

**LESSON**  
**11.2****Study Guide**

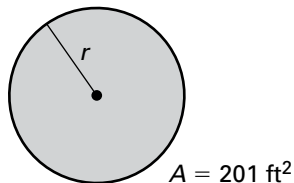
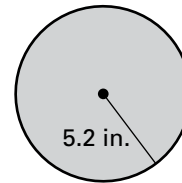
For use with the lesson "Areas of Circles and Sectors"

**GOAL Find the areas of circles and sectors.****Vocabulary**

A **sector of a circle** is the region bounded by two radii of the circle and their intercepted arc.

**Theorem 9 Area of a circle:** The area of a circle is  $\pi$  times the square of the radius.

**Theorem 10 Area of a sector:** The ratio of the area of a sector of a circle to the area of the whole circle ( $\pi r^2$ ) is equal to the ratio of the measure of the intercepted arc to  $360^\circ$ .

**EXAMPLE 1 Use the formula for area of a circle****Find the indicated measure.****a.** Radius**b.** Area**Solution**

- a.**  $A = \pi r^2$  Write the formula for area of a circle.  
 $201 = \pi r^2$  Substitute 201 for  $A$ .  
 $\frac{201}{\pi} = r^2$  Divide each side by  $\pi$ .  
 $8 \approx r$  Find the positive square root of each side.  
 The radius of the circle is about 8 feet.
- b.**  $A = \pi r^2$  Write the formula for area of a circle.  
 $= \pi \cdot (5.2)^2$  Substitute 5.2 for  $r$ .  
 $= 27.04\pi$  Simplify.  
 $\approx 84.9$  Use a calculator.  
 The area of the circle is about 84.9 square inches.

**Exercises for Example 1****Find the indicated measure.**

- The diameter of the circle is 11 centimeters. Find the area.
- The area of the circle is 158.3 square yards. Find the radius.
- The area of the circle is  $1024\pi$  square meters. Find the diameter.

LESSON  
11.2**Study Guide** *continued*  
For use with the lesson "Areas of Circles and Sectors"**EXAMPLE 2 Find the areas of sectors****Find the areas of the sectors formed by  $\angle PQR$ .****Solution****STEP 1** Find the measures of the minor and major arcs.

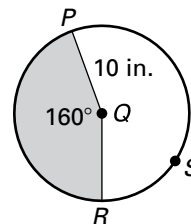
$$\text{Because } m\angle PQR = 160^\circ, m\widehat{PR} = 160^\circ \text{ and } m\widehat{PSR} = 360^\circ - 160^\circ = 200^\circ.$$

**STEP 2** Find the areas of the small and large sectors.

$$\text{Area of small sector} = \frac{160^\circ}{360^\circ} \cdot \pi \cdot 10^2 \approx 139.63$$

$$\text{Area of large sector} = \frac{200^\circ}{360^\circ} \cdot \pi \cdot 10^2 \approx 174.53$$

So, the areas of the small and large sectors are about 139.63 square inches and 174.53 square inches, respectively.

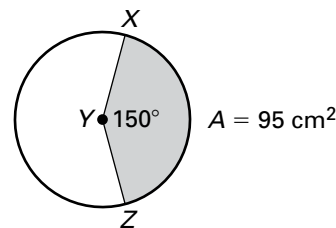
**EXAMPLE 3 Use the Area of a Sector Theorem****Use the diagram to find the area of  $\odot Y$ .****Solution**

$$\text{Area of sector } XYZ = \frac{m\widehat{XZ}}{360^\circ} \cdot \text{Area of } \odot Y$$

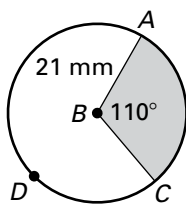
$$95 = \frac{150^\circ}{360^\circ} \cdot \text{Area of } \odot Y$$

$$228 = \text{Area of } \odot Y$$

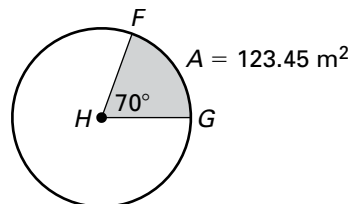
The area of  $\odot Y$  is 228 square centimeters.

**Exercises for Examples 2 and 3**

4. Find the areas of the sectors formed by  $\angle ABC$ .



5. Find the area of  $\odot H$ .



## Lesson 11.2 Areas of Circles and Sectors, continued

**2. Sample answer:** If the radius of  $\odot A$  is  $r$ , the circumference of  $\odot A$  is  $2\pi r$ . The radius of each of the smaller circles is  $\frac{1}{2}$  of the length of the radius of  $\odot A$ . So, the circumference of each smaller circle is  $2\pi\left(\frac{1}{2}r\right)$  or  $\pi r$ . When the circumference of  $\odot D$  is added to the circumference of  $\odot E$ , the result is  $2\pi r$ , which equals the circumference of  $\odot A$ .

### Practice Level A

- $4\pi$  in.<sup>2</sup>; 12.57 in.<sup>2</sup>
- $64\pi$  ft<sup>2</sup>; 201.06 ft<sup>2</sup>
- $\frac{\pi}{4}$  yd<sup>2</sup>; 0.79 yd<sup>2</sup>
- about 4.30 in.
- about 3.43 m
- about 11.62 cm
- about 17.81 ft
- about 28.27 cm<sup>20</sup>; about 84.82 cm<sup>2</sup>
- about 52.36 in.<sup>2</sup>; about 261.08 in.<sup>2</sup>
- about 603.19 ft<sup>2</sup>; about 1206.37 ft<sup>2</sup>
- about 62.86 m<sup>2</sup>
- about 81.30 in.<sup>2</sup>
- about 2.91 ft
- about 6.29 cm
- about 39.54 cm
- $81^\circ$
- about 8.90 cm
- about 21.49 cm
- about 43.23 cm
- about 37.7 in.<sup>2</sup>
- about 21.46 cm<sup>2</sup>
- about 73.06 ft<sup>2</sup>
- about 706.86 in.<sup>2</sup>
- about 25.13 in.<sup>2</sup>
- 24 in.; about 113.10 in.<sup>2</sup>

### Practice Level B

- $36\pi$  in.<sup>2</sup>; 113.10 in.<sup>2</sup>
- $110.25\pi$  ft<sup>2</sup>; 346.36 ft<sup>2</sup>
- $153.76\pi$  cm<sup>2</sup>; 483.05 cm<sup>2</sup>
- 7.42 in.
- 9.61 m
- 28.86 cm
- 25.93 ft
- 9.08 in.<sup>2</sup> and 41.19 in.<sup>2</sup>
- 827.02 cm<sup>2</sup> and 1463.20 cm<sup>2</sup>
- 426.94 m<sup>2</sup> and 590.93 m<sup>2</sup>
- 107.055 ft<sup>2</sup>
- 6.89 in.
- 6.83 m
- 9.70 in.
- 60.94 in.
- $67^\circ$
- 11.34 in.
- 30.74 in.
- 69.00 in.
- 86.08 cm<sup>2</sup>
- 199.10 in.<sup>2</sup>
- 236.40 m<sup>2</sup>
- 37.70 ft<sup>2</sup>
- 19.27 in.<sup>2</sup>
- 117.92 cm<sup>2</sup>
- 1385.44 ft<sup>2</sup>
- a. 301.59 ft<sup>2</sup> b. 117.81 ft<sup>2</sup>
- 10.60 m<sup>2</sup>

### Practice Level C

- $\frac{9\pi}{64}$  in.<sup>2</sup>; 0.44 in.<sup>2</sup>
- $13.69\pi$  cm<sup>2</sup>; 43.01 cm<sup>2</sup>
- $\frac{529\pi}{16}$  in.<sup>2</sup>; 103.87 in.<sup>2</sup>
- about 8.67 in.
- about 11.14 m
- about 33.03 cm

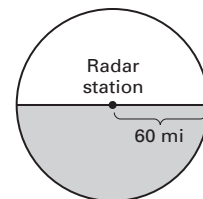
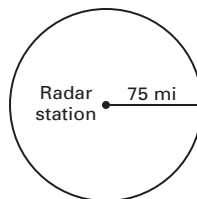
- about 30.15 ft
- about 33.51 in.<sup>2</sup>; about 167.55 in.<sup>2</sup>
- about 21.21 in.<sup>2</sup>; about 42.41 in.<sup>2</sup>
- about 157.28 mm<sup>2</sup>; about 357.44 mm<sup>2</sup>
- about 43.0 cm<sup>2</sup>
- about 6.96 m
- about 11.50 ft
- about 14.13 m
- about 88.58 m
- about  $37^\circ$
- about 9.110 m
- about 37.31 m
- about 107.68 m
- about 31.42 m<sup>2</sup>
- about 31.32 m<sup>2</sup>
- about 70.69 in.<sup>2</sup>
- about 110.01 in.<sup>2</sup>
- about 219.75 cm<sup>2</sup>
- about 12.57 cm<sup>2</sup>
- c. 16-inch pizza
- They all waste the same amount of paper.

### Study Guide

- $A \approx 95$  cm<sup>2</sup>
- $r \approx 7.1$  yd
- $d = 64$  m
- 423.33 m<sup>2</sup> and 962.11 m<sup>2</sup>
- 634.89 m<sup>2</sup>

### Interdisciplinary Application

- about 52,360 mi<sup>2</sup>
- about 17,671.5 mi<sup>2</sup>
- about 5655 mi<sup>2</sup>



### Challenge Practice

- $\frac{50\pi}{3} - 25\sqrt{3} \approx 9.1$  cm<sup>2</sup>
- $\frac{81\pi}{2} - 81\sqrt{2} \approx 12.7$  in.<sup>2</sup>
- 20.2 ft<sup>2</sup>
- $36\sqrt{3} - 18\pi \approx 5.8$  cm<sup>2</sup>
- $1369\pi \approx 4300.8$  in.<sup>2</sup>
- a.

x	30°	60°	90°	120°	150°	180°
y	$\frac{3\pi}{4}$	$\frac{3\pi}{2}$	$\frac{9\pi}{4}$	$3\pi$	$\frac{15\pi}{4}$	$\frac{9\pi}{2}$

