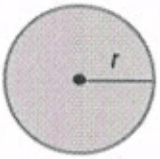
Key

Notes 8.4 Area of Circles

Find the Area of a Circle

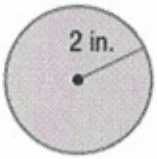
Model



Words The area, A, of a circle equals the product of π and the square of its radius, r.

Symbols $A = \pi r^2$

Example 1: Find the area of the circle. State your answer in terms of π and to the nearest hundredth.



$A = \pi r^2$	Area of a circle.
$A = \pi \cdot 2^2$	Substitute 2 for r.
$A = \pi \cdot 4$	Multiply.
$A = 4\pi\ in^2$	Answer in terms of π.
$A \approx 12.566$	Multiply.
$A \approx 12.57$	Round to the nearest hundredth.

The area of the circle is approximately 12.57 square inches.

Try This:

a. Find the area of a circle with a radius of 3.2 centimeters. State your answer in terms of π and to the nearest hundredth.

3.2 cm = r

$A = \pi r^2$

$A = \pi(3.2)^2$

$A = \pi(10.24)$

$A \approx 32.169$

$A \approx 32.17\ cm^2$

Example 2. Find the area of the face of the Virginia quarter with a diameter of 24 millimeters. Round to the nearest hundredth.

The radius is $\frac{1}{2}(24)$ or 12 millimeters.

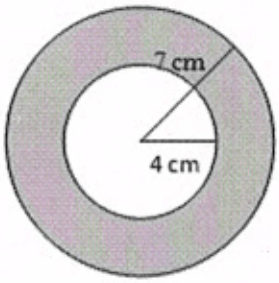
$A = \pi r^2$	Area of a circle
$A = \pi \cdot 12^2$	Substitute 12 for r.
$A = \pi \cdot 144$	Multiply.
$A \approx 452.389$	Multiply.
$A \approx 452.39$	Round to the nearest hundredth.

$d = 24$
$r = \frac{d}{2}$
$r = \frac{24}{2}$
$r = 12\,mm$

The area is approximately 452.39 square millimeters.

Example 3: Find the area of the shaded region. Round to the nearest hundredth.

Step 1: Find the area of each circle.



Area of large circle:

$A = \pi r^2$
$A = \pi 7^2$
$A = \pi \cdot 49$
$A \approx 153.938$
$A \approx 153.94\ cm^2$

Area of small circle:

$A = \pi r^2$
$A = \pi 4^2$
$A = \pi \cdot 16$
$A \approx 50.265$
$A \approx 50.27 cm^2$

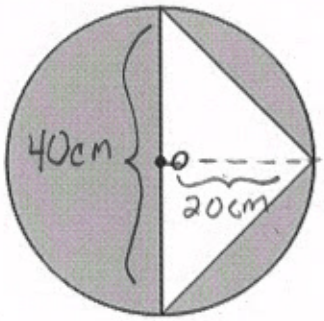
Step 2: Subtract the area of the smaller circle from the area of the larger circle.

$153.94 - 50.27 \approx 103.67$

The area of the shaded region is about 103.67 cm^2.

Try This:

b. In the following figure, the triangle is an isosceles triangle with its base passing through the center of the circle. The diameter of the circle is 40 centimeters. Find the area of the shaded region. Round to the nearest hundredth.



d = 40cm
r = 20cm

① Area of Circle

$A = \pi r^2$

$A = \pi (20)^2$

$A = \pi (400)$

$A \approx 1256.637$

$A \approx 1256.64\ cm^2$

② Area of Triangle

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(40 \cdot 20)$

$A = \frac{1}{2}(800)$

$A = 400\ cm^2$

③ Area of Shaded region

A = Area of Circle − Area of Triangle

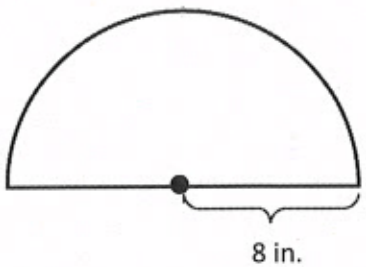
$A \approx 1256.64 - 400$

Area of Shaded region $\approx 856.64\ cm^2$

Area of Semicircles

A **semicircle** is half of a circle. The formula for the area of a semicircle is $A = \frac{1}{2}\pi r^2$.

Example 4: Find the area of the semicircle. Round to the nearest hundredth.



$A = \frac{1}{2}\pi r^2$	Area of a semicircle.
$A = \frac{1}{2}\pi \cdot 8^2$	Substitute 8 for r.
$A = \frac{1}{2}\pi \cdot 64$	Multiply.
$A = \pi \cdot 32$	Multiply.
$A \approx 100.530$	Multiply.
$A \approx 100.53$	Round to the nearest hundredth.

The area of the semicircle is approximately 100.53 square inches.

Try This:

c. Find the approximate area of a semicircle with a diameter of 8 centimeters. Round to the nearest hundredth.

$A = \frac{1}{2}\pi r^2$

$A = \frac{1}{2}\pi (4)^2$

$A = \frac{1}{2}(16)\pi$

$A = 8\pi$

$A \approx 25.132$

$A \approx 25.13\ cm^2$

$d = 8$

$r = \frac{d}{2}$

$r = \frac{8}{2}$

$r = 4\ cm$.