Name: ________________________

Geometry

Mrs. Tilus

Unit 11: Measuring Length and Area

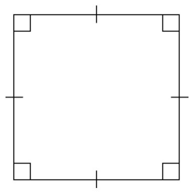
Priority Standard:

Unit 8 “I can” Statements:

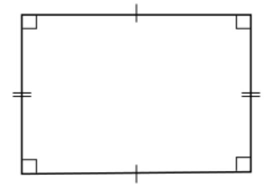
1. I can find the area of triangles
2. I can find the area of parallelograms
3. I can find the area of squares
4. I can find the area of rectangles
5. I can find the area of trapezoids
6. I can find the area of kites
7. I can find the circumference of circles
8. I can find the arc measure and arc lengths of circles
9. I can find the area of circles
10. I can find the area of a sector of a circle
11. I can find the area of any regular polygon
12. I can find geometric probability using lengths and areas.

Chapter 11.1: Areas of Triangles and Parallelograms

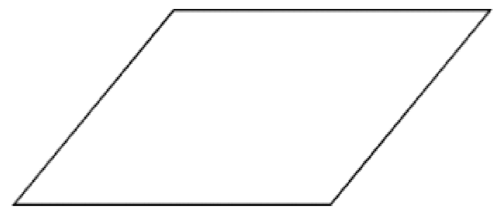
Area of a Square Postulate (Postulate 24):



Area of a Rectangle (Theorem 11.1):



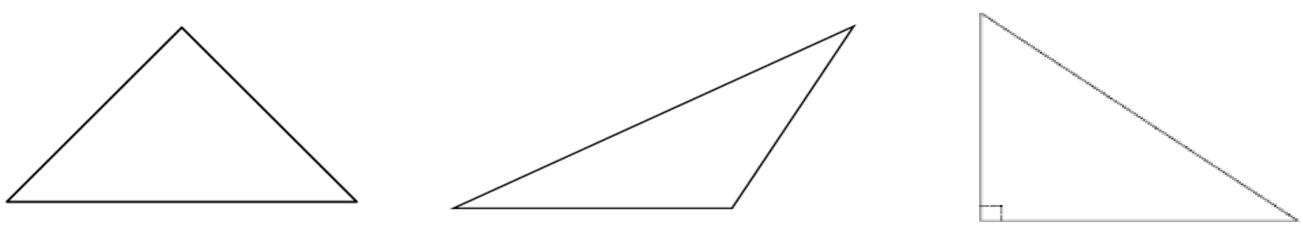
Area of a Parallelogram (Theorem 11.2):



Bases of a Parallelogram:

Height of a Parallelogram:

Area of a Triangle (Theorem 11.3):

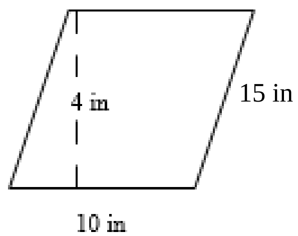


Area Congruence Postulate (Postulate 25):

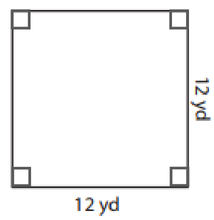
Area Addition Postulate (Postulate 26):

Example #1: Find the area and perimeter of the following figures.

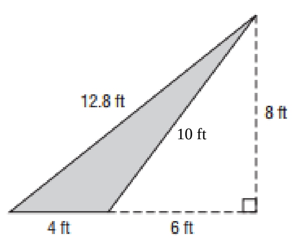
a.)



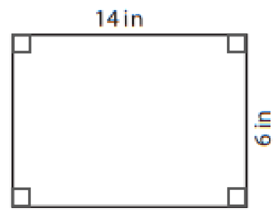
b.)



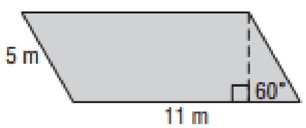
c.)



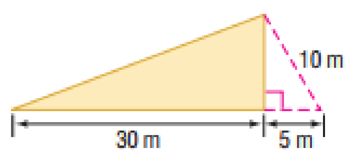
d.)



e.)

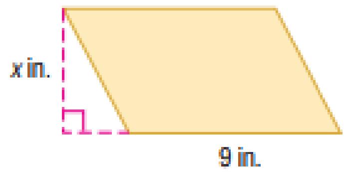


f.)

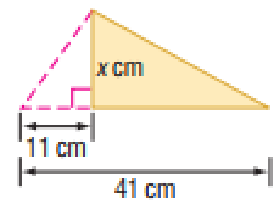


Example #2: Find x.

a.) $A = 153\ in^2$



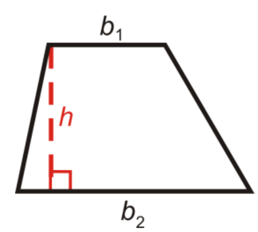
b.) $A = 165\ cm$



Example #3: The base of a triangle is four times its height. The area of the triangle is 50 square inches. Find the base and height.

Chapter 11.2: Areas of Trapezoids, Rhombuses and Kites

Area of a Trapezoid (Theorem 11.4):

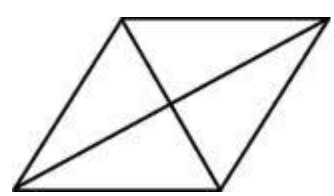


The area of a trapezoid is one half the product of the height and the sum of the lengths of the bases

* The height of a trapezoid is the perpendicular distance between its bases

Area =

Area of a Rhombus (Theorem 11.5):

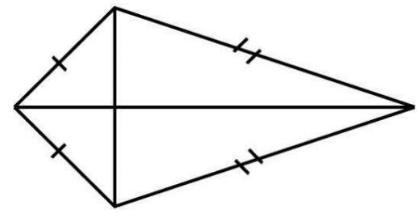


The area of a rhombus is one half the product of the lengths of its diagonals.

Area=

Area of a Kite (Theorem 11.6):

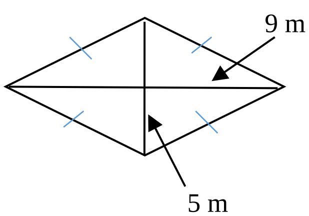
The area of a kite is one half the product of the lengths of its diagonals.



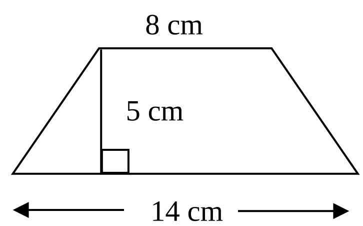
Area=

Example #1: Find the area of the figures.

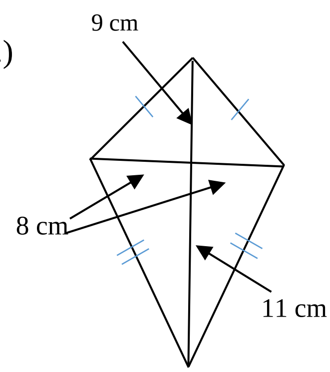
a.)



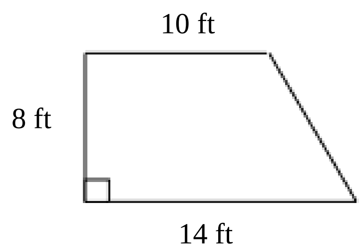
b.)



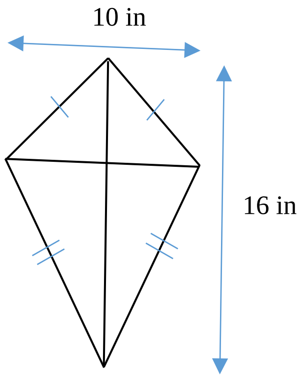
c.)



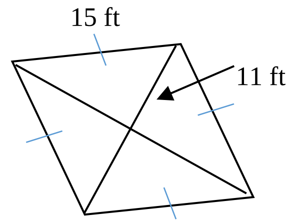
d.)



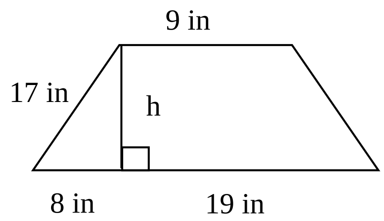
e.)



f.)

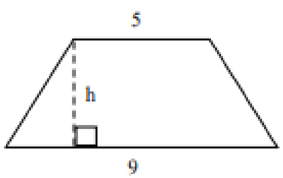


g.)

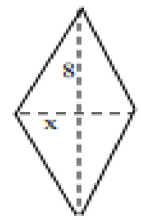


Example #2: Use the given information to find the missing value.

a.) Area $=42\ ft^2$

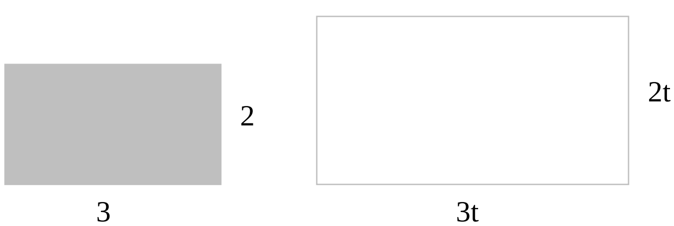


b.) Rhombus Area= $48cm^2$



Chapter 11.3: Perimeter and Area of Similar Figures

Back in Chapter 6 you learned that if two polygons are similar, then the ratio of their perimeters, or of any two corresponding lengths, is equal to the ratio of their corresponding side lengths. Areas, however, have a different ratio.



Ratio of Perimeters/corresponding sides

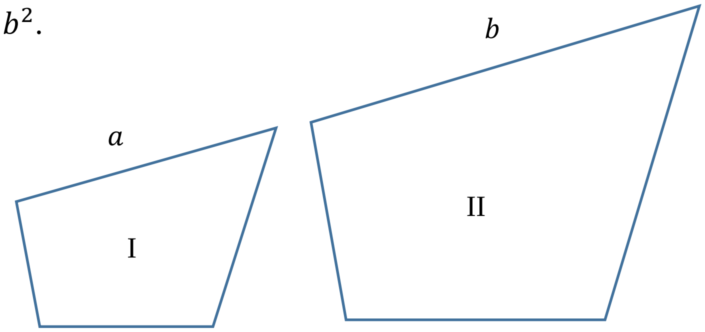
Ratio of Areas

Areas of Similar Polygons (Theorem 11.7):

If two polygons are similar with the lengths of corresponding sides in the ratio of $a:b$, then the ratio of their area is $a^2:b^2$.

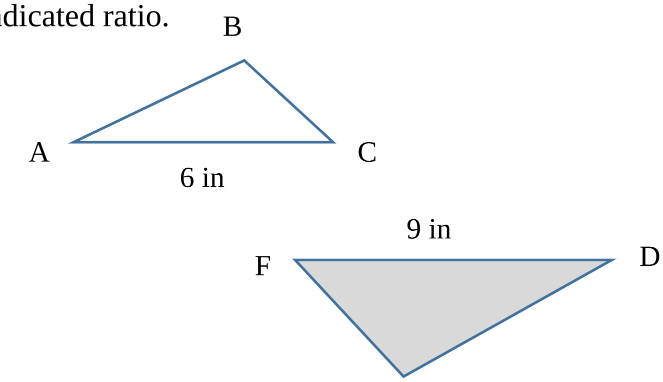
$$\frac{\text{Side length of Polygon 1}}{\text{Side length of Polygon II}} =$$

$$\frac{\text{Area of Polygon 1}}{\text{Area of Polygon II}} =$$



Example #1: In the diagram, $\triangle ABC \sim \triangle DEF$. Find the indicated ratio.

a.) Ratio (shaded to unshaded) of the perimeters



b.) Ratio (shaded to unshaded) of the areas.

Example #2: Fill-in the (simplified) ratios that missing in the chart.

Ratio of corresponding side lengths	Ratio of Perimeters	Ratio of Areas
5:8		
	4:7	
		169:36
66:18=		

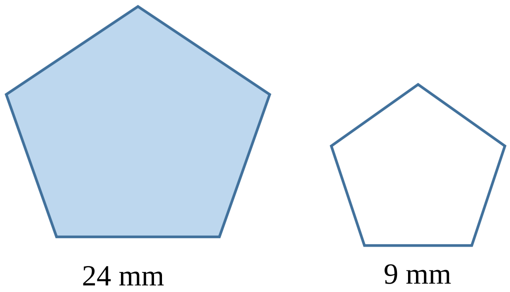
Example #3: The ratio of the areas of two similar figures is given. Write the ratio of the lengths of corresponding sides.

a.) Ratio of areas = 16:81

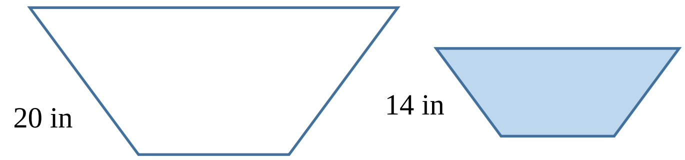
b.) Ratio of areas =144:49

Example #4: Corresponding lengths in similar figures are given. Find the ratios (shaded to unshaded) of the perimeters and areas. Find the unknown area.

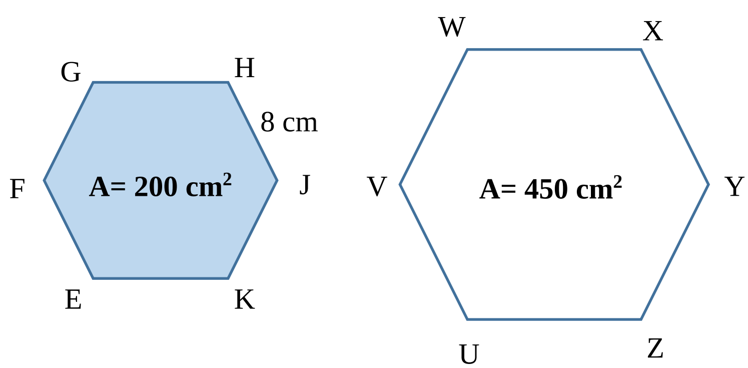
a) Shaded Area= 1024 mm^2



b.) Unshaded Area= 400 in^2



Example #5: If EFGHJK~UVWXYZ, then use the given area to find XY



Example #6: A large rectangular billboard is 12 feet high and 27 feet long. A smaller billboard is similar to the large billboard. The area of the smaller billboard is 144 square feet. Find the height of the smaller billboard.

Example #7: Rhombuses MNPQ and RSTU are similar. The area of RSTU is 28 square feet. The diagonals of MNPQ are 25 feet long and 14 feet long. Find the area of MNPQ. Then use the ratio of the areas to find the lengths of the diagonals of RSTU.

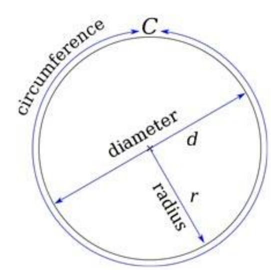
Chapter 11.4: Circumference and Arc Length

Circumference of a Circle (Theorem 11.8):

The circumference *C* of a circle is

Where *d* is the diameter of the circle and *r* is the radius of the circle

Exact Measure:

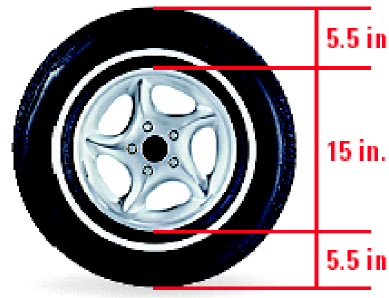


Example #1: Find the indicated measure.

a.) Circumference of a circle with radius 9 cm

b.) Radius of a circle with circumference 26 m

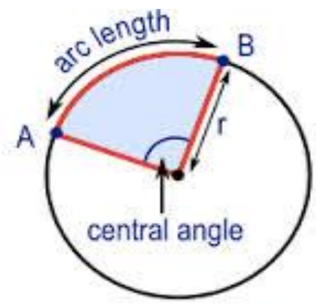
Example #2: The dimensions of a car tire is shown at the right
To the nearest foot, how far does the tire travel when it makes 15 revolutions?



Central Angle: A central angle of a circle is an angle whose vertex is the center of the circle.

Arc Length: is a portion of the circumference of circle.

- The measure of the arc is measured in degrees
- The measure of the length is measured in linear units



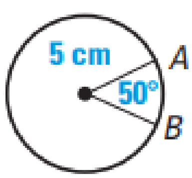
Arc Length Corollary

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°

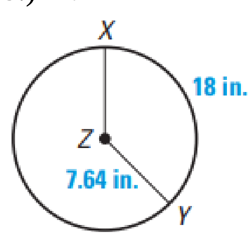
$$\frac{Arc\ Length\ of\ \widehat{AB}}{2\pi r} = \frac{m\widehat{AB}}{360°} \rightarrow$$

Example #3: Find the indicated measure.

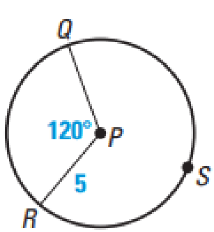
a.) Arc Length of $\widehat{AB}$



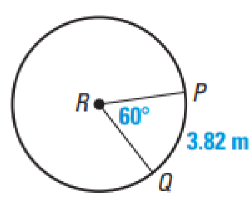
b.) $m\widehat{XY}$



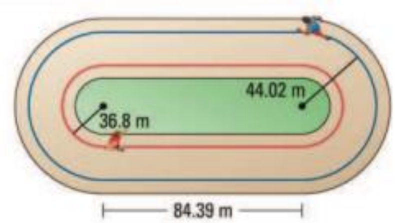
c.) Arc Length of $\widehat{QSR}$



d.) Circumference of $\odot R$



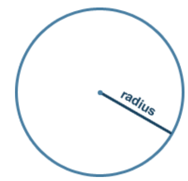
Example #4: The curves at the ends of the track show are 180° arc of circles. The radius of the arc for a runner on the inside path is 36.8 meters. About how far does this runner travel to go once around the track? Round to the nearest tenth of a meter.



Chapter 11.5: Areas of Circles and Sectors

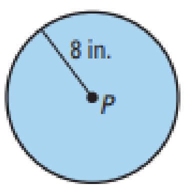
Area of a Circle (Theorem 11.9):

$A =$ ____________________

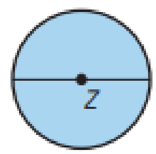


Example #1: Find the indicated measure

a.) Find the area of $\odot P$.



b.) Find the diameter of $\odot Z$ if the $A = 96cm^2$



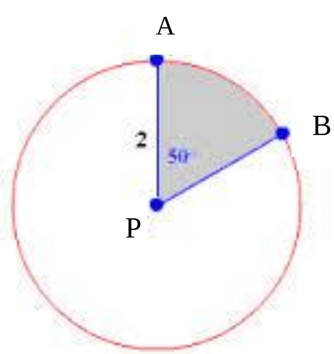
Sector of a Circle: is the region bounded by two radii of the circle and their intercepted arc.

In the diagram, sector APB is bounded by…___________________________________

Area of a Sector (Theorem 11.10):

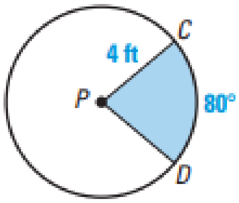
The ratio of the area of a sector of a circle to the area of the whole circle (πr^2) is equal to the ratio of the measure of the intercepted arc to 360°

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

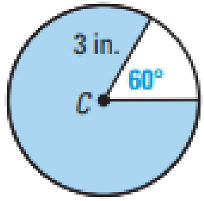


Example #2: Find the area of the shaded area shown.

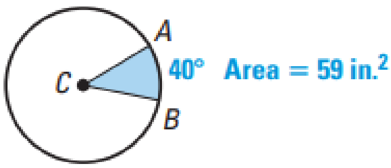
a.)



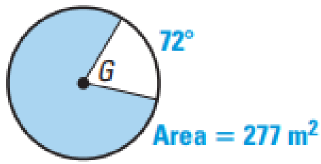
b.)



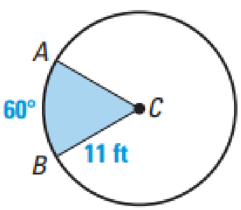
Example #3: Find the radius of $\odot C$.



Example #4: Find the diameter of $\odot G$.

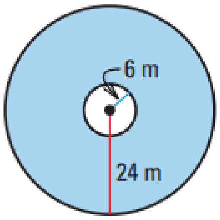


Example #5: Find the areas of the sectors formed by $\angle ACB$

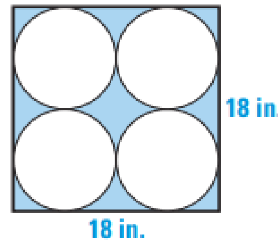


Example #6: Find the area of the shaded region.

a.)



b.)



Chapter 11.6: Areas of Regular Polygons

Center of a polygon: The center of a polygon is the center of its circumscribed circle.

Example:

Radius of a polygon: The radius of a polygon is the radius of its circumscribed circle.

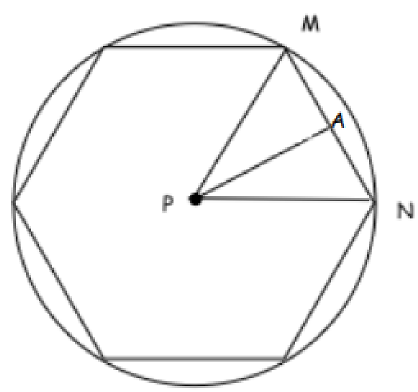
Example:

Apothem of a polygon: The distance from the center to any side of the polygon.

Example:

Central angle of a regular polygon: A central angle of a regular polygon is an angle formed by two radii drawn to consecutive vertices of the polygon.

Example:

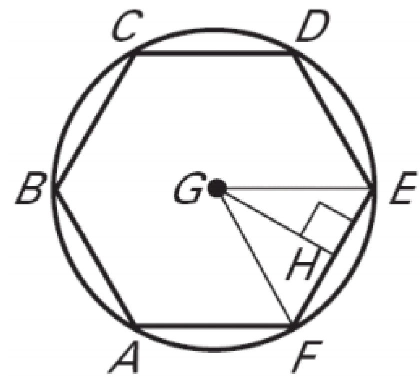


Identify $\triangle MPN$ by its sides.

How does the apothem relate to $\triangle MPN$?

$\angle MPA \cong$ and $\overline{MA} \cong$

Example #1: In the diagram, ABCDEF is a regular hexagon inscribed in $\odot G$. If DE= 8cm, find each of the following.



a.) $m\angle EGF =$

b.) $m\angle EGH =$

c.) $m\angle HEG =$

d.) FE =

e.) HE =

f.) GH =

g.) What is the perimeter of the hexagon?

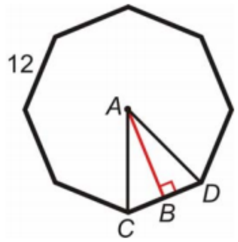
Example #2: Find the measure of a **central angle** of a regular polygon with the given number of sides.

a.) 9 sides

b.) 15 sides

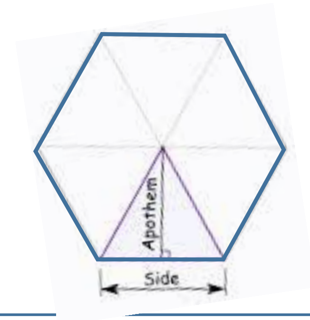
c.) 30 sides

Example #3: Find the length of the apothem in the regular octagon. Round your answer to the nearest hundredth.

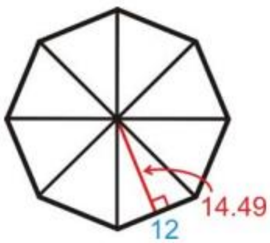


Area of a Regular Polygon **(Theorem 11.11):**

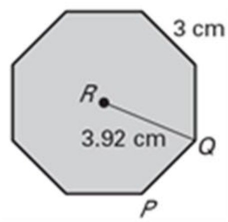
The <u>area</u> of a regular n-gon with <u>side length *s*</u> is half the product of the <u>apothem *a*</u> and the <u>perimeter *P*</u>



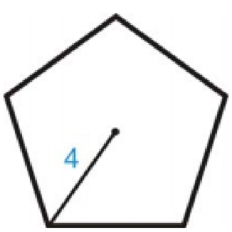
Example # 4: Find the area of the regular octagon. Round your answer to the nearest hundredth.



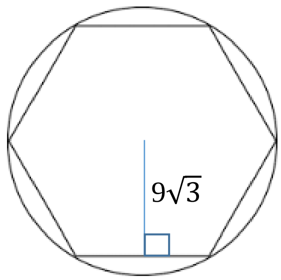
Example #5: A wooden coaster is a regular octagon with 3 cm sides and a radius of about 3.92 cm. What is the area of the coaster? Round your answer to the nearest hundredth.



Example #6: Find the area of the regular pentagon with radius 4. Round your answer to the nearest hundredth.



Example #7: Find the area of the inscribed hexagon. Round your answer to the nearest hundredth.



Finding Lengths in a Regular N-gon

To find the area of a regular n-gon with radius *r*, you may need to first find the apothem *a* or the side length *s.*

You can use…	…when you know *n* and…	Example(s) to Reference

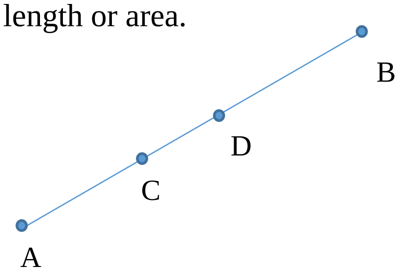
Chapter 11.7: Use Geometric Probability

Probability: the likelihood that an event will occur.

Probability = ______________________

$P = 0$ $P = 0.25$ $P = 0.50$ $P = 0.75$ $P = 1$

Geometric Probability: A ratio that involves a geometric measure such as length or area.

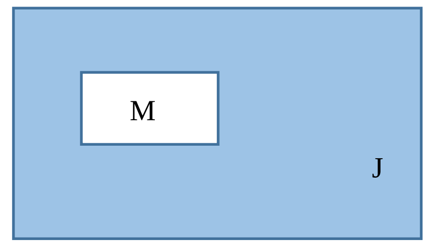


Probability and Length: Let $\overline{AB}$ be a segment that contains the segment $\overline{CD}$. If a point K on $\overline{AB}$ is chosen at random, then the probability that it is on $\overline{CD}$ is the ratio of the length of $\overline{CD}$ to the length of $\overline{AB}$.

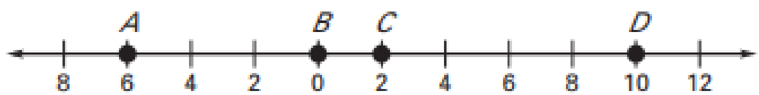
P(K is on $\overline{CD}$) = ____________________

Probability and Area: Let J be a region that contains region M. If a point K in J is chosen at random, then the probability that it is in region M is that ratio of the area of M to the area of J.

P(K is in region M) = ____________________

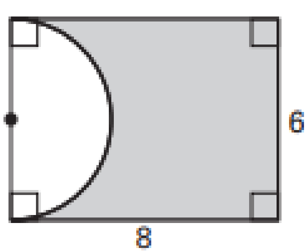


Example #1: Find the probability that a point chosen at random on $\overline{AD}$ is on the given line segment. Express your answer as a fraction, a decimal and a percent.



a.) $\overline{AB}$ b.) $\overline{BC}$ c.) $\overline{AC}$ d.) $\overline{BD}$

Example #2: Find the probability that a point chosen at random in the figure lies in the shaded region. Express you answer as a percent.



Example #3: A shuttle to town runs every 10 minutes. The ride from your boarding location to town takes 13 minutes. On afternoon, you arrive at the boarding location at 2:41 pm. You want to get to town by 2:57 pm. What is the probability you will get there by 2:57 pm?

What if you arrived at the pickup location at 2:38 pm?

Example #4: Find the probability that a point chosen at random in the figure lies in the shaded region. Express you answer as a percent.