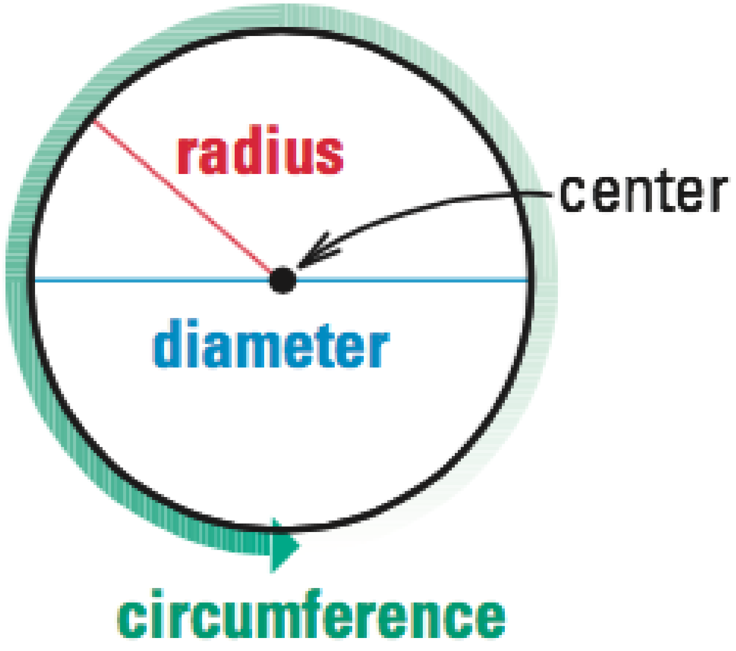
Chapter 8

Polygons and Area

Section 7
Circumference and Area of Circles

A **circle** is the set of all points in a plane that are the same distance from a given point, called the **center** of the circle. A circle with center P is called "circle P," or $\odot P$.

The distance from the center to a point on the circle is the **radius**. The plural of radius is *radii*.



The distance across the circle, through the center, is the **diameter**. The diameter d is twice the radius r. So, $d = 2r$.

$r = \frac{1}{2}d$

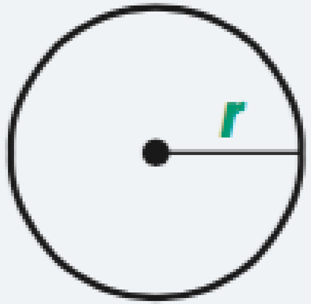
The **circumference** of a circle is the distance around the circle.

For any circle, the ratio of the circumference to its diameter is denoted by the Greek letter π, or *pi*. The number π is 3.14159 . . . , which is an irrational number. This means that π neither terminates nor repeats. So, an approximation of 3.14 is used for π.

CIRCUMFERENCE OF A CIRCLE

Words Circumference $= \pi(\text{diameter})$
$= 2\pi(\text{radius})$

Symbols $C = \pi d$ or $C = 2\pi r$



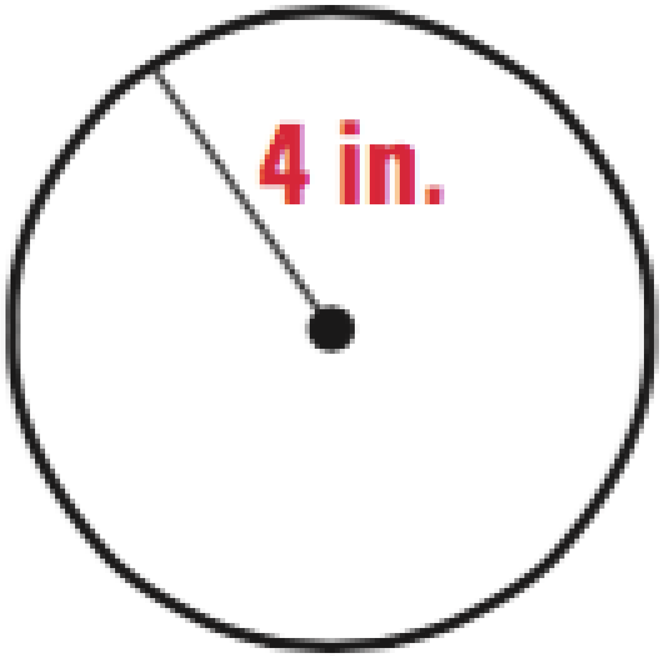
Example 1: Find the Circumference of a Circle

Find the circumference of the circle.

$C = 2\pi r$

$2(3.14)(4)$

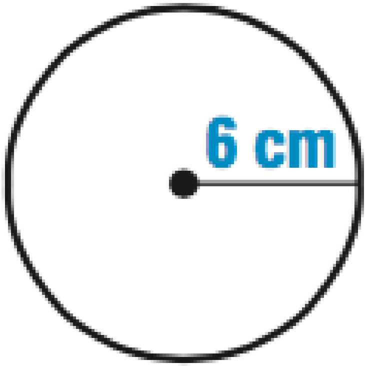
25.12 in.



Checkpoint: Find the circumference of a Circle

Find the circumference of the circle. Round your answer to the nearest whole number.

1.



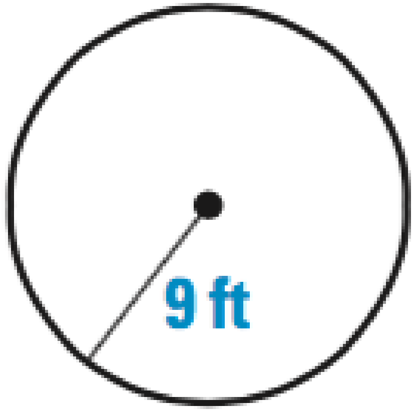
$2\pi r$

$2(3.14)(6)$

37.68

38 cm

2.

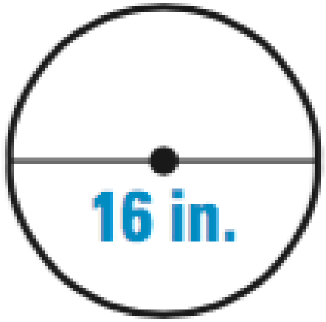


$2(3.14)(9)$

56.52

57 ft

3.



$r = 8$

$2(3.14)(8)$

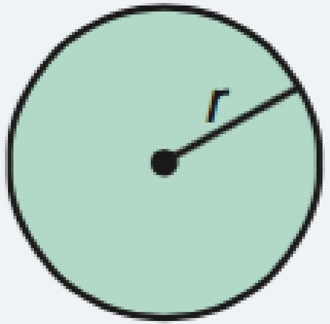
50.24

50 in.

AREA OF A CIRCLE

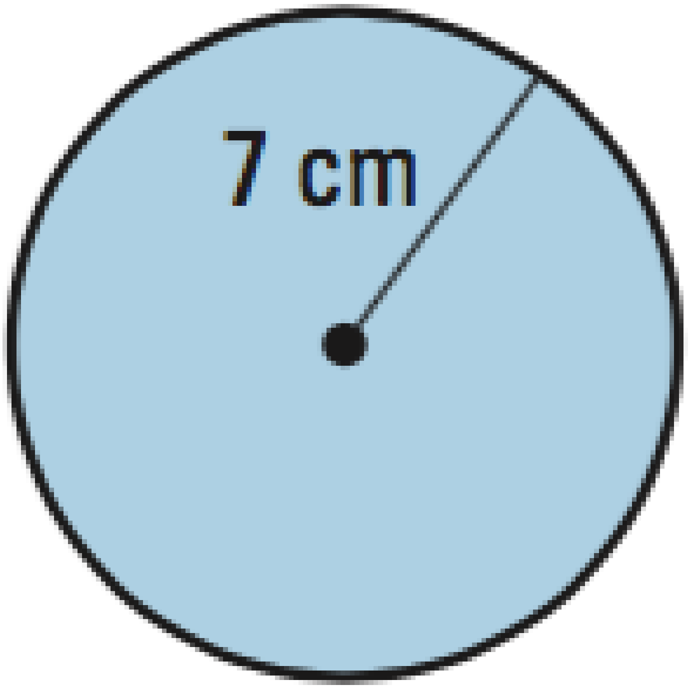
Words Area $= \pi(\text{radius})^2$

Symbols $A = \pi r^2$



Example 2: Find the Area of a Circle

Find the area of the circle.



$A = \pi r^2$

$3.14(7)^2$

$3.14(49)$

153.86 cm^2

Example 3: Use the Area of a Circle

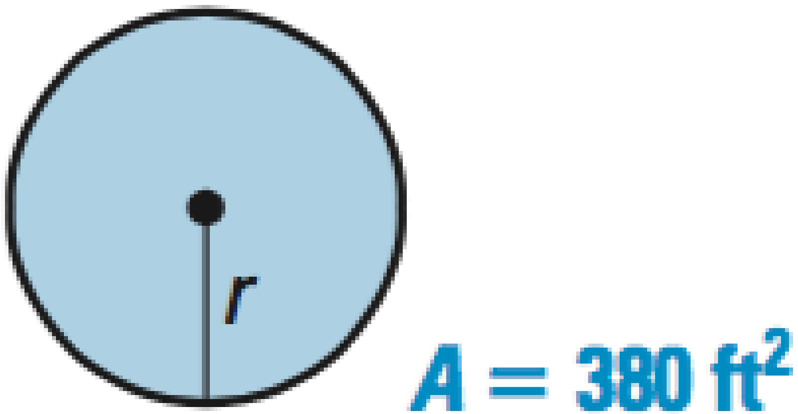
Find the radius of a circle with an area of 380 square feet.

$$A = \pi r^2$$

$$\frac{380}{3.14} = \frac{\cancel{3.14} r^2}{\cancel{3.14}}$$

$$\sqrt{121.01} = \sqrt{\cancel{r^2}}$$

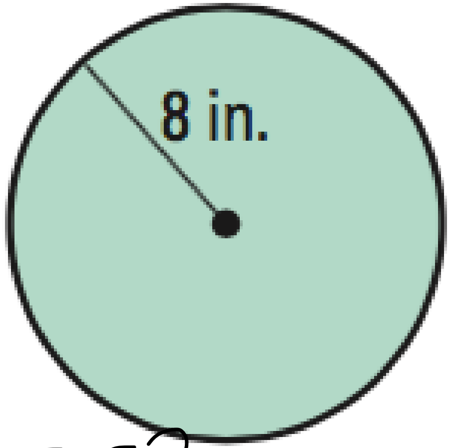
$$11.00 \text{ ft} = r$$



Checkpoint: Find the Area of a Circle

Find the area of the circle. Round your answer to the nearest whole number.

4.



πr^2

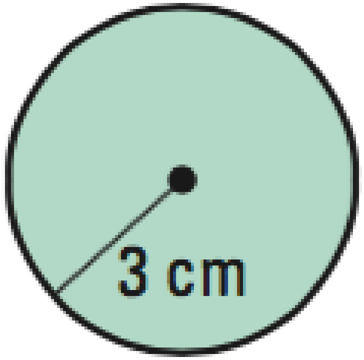
$3.14\,(8)^2$

$3.14(64)$

200.96

201 in^2

5.



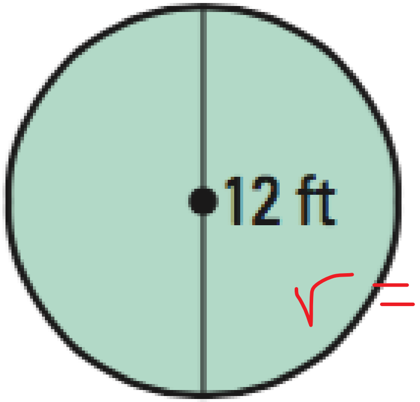
$3.14(3)^2$

$3.14(9)$

28.26

28 cm^2

6.



$r = 6$

$3.14(6)^2$

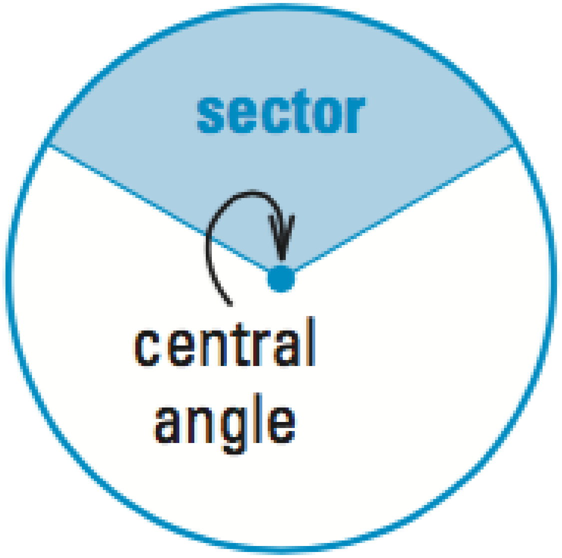
$3.14(36)$

113.04

113 ft^2

Central Angles An angle whose vertex is the center of a circle is a **central angle** of the circle.

A region of a circle determined by two radii and a part of the circle is called a **sector** of the circle.

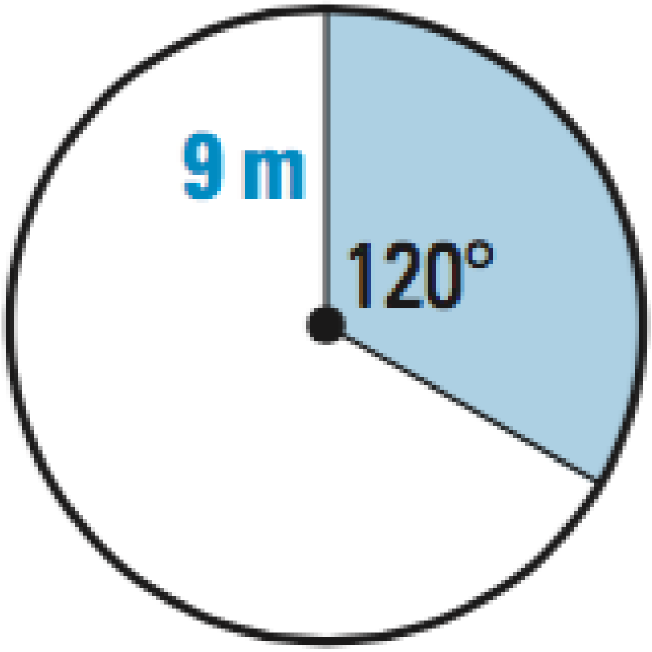


Because a sector is a portion of a circle, the following proportion can be used to find the area of a sector.

$$\frac{\text{Area of sector}}{\text{Area of entire circle}} = \frac{\text{Measure of central angle}}{\text{Measure of entire circle}}$$ → 360

Example 4: Find the Area of a Sector

Find the area of the blue sector.



Area of circle

$\hookrightarrow \pi r^2 \to 3.14(9)^2 = 254.34$

$$\frac{x}{254.34} = \frac{120}{360}$$

$$\frac{\cancel{360}x}{\cancel{360}} = \frac{30520.8}{360}$$

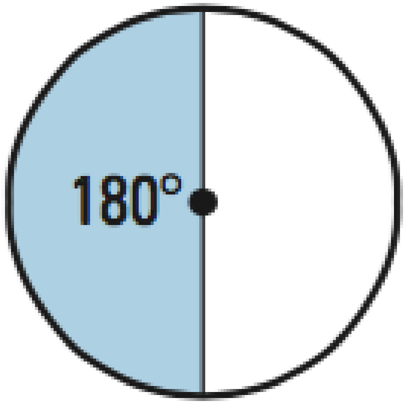
$$\boxed{84.78\ m^2}$$

Checkpoint: Find the Area of a Sector

In Exercises 7 and 8, *A* represents the area of the entire circle and *x* represents the area of the blue sector. Complete the proportion used to find *x*. Do not solve the proportion.

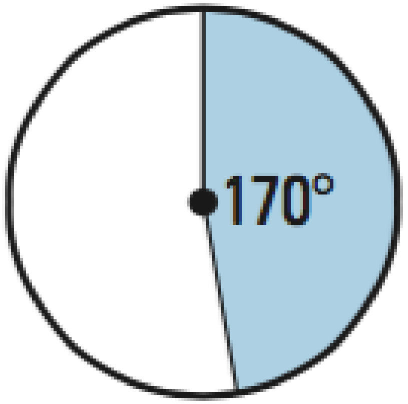
7. $A = 22\text{ m}^2$

$$\frac{x}{?} = \frac{180^\circ}{?}$$



8. $A = 28\text{ ft}^2$

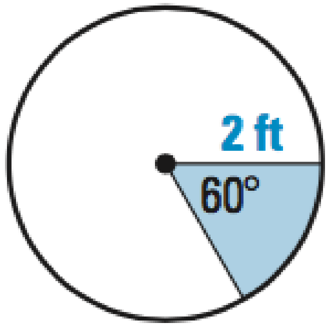
$$\frac{x}{?} = \frac{?}{360^\circ}$$



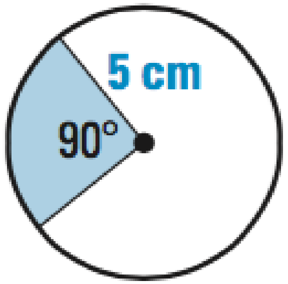
Checkpoint: Find the Area of a Sector

Find the area of the blue sector. Round your answer to the nearest whole number.

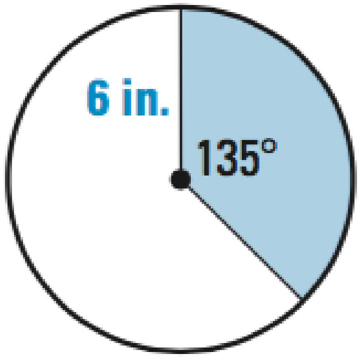
9.



10.



11.



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