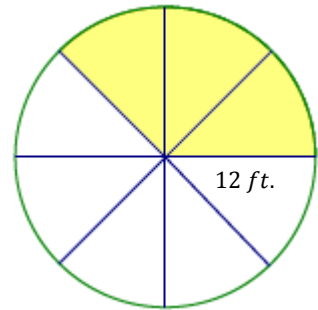
Sasha's expression: $\frac{1}{4}\pi(6^2)$

Barry's expression: $\pi(6^2) - \frac{3}{4}\pi(6^2)$

Kyra's expression: $\frac{1}{2}\left(\frac{1}{2}\pi(6^2)\right)$

Exercise 1

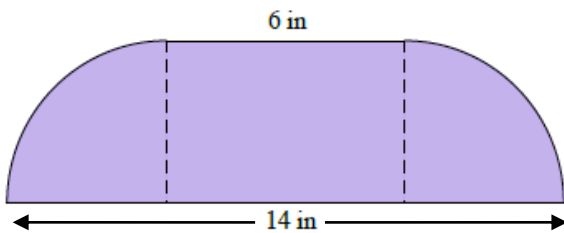
- a. Find the area of the shaded region of the circle to the right.



- b. Explain how the expression you used represents the area of the shaded region.

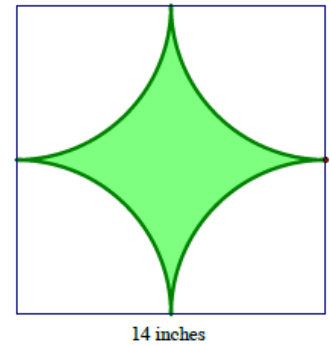
Exercise 2

Calculate the area of the figure below that consists of a rectangle and two quarter circles, each with the same radius. Leave your answer in terms of pi.



Example 2

The square in this figure has a side length of 14 inches. The radius of the quarter circle is 7 inches.



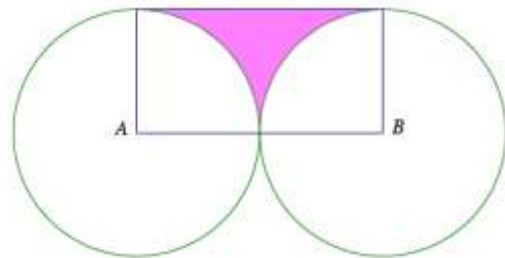
14 inches

- Estimate the shaded area.
- What is the exact area of the shaded region?
- What is the approximate area using $\pi \approx \frac{22}{7}$?

Exercise 3

The vertices A and B of rectangle $ABCD$ are centers of circles each with a radius of 5 inches.

- Find the exact area of the shaded region.

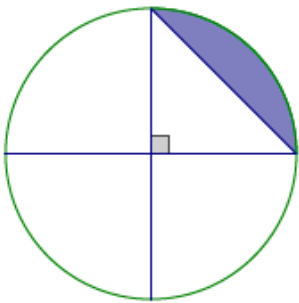


b. Find the approximate area using $\pi \approx \frac{22}{7}$.

c. Find the area to the nearest hundredth using your π key on your calculator.

Exercise 4

The diameter of the circle is 12 in. Write and explain a numerical expression that represents the area.



Problem Set

1. A circle with center O has an area of 96 in^2 . Find the area of the shaded region.



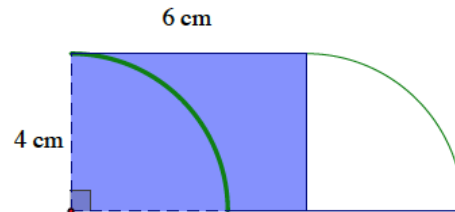
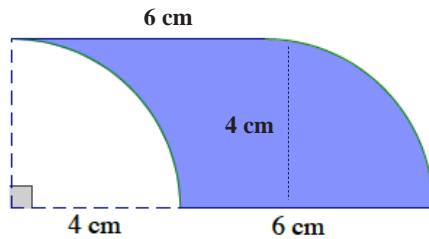
Peyton's Solution

$$A = \frac{1}{3}(96) \text{ in}^2 = 32 \text{ in}^2$$

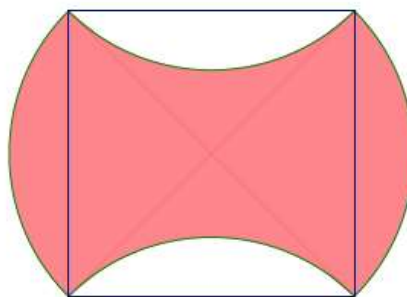
Monte's Solution

$$A = \frac{96}{120} \text{ in}^2 = 0.8 \text{ in}^2$$

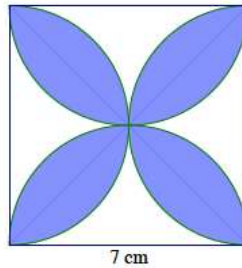
2. The following region is bounded by the arcs of two quarter circles each with a radius of 4 cm and by line segments 6 cm in length. The region on the right shows a rectangle with dimensions 4 cm by 6 cm. Show that both shaded regions have equal areas.



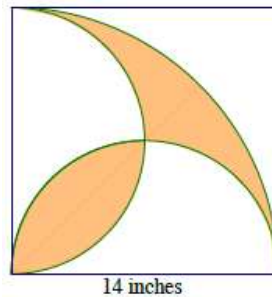
3. A square is inscribed in a paper disc (i.e., a circular piece of paper) with a radius of 8 cm. The paper disc is red on the front and white on the back. Two edges of the square are folded over. Write and explain a numerical expression that represents the area of the figure. Then find the area of the figure.



4. The diameters of four half circles are sides of a square with a side length of 7 cm.



- Find the exact area of the shaded region.
 - Find the approximate area using $\pi \approx \frac{22}{7}$.
 - Find the area using the π button on your calculator and rounding to the nearest thousandth.
5. A square with a side length of 14 inches is shown below, along with a quarter circle (with a side of the square as its radius) and two half circles (with diameters that are sides of the square). Write and explain a numerical expression that represents the area of the figure.



6. Three circles have centers on segment AB . The diameters of the circles are in the ratio 3:2:1. If the area of the largest circle is 36 ft^2 , find the area inside the largest circle but outside the smaller two circles.
7. A square with a side length of 4 ft. is shown, along with a diagonal, a quarter circle (with a side of the square as its radius), and a half-circle (with a side of the square as its diameter). Find the exact, combined area of regions I and II.

