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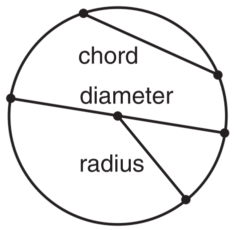
Study Guide

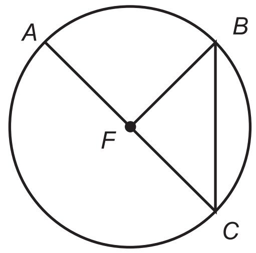
Parts of a Circle

A **circle** is the set of all points in a plane that are a given distance from a given point in the plane called the **center**. Various parts of a circle are labeled in the figure at the right. Note that the diameter is twice the radius.



Example: In $\odot F$, $\overline{AC}$ is a diameter.

- Name the circle. $\odot F$
- Name a radius. $\overline{AF}$, $\overline{CF}$, or $\overline{BF}$
- Name a chord that is not a diameter. $\overline{BC}$



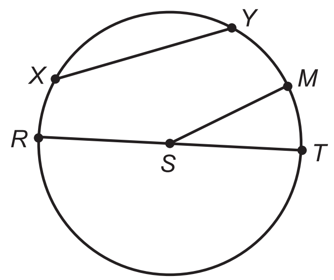
Use ⊙S to name each of the following.

1. the center

2. three radii

3. a diameter

4. a chord

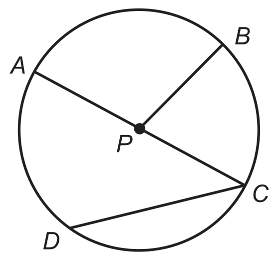


Use ⊙P to determine whether each statement is true or false.

5. $\overline{PC}$ is a radius of $\odot P$.

6. $\overline{AC}$ is a chord of $\odot P$.

7. If $PB = 7$, then $AC = 14$.



On a separate sheet of paper, use a compass and a ruler to make a drawing that fits each description.

8. $\odot A$ has a radius of 2 inches. $\overline{QR}$ is a diameter.

9. $\odot G$ has a diameter of 2 inches. Chord $\overline{BC}$ is 1 inch long.

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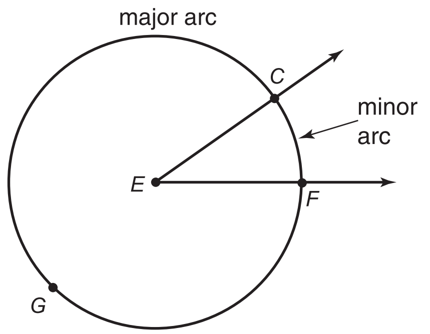
Study Guide

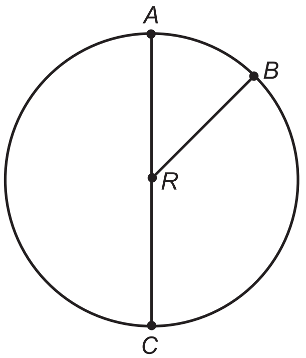
Arcs and Central Angles



An angle whose vertex is at the center of a circle is called a **central angle**. A central angle separates a circle into two arcs called a **major arc** and a **minor arc**. In the circle at the right, $\angle CEF$ is a central angle. Points C and F and all points of the circle interior to $\angle CEF$ form a minor arc called arc CF. This is written $\overset{\frown}{CF}$. Points C and F and all points of the circle exterior to $\angle CEF$ form a major arc called $\overset{\frown}{CGF}$.

You can use central angles to find the degree measure of an arc. The arcs determined by a diameter are called **semicircles** and have measures of 180.

Examples: In $\odot R$, $m\angle ARB = 42$ and $\overline{AC}$ is a diameter.



1 Find $m\overset{\frown}{AB}$.

Since $\angle ARB$ is a central angle and $m\angle ARB = 42$, then $m\overset{\frown}{AB} = 42$.

2 Find $m\overset{\frown}{ACB}$.

$m\overset{\frown}{ACB} = 360 - m\angle ARB = 360 - 42$ or 318

3 Find $m\overset{\frown}{CAB}$.

$$\begin{aligned} m\overset{\frown}{CAB} &= m\overset{\frown}{ABC} + m\overset{\frown}{AB} \\ &= 180 + 42 \\ &= 222 \end{aligned}$$

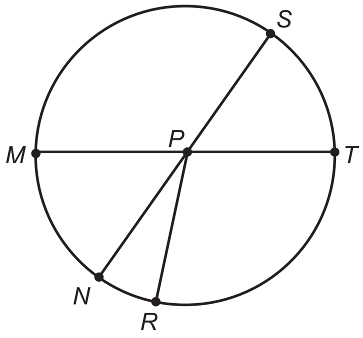
Refer to $\odot P$ for Exercises 1–4. If $\overline{SN}$ and $\overline{MT}$ are diameters with $m\angle SPT = 51$ and $m\angle NPR = 29$, determine whether each arc is a minor arc, a major arc, or a semicircle. Then find the degree measure of each arc.

1. $m\overset{\frown}{NR}$

2. $m\overset{\frown}{ST}$

3. $m\overset{\frown}{TSR}$

4. $m\overset{\frown}{MST}$



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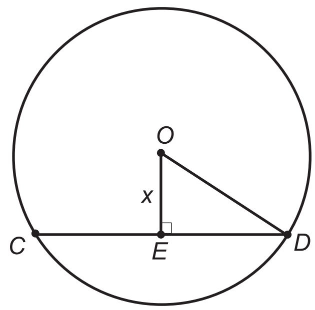
Study Guide

Arcs and Chords

The following theorems state relationships between arcs, chords, and diameters.

- In a circle or in congruent circles, two minor arcs are congruent if and only if their corresponding chords are congruent.
- In a circle, a diameter bisects a chord and its arc if and only if it is perpendicular to the chord.

Example: In the circle, O is the center, $OD = 15$, and $CD = 24$. Find x.

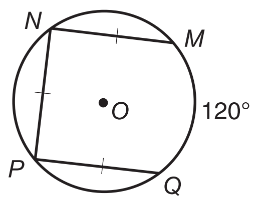


$$ED = \frac{1}{2}CD = \frac{1}{2}(24) = 12$$

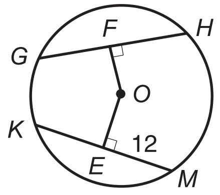
$$(OE)^2 + (ED)^2 = (OD)^2$$
$$x^2 + 12^2 = 15^2$$
$$x^2 + 144 = 225$$
$$x^2 = 81$$
$$x = 9$$

In each circle, O is the center. Find each measure.

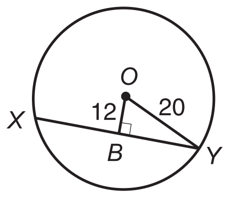
1. $m\overparen{NP}$



2. KM



3. XY



4. Suppose a chord is 20 inches long and is 24 inches from the center of the circle. Find the length of the radius.

5. Suppose a chord of a circle is 5 inches from the center and is 24 inches long. Find the length of the radius.

6. Suppose the diameter of a circle is 30 centimeters long and a chord is 24 centimeters long. Find the distance between the chord and the center of the circle.

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Study Guide

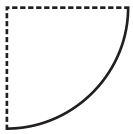
Inscribed Polygons

You can make many regular polygons by folding a circular piece of paper. The vertices of the polygon will lie on the circle, so the polygon is said to be inscribed in the circle.

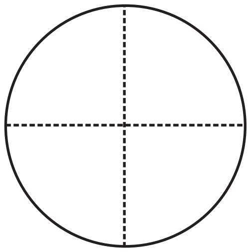
1. Draw a circle with a radius of 2 inches and cut it out. Make the following folds to form a square.

Step A
Fold the circle in half.

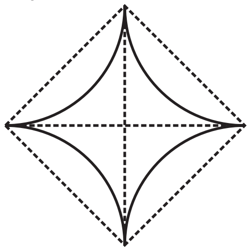
Step B
Fold the circle in half again.



Step C
Unfold the circle.

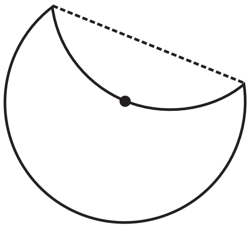


Step D
Fold the four arcs designated by the creases.

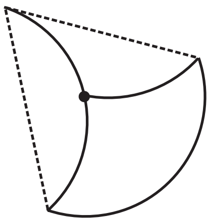


2. Draw another circle with a radius of 2 inches and cut it out. Make the following folds to form a regular triangle.

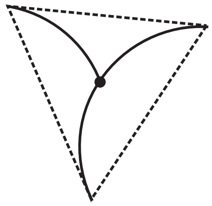
Step A
Fold one portion in toward the center.



Step B
Fold another portion in toward the center, overlapping the first.



Step C
Fold the remaining third of the circle in toward the center.



3. Cut out another circle and fold it to make a regular octagon. Draw the steps used.

4. Cut out another circle and fold it to make a regular hexagon. Draw the steps used.

5. Cut out a circle with radius 4 inches and fold it to make a regular dodecagon. Draw the steps used.

11–5

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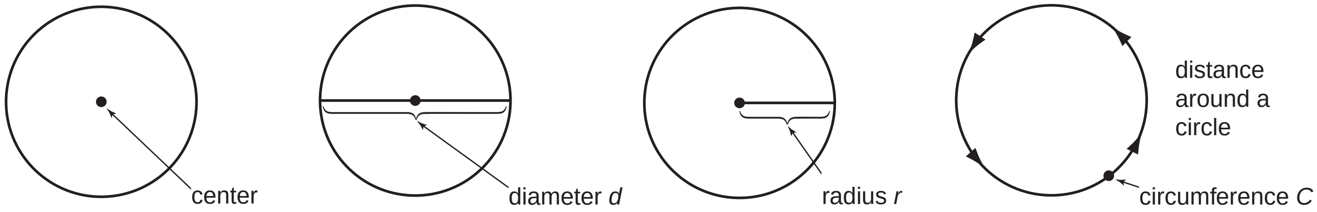
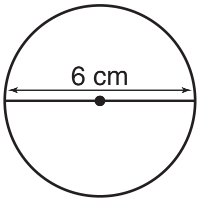
Study Guide

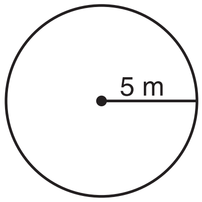
Circumference of a Circle



Examples: Find the circumference of each circle.



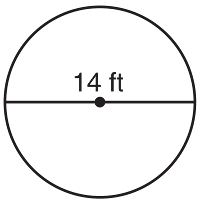
$C = \pi d$
$C = \pi(6)$
$C \approx 18.85$
$C \approx 19$ cm



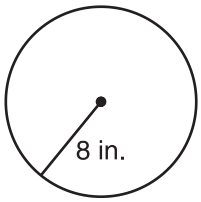
$C = 2\pi r$
$C = 2\pi(5)$
$C = 10\pi$
$C \approx 31.4$
$C \approx 31$ m

Find the circumference of each circle.

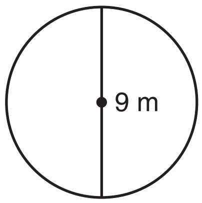
1.



2.



3.



4. The radius is $6\frac{1}{5}$ feet.

5. The diameter is 4.7 yards.

Solve. Round to the nearest inch.

6. What is the circumference of the top of an ice cream cone if its diameter is about $1\frac{7}{8}$ inches?

7. The radius of the basketball rim is 9 inches. What is the circumference?

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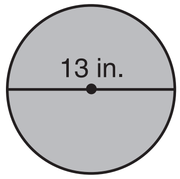
Study Guide

Area of a Circle

The area A of a circle equals π times the radius r squared: $A = \pi r^2$.

Examples ***1*** Find the area of the circle.



$A = \pi r^2$

$A = \pi\left(\frac{13}{2}\right)^2$

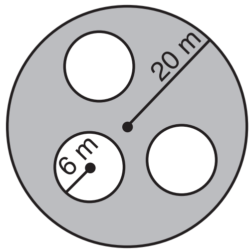
$A = \pi(42.25)$

$A \approx 132.73$

The area of the circle is about 132.7 in^2.

2 Find the area of the shaded region.

Assume that the smaller circles are congruent.



Find the area of the large circle.	Find the area of a small circle.
$A = \pi r^2$	$A = \pi r^2$
$A = \pi(20)^2$	$A = \pi(6)^2$
$A \approx 1256.64$	$A \approx 113.10$

Now find the area of the shaded region.

$A \approx 1256.64 - 3(113.10)$

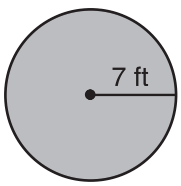
$\approx 1256.64 - 339.3$

≈ 917.34

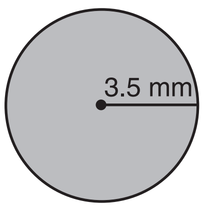
The area of the shaded region is about 917.3 m^2.

Find the area of each circle to the nearest tenth.

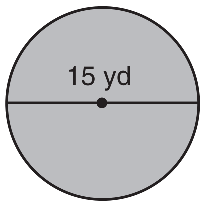
1.



2.

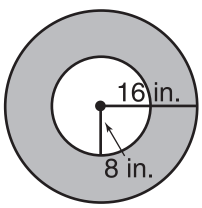


3.

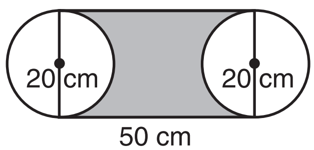


Find the area of each shaded region to the nearest tenth.

4.



5.



6.