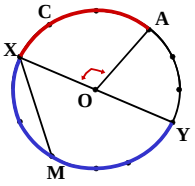
Lesson 9-2

Objective - To find area of circles and regular polygons.

Circle - The locus of points equidistant from a center point.



O - **Center**

$\overline{OA}$ - **Radius- Segment or distance from center to circle.**

$\overline{XM}$ - **Chord- Segment that connects one point on circle to another.**

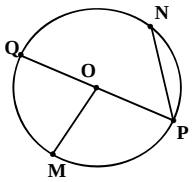
$\overline{XY}$ - **Diameter- Chord that passes through the center.**

$\overset{\frown}{XCA}$ - **Arc - Piece of a circle.**

$\overset{\frown}{XMY}$ - **Semicircle - Half of a circle.**

$\angle XOA$ - **Central Angle - Angle whose vertex is the center.**

Name each of the following in the figure below.



Circle

Circle O

2 Chords

$\overline{PN}$, $\overline{QP}$

1 Diameter

$\overline{QP}$

3 Radii

$\overline{OQ}$, $\overline{OP}$, $\overline{MO}$

Central Angles < 180°

$\angle QOM$, $\angle MOP$

Relationship Between Diameter and Circumference

- Two easiest things to measure on a circle.

Silver Dollar	diameter	Circumference	Ratio of C:d
	3.8 cm	12.0 cm	$\frac{12.0}{3.8} \approx 3.1578...$
Compact Disc 	12.0 cm	37.7 cm	$\frac{37.7}{12.0} \approx 3.1416...$
Table Top 	200 cm	628.3 cm	$\frac{628.3}{200} \approx 3.1415...$

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Table Top 	$\frac{628.3}{200} \approx 3.1415...$

Regardless of the size of the circle, the ratio of the circumference to the diameter remains constant.

$\frac{C}{d} \approx 3.141592...$

$\frac{C}{d} = \pi$

Circumference of a Circle

$(d)\frac{C}{d} = \pi(d)$

$C = \pi \bullet d$

Find the circumference of a circle with a diameter of 7 inches. Use $\pi \approx 3.14$.

$C = \pi \bullet d$

Actual $C = 7\pi$

$C \approx (3.14) \bullet 7$

Estimate $C \approx 21.98$ inches

Find the missing information. Use $\pi \approx 3.14$.

radius	diameter	Circumference
5 in.	d = 2r 10 in.	$C = \pi \bullet d$ $C \approx (3.14) \bullet 10$ $C \approx 31.4$ in.
4 m	8 m	$C = \pi \bullet d$ $C \approx (3.14) \bullet 8$ $C \approx 25.12$ m
$r \approx 10$ ft.	$\frac{62.8}{3.14} \approx d$ 20 ft. $\approx d$	$C = 62.8$ ft. $C = \pi \bullet d$ $\frac{62.8}{3.14} \approx \frac{3.14 \bullet d}{3.14}$

Lesson 9-2

Find the missing information. Use $\pi \approx \frac{22}{7}$.

radius	diameter	Circumference
7 mi.	$d = 2r$	$C = \pi \bullet d$
	14 mi.	$C \approx \frac{22}{7} \bullet \frac{14}{1}$ (÷7, 2)
		$C \approx 44$ mi.

$r \approx 3.5 \div 2$

$r \approx 1.75$ cm

$d \approx \frac{11}{1} \bullet \frac{7}{22}$ (÷11, 2)

$d \approx \frac{7}{2}$

$d \approx 3.5$ cm

$C = 11$ cm

$C = \pi \bullet d$

$11 \approx \frac{22}{7} \bullet d$

$\left(\frac{7}{22}\right)\frac{22}{7} \bullet d \approx 11\left(\frac{7}{22}\right)$

Area of a Circle

Area Formula

$A = \pi \bullet r^2$

Find the area of a circle with a radius of 6 inches. Use $\pi \approx 3.14$.

$A = \pi \bullet r^2$

$A = \pi \bullet 6^2$

$A \approx (3.14) \bullet 36$

$A \approx 113.04$ in^2

Area of a Circle

$C = \pi \bullet d$

$\pi \bullet r$

$\pi \bullet r$

$\pi \bullet r$

$\pi \bullet r$

$C = \pi \bullet d$

$\pi \bullet r$

$A = \pi \bullet r \bullet r$

$A = \pi r^2$

Find the area of the circles below. Use $\pi \approx 3.14$.

1) 7 in.

$A = \pi \bullet r^2$

$A = \pi \bullet (7)^2$

$A = \pi \bullet 49$

Actual $A = 49\pi$

$A \approx 49 \bullet (3.14)$

Estimate $A \approx 153.86$ in^2

2) 16 m

$A = \pi \bullet r^2$

$A = \pi \bullet (16)^2$

$A \approx 256\pi$

$A \approx (3.14) \bullet 256$

$A \approx 803.84$ m^2

Find the missing information. Use $\pi \approx 3.14$.

radius	diameter	Area
8 yds.	d = 16 yds.	$A = \pi \bullet r^2$
		$A \approx 3.14 \bullet (8)^2$
		$A \approx 3.14 \bullet 64$
		$A \approx 200.96$ yds^2

$r^2 \approx 25$

$r \approx 5$ cm

$d = 2r$

$d \approx 10$ cm

$A = 78.5$ cm^2

$A = \pi \bullet r^2$

$\frac{78.5}{3.14} \approx \frac{3.14 \bullet r^2}{3.14}$

$25 \approx r^2$

How far does a 20 inch diameter wheel travel after 10 revolutions?

1 Revolution $= \pi \bullet d$

10 Rev. $= 10 \bullet \pi \bullet d$

$\approx 10 \bullet 3.14 \bullet 20$

≈ 628 inches

Lesson 9-2

Area of a Regular Polygons

a = apothem

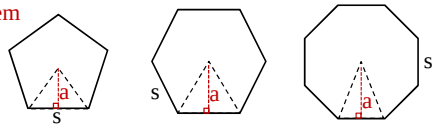
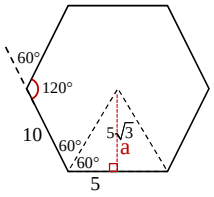


Figure:	Pentagon	Hexagon	Octagon
# sides:	5	6	8
Area:	$A = 5\left[\frac{1}{2}(b \cdot h)\right]$	$A = 6\left[\frac{1}{2}(b \cdot h)\right]$	$A = 8\left[\frac{1}{2}(b \cdot h)\right]$
	$A = 5\left[\frac{1}{2}(s \cdot a)\right]$	$A = 6\left[\frac{1}{2}(s \cdot a)\right]$	$A = 8\left[\frac{1}{2}(s \cdot a)\right]$

Area of Regular *n*-gon = $A = \frac{n}{2}(s \cdot a)$

Or since P = *n*s the area of a regular *n*-gon = $A = \frac{1}{2}(P \cdot a)$

Find the area of a regular hexagon with sides of 10 cm.



Exterior Angle $= \frac{360°}{n} = \frac{360°}{6} = 60°$

Interior Angle $= 120°$

$A = \frac{n}{2}(s \cdot a)$

$A = \frac{6}{2}(10 \cdot 5\sqrt{3})$

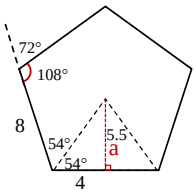
$A = 150\sqrt{3}$

$A = \frac{1}{2}(P \cdot a)$

$A = \frac{1}{2}(60 \cdot 5\sqrt{3})$

$A = 150\sqrt{3}$

Find the area of a regular pentagon with sides of 8 cm.



Exterior Angle $= \frac{360°}{n} = \frac{360°}{5} = 72°$

Interior Angle $= 108°$

$\tan 54° = \frac{a}{4}$

$a = 4 \tan 54°$

$a \approx 4(1.3764)$

$a \approx 5.5$

$A = \frac{1}{2}(P \cdot a)$

$A \approx \frac{1}{2}(40 \cdot 5.5)$

$A \approx 110 \text{ cm}^2$