Geometry: 11.1-11.4 Notes

NAME______________________

11.1 Circumference and Arc Length______________________________ **Date:**__________________

Define Vocabulary:

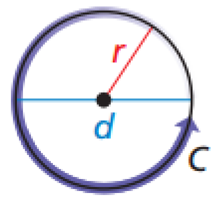
circumference –

arc length –

radian –

Circumference of a Circle

The circumference C of a circle is $C = \pi d$ or $C = 2\pi r$, where d is the diameter of the circle and r is the radius of the circle.



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

Examples: Using the Formula for Circumference

WE DO

Find each indicated measure.

a. circumference of a circle with a radius of 11 inches

b. radius of a circle with a circumference of 4 millimeters

YOU DO

1. Find the circumference of a circle with a diameter of 5 inches.

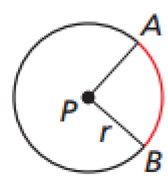
2. Find the diameter of a circle with a circumference of 17 feet.

Arc Length

In a circle, the ratio of the length of a given arc to the circumference is equal to the ratio of the measure of the arc to 360°.

$$\frac{\text{Arc length of } \widehat{AB}}{2\pi r} = \frac{m\widehat{AB}}{360^\circ}, \text{ or}$$

$$\text{Arc length of } \widehat{AB} = \frac{m\widehat{AB}}{360^\circ} \cdot 2\pi r$$

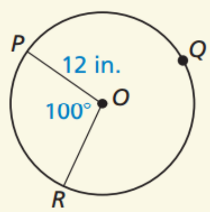


Examples: Using Arc Lengths to Find Measures

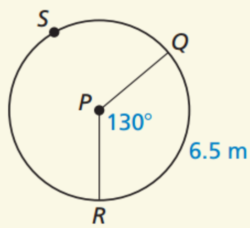
WE DO

Find each indicated measure.

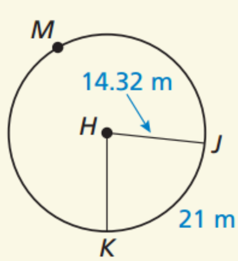
a. arc length of $\widehat{PR}$



b. circumference of $\odot P$



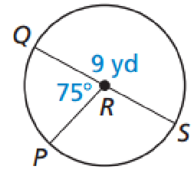
c. $m\widehat{JK}$



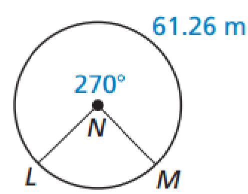
YOU DO

Find the indicated measure.

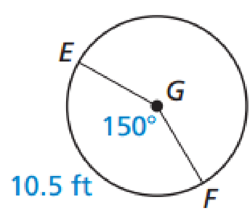
arc length of $\widehat{PQ}$



circumference of $\odot N$



radius of $\odot G$



Examples: Using Circumference to Find Distance Traveled

<u>WE DO</u>

The radius of a wheel on a toy truck is 4 inches. To the nearest foot, how far does the wheel travel when it makes 7 revolutions?

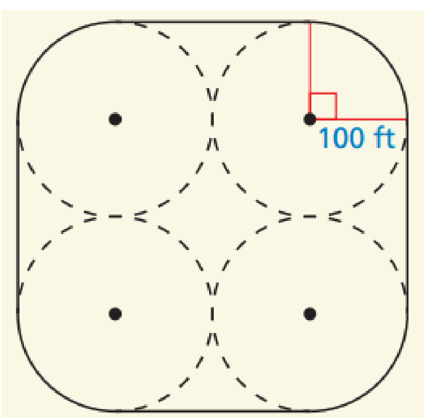
<u>YOU DO</u>

A car tire has a diameter of 28 inches. How many revolutions does the tire make while traveling 500 feet?

Examples: Using Arc Length to Find Distances

<u>WE DO</u>

A path is built around four congruent circular fields. The radius of each field is 100 feet. How long is the path? Round to the nearest hundred feet.



Converting between Degrees and Radians

Degrees to radians

Multiply degree measure by

$$\frac{2\pi \text{ radians}}{360^\circ}, \text{ or } \frac{\pi \text{ radians}}{180^\circ}.$$

Radians to degrees

Multiply radian measure by

$$\frac{360^\circ}{2\pi \text{ radians}}, \text{ or } \frac{180^\circ}{\pi \text{ radians}}.$$

Examples: Converting between Degree and Radian Measure

WE DO

a. Convert 30° to radians.

b. Convert $\frac{3\pi}{8}$ radians to degrees.

YOU DO

1. Convert 15° to radians.

2. Convert $\frac{4\pi}{3}$ radians to degrees.

Assignment	

11.2 Areas of Circles and Sectors______________ __________________________ Date:____________

Define Vocabulary:

population density –

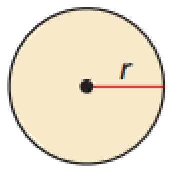
sector of a circle –

Area of a Circle

The area of a circle is

$$A = \pi r^2$$

where r is the radius of the circle.



WE DO

Find each indicated measure.

a. area of a circle with a radius of 8.5 inches

b. diameter of a circle with an area of 153.94 square feet

YOU DO

Find the indicated measure.

1. Find the area of a circle with a radius of 4.5 meters.

2. Find the radius of a circle with an area of 176.7 square feet.

Using the Formula for Population Density

The **population density** of a city, county, or state is a measure of how many people live within a given area.

$$\text{Population density} = \frac{\text{number of people}}{\text{area of land}}$$

Population density is usually given in terms of square miles but can be expressed using other units, such as city blocks.

Examples: Using the Formula for Population Density

WE DO

a. About 124,000 people live in a 2-mile radius of a city's post office. Find the population density in people per square mile.

b. A region with a 10-mile radius has a population density of about 869 people per square mile. Find the number of people who live in the region.

c. About 150,000 people live in a circular region with a population density of about 1578 people per square mile. Find the radius of the region.

YOU DO

1. About 58,000 people live in a region with a 2-mile radius. Find the population density in people per square mile.

2. A region with a 3-mile radius has a population density of about 1000 people per square mile. Find the number of people who live in the region.

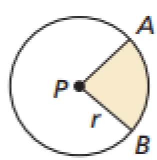
3. About 1.75 million people live in a circular region with a population density of about 5050 people per square mile. Find the radius of the region

Area of a Sector

The ratio of the area of a sector of a circle to the area of the whole circle (πr^2) is equal to the ratio of the measure of the intercepted arc to 360°.

$$\frac{\text{Area of sector } APB}{\pi r^2} = \frac{m\widehat{AB}}{360°}, \text{ or}$$

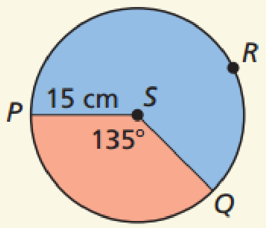
$$\text{Area of sector } APB = \frac{m\widehat{AB}}{360°} \cdot \pi r^2$$



Examples: Finding Areas of Sectors

<u>WE DO</u>

Find the areas of the sectors formed by $\angle PSQ$.

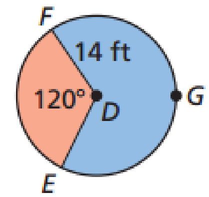


<u>YOU DO</u>

Find the indicated measure.

5. area of red sector

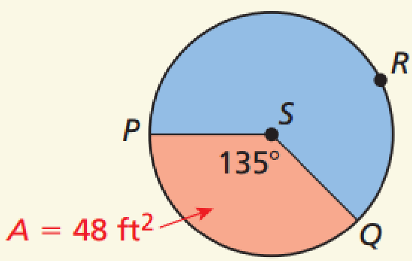
6. area of blue sector



Examples: Using the Area of a Sector

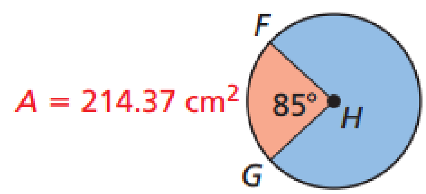
<u>WE DO</u>

Find the area of $\odot S$.



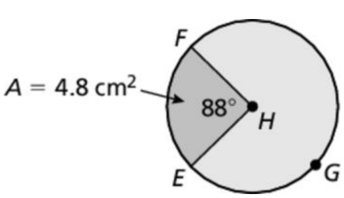
<u>YOU DO</u>

Find the area of $\odot H$.



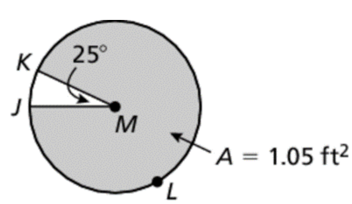
<u>WE DO</u>

Find the radius of circle *H*



<u>YOU DO</u>

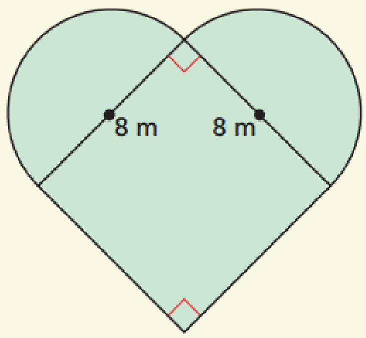
Find the radius of circle *M*



Examples: Finding the Area of a Region

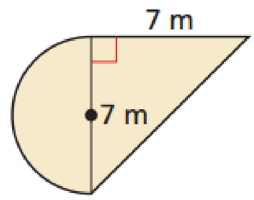
<u>WE DO</u>

A farmer has a field with the shape shown. Find the area of the shaded region to the nearest square meter.



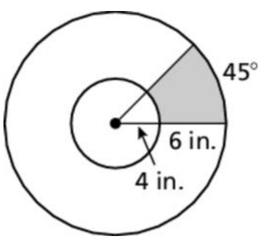
<u>YOU DO</u>

Find the area of the figure.



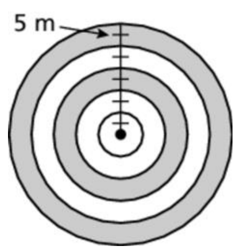
<u>WE DO</u>

Find the area of the shaded region



<u>YOU DO</u>

Find the area of the shaded region



Assignment	

11.3 Areas of Polygons____ **Date:**______________

Define Vocabulary:

center of a regular polygon –

radius of a regular polygon –

apothem of a regular polygon –

central angle of a regular polygon –

Area of a Rhombus or Kite

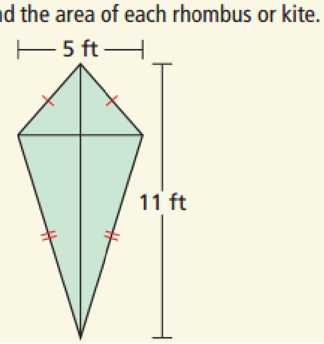
The area of a rhombus or kite with diagonals d_1 and d_2 is $\frac{1}{2}d_1d_2$.

Examples: Finding the Area of a Rhombus or Kite

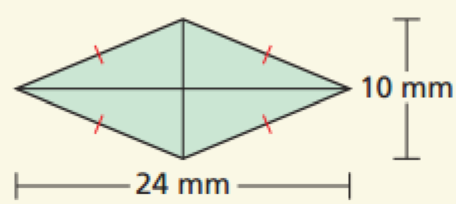
WE DO

Find the area of each rhombus or kite.

a.



b.



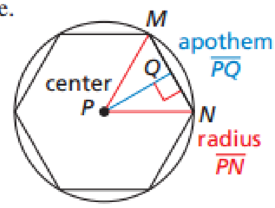
YOU DO

1. Find the area of a rhombus with diagonals d_1 = 4 feet and d_2 = 5 feet.

2. Find the area of a kite with diagonals d_1 = 12 inches and d_2 = 9 inches.

Finding Angle Measures in Regular Polygons

The diagram shows a regular polygon inscribed in a circle. The **center of a regular polygon** and the **radius of a regular polygon** are the center and the radius of its circumscribed circle.



$\angle MPN$ is a central angle.

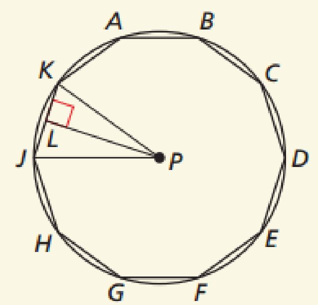
The distance from the center to any side of a regular polygon is called the **apothem of a regular polygon**. The apothem is the height to the base of an isosceles triangle that has two radii as legs. The word "apothem" refers to a segment as well as a length. For a given regular polygon, think of *an* apothem as a segment and *the* apothem as a length.

A **central angle of a regular polygon** is an angle formed by two radii drawn to consecutive vertices of the polygon. To find the measure of each central angle, divide 360° by the number of sides.

Examples: Finding Angle Measures in a Regular Polygon

WE DO

In the diagram, polygon *ABCDEFGHJK* is a regular decagon inscribed in ⊙*P*. Find each angle measure.



a. $m\angle KPJ$

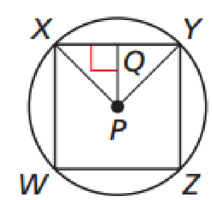
b. $m\angle LPK$

c. $m\angle LJP$

YOU DO

1. Identify the center, a radius, an apothem, and a central angle of the polygon.

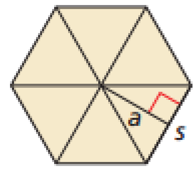
2. Find m∠XPY, m∠XPQ, and m∠PXQ.



Area of a Regular Polygon

The area of a regular n-gon with side length s is one-half the product of the apothem a and the perimeter P.

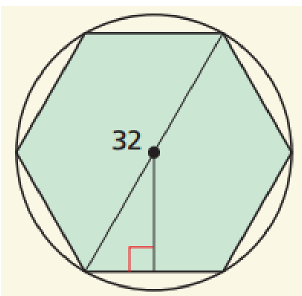
$$A = \frac{1}{2}aP, \text{ or } A = \frac{1}{2}a \cdot ns$$



Examples: Finding the Area of a Regular Polygon

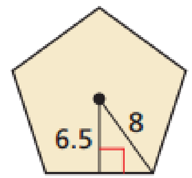
<u>WE DO</u>

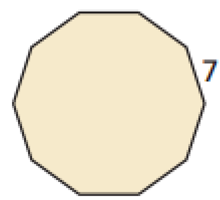
A regular hexagon is inscribed in a circle with a diameter of 32 units. Find the area of the hexagon.



<u>YOU DO</u>

Find the area of the regular polygon.

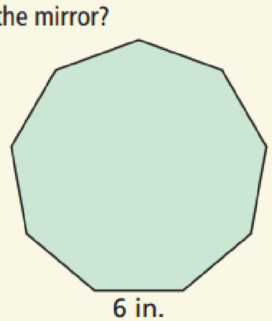




Examples: Finding the Area of a Regular Polygon

<u>WE DO</u>

A mirror is in the shape of a regular nonagon with 6-inch sides. What is the area of the mirror?



Assignment	

<u>11.4 Three-Dimensional Figures</u> **<u>Date:</u>**____________

Define Vocabulary:

polyhedron – A solid that is bounded by polygons

face – A flat surface of a polyhedron

edge – A line segment formed by the intersection of two faces of a polyhedron

vertex (of a polyhedron) – A point of a polyhedron where three or more edges meet

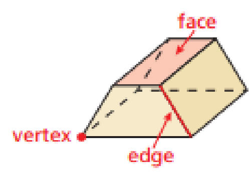
cross section – The intersection of a plane and a solid

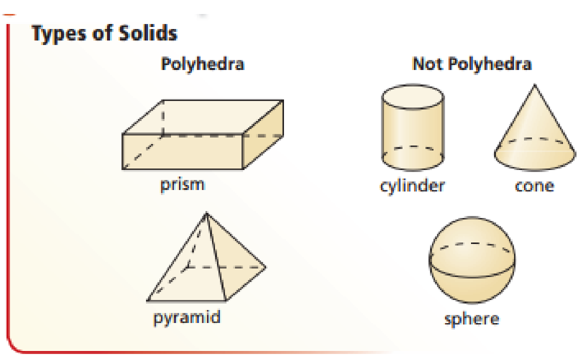
solid of revolution – A three dimensional figure that is formed by rotating a two dimensional shape around an axis

axis of revolution – The line around which a two dimensional shape is rotated to form a three-dimensional figure

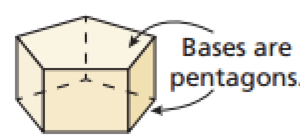
Classifying Solids

A three-dimensional figure, or solid, is bounded by flat or curved surfaces that enclose a single region of space. A **polyhedron** is a solid that is bounded by polygons, called **faces**. An **edge** of a polyhedron is a line segment formed by the intersection of two faces. A **vertex** of a polyhedron is a point where three or more edges meet. The plural of polyhedron is *polyhedra* or *polyhedrons*.

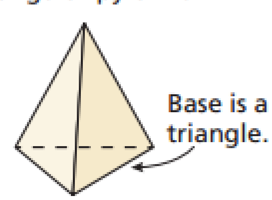




Pentagonal prism



Triangular pyramid

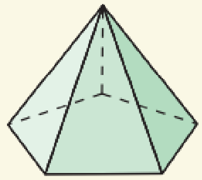


Examples: Classifying Solids

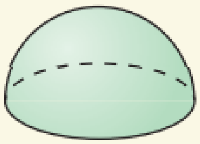
<u>**WE DO**</u>

Tell whether each solid is a polyhedron. If it is, name the polyhedron.

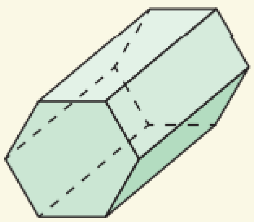
a.



b.



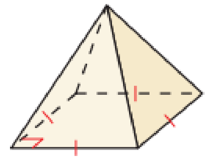
c.



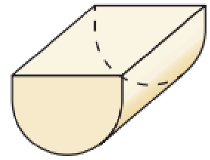
<u>**YOU DO**</u>

Tell whether each solid is a polyhedron. If it is, name the polyhedron

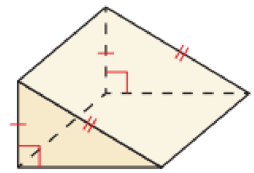
1.



2.

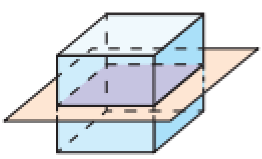


3.

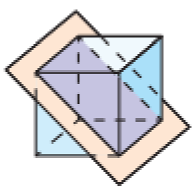


Describing Cross Sections

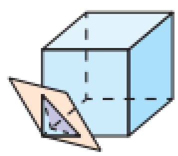
Imagine a plane slicing through a solid. The intersection of the plane and the solid is called a **cross section**. For example, three different cross sections of a cube are shown below.



square



rectangle



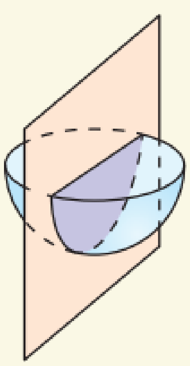
triangle

Examples: Describing Cross Sections

<u>**WE DO**</u>

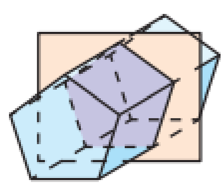
Describe the shape formed by the intersection of the plane and the solid.

a.



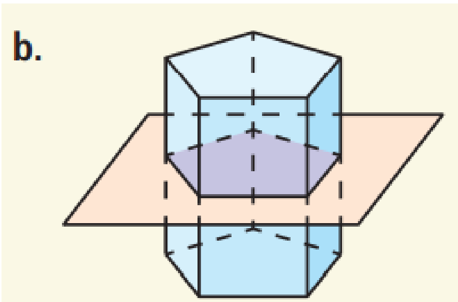
<u>**YOU DO**</u>

Describe the shape formed by the intersection of the plane and the solid.



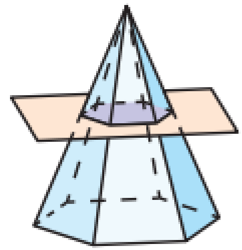
WE DO

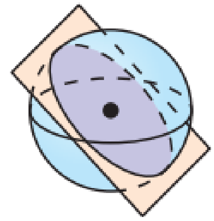
Describe the shape formed by the intersection of the plane and the solid.



YOU DO

Describe the shape formed by the intersection of the plane and the solid.

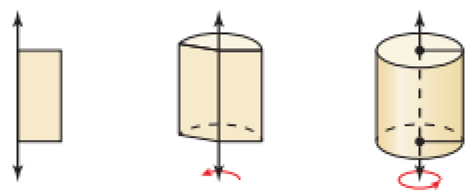




Sketching and Describing Solids of Revolution

A **solid of revolution** is a three-dimensional figure that is formed by rotating a two-dimensional shape around an axis. The line around which the shape is rotated is called the **axis of revolution**.

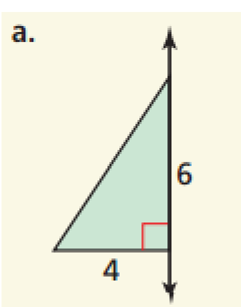
For example, when you rotate a rectangle around a line that contains one of its sides, the solid of revolution that is produced is a cylinder.



Examples: Describing Cross Sections

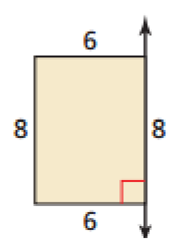
WE DO

Sketch the solid produced by rotating the figure around the given axis. Then identify and describe the solid.



YOU DO

Sketch the solid produced by rotating the figure around the given axis. Then identify and describe the solid.



Assignment	