Pre-AP Geometry

Unit 12: Area

Tentative Schedule

Day/Date:	Topic:	Assignments:
Tuesday, February 19	10-1: Area of Parallelograms & Triangles	CW: p. 2-3 **HW: Textbook p. 536 (1-9; 12-14; 19-27; 32-36)**
Wednesday, February 20	10-2: Area of Trapezoids, Rhombuses, & Kites	CW: p. 4-5 **HW: p. 6-7; Textbook p. 542 (8-18; 22-32; 35)**
Thursday, February 21	10-3; 10-5: Area of Regular Polygons & Trigonometry & Area	CW: p. 8-9 **HW: Textbook p. 548 (1-3, 10-18; 24-25; 29)**
Friday, February 22	**Quiz: Area of Parallelograms, Trapezoids, Rhombuses, & Kites; Retention Quiz**	CW: TBA **HW: TBA**
Monday, February 25	10-5: Continue Area Using Trig.; Heron's Formula & Circle Area	CW: p. 10-11 Textbook p. 561 (1-2, 4, 7, 8, 11-17, 25) **HW: p. 12-13**
Tuesday, February 26	Circles: Arc Length, Area of Sectors & Segments	CW: p. 14-15 **HW: Textbook p. 578 (22, 25-28, 30, 32, 35, 40)**
Wednesday, February 27	**Quiz: Area of Regular Polygons/Area w/ Trig.**	CW: TBA
Thursday, February 28	10-4: Perimeter & Area of Similar Figures	CW: p. 16 **HW: Textbook p. 555 (2, 3, 5-10, 13-16, 19-22, 28-32, 35-37)**
Friday, March 1	Geometric Probability & Composite Area	CW: p. 17-18 **HW: 19-20** **Textbook p. 584 (1-5, 15-20, 23-26)**
Monday, March 4	Review for Test	HW: p. 21-22
Tuesday, March 5	**Unit Test**	**HW: Complete Review (p. 21-22) if not already completed.**
Wednesday, March 6	EOC Review Day	
Thursday, March 7	**District Assessment**	**HW: Study for Unit Test**
Friday, March 8	Extension/Flex Day	CW: TBA

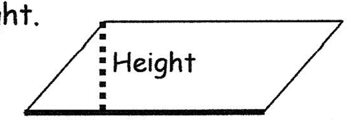
Study Guide 10-1 Areas of Parallelograms and Triangles

Area of a Rectangle is the product of its base and height.

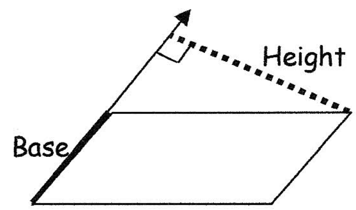
$A = bh$

Area of a Parallelogram is the product of a base and the corresponding height.

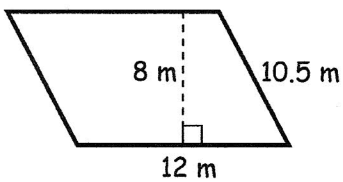
$A = bh$



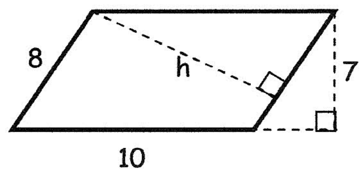
The **base** of a parallelogram is any of its sides. The corresponding altitude is a segment perpendicular to the line containing that base, drawn from the side opposite the base. The **height** is the length of an altitude.



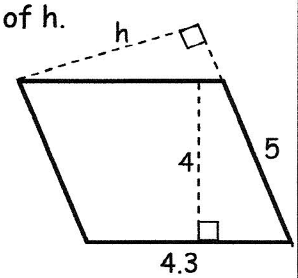
Example 1: Find the area of the parallelogram.



Example 2: Find the value of h.

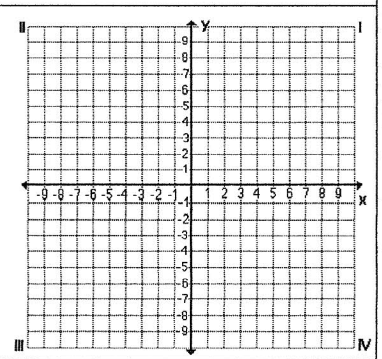


Example 3: Find the value of h.

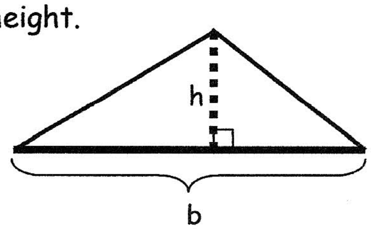


Example 4: A parallelogram has 9-in. and 18 in. sides. The height corresponding to the 9-in. base is 15 in. Find the height corresponding to the 18-in. base.

Example 5: What is the area of ▱ ABDC with vertices A(-4, -6), B(6, -6), C(-1, 5), and D(9, 5)

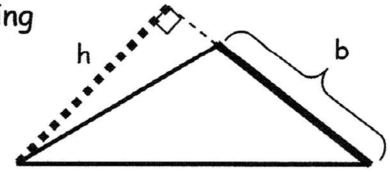


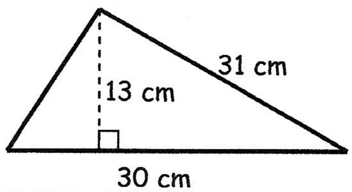
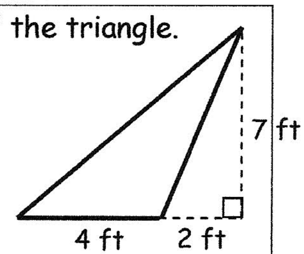
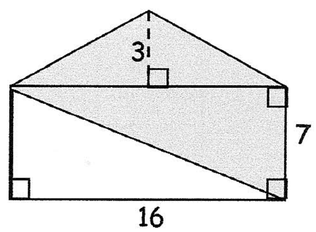
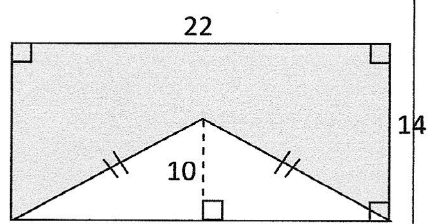
Area of a Triangle is half the product of a base and the corresponding height.



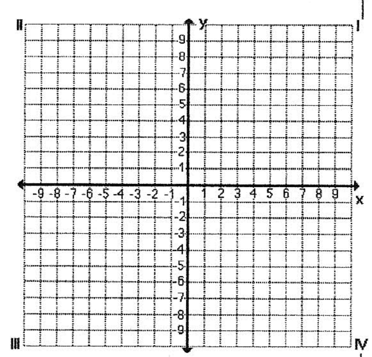
$$A = \frac{1}{2}bh$$

A **base** of a triangle is any of its sides. The corresponding **height** is the length of the altitude to the line containing that base.



Example 6: Find the area of the triangle. 	Example 7: Find the area of the triangle. 
Example 8: Find the area of the shaded region. 	Example 9: Find the area of the shaded region. 

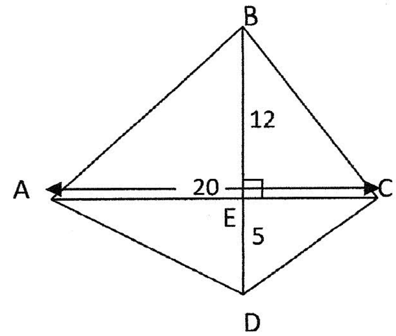
Example 10: Graph the lines and find the area of the triangle enclosed by the lines.
$y = 7$
$x = -3$
$y = 2x - 1$



Example 11: Find the area of an isosceles triangle whose legs are 13 cm each and whose base is 10 cm.

Area of Quadrilateral ABCD with Perpendicular Diagonals

Area of Quadrilateral ABCD = $\frac{1}{2}$(the product of the diagonals)



Area of a Quadrilateral with Perpendicular Diagonals = $\frac{1}{2}d_1d_2$

What special quadrilaterals have perpendicular diagonals?

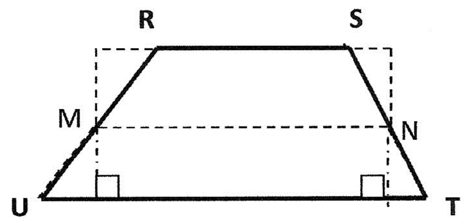
$Area_{rhombus} = \frac{1}{2}d_1d_2$	$Area_{kite} = \frac{1}{2}d_1d_2$	$Area_{square} = \frac{1}{2}d^2$ (Diagonals of a square are $\cong$)

Area of Trapezoid RSTU

$A_{trapezoid} = \frac{1}{2}(h)(b_1 + b_2)$ where h is height and b_1 and b_2 are the bases

or

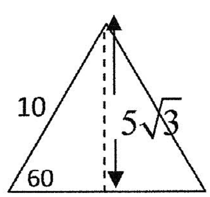
Construct $\overline{MN}$, the median of trapezoid RSTU.
Drop perpendiculars from M and N to base $\overline{UT}$.
Rotate the small triangles that are formed around the midpoints, M and N. A rectangle with length MN is formed.



$A_{trapezoid}$ = (median)(height)

Area of Equilateral Triangle

Equilateral triangle whose sides are 10 cm. each.

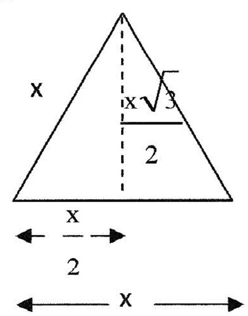


$A_{triangle} = \frac{1}{2}bh$

$= \frac{1}{2}(10)(5\sqrt{3})$

$= 25\sqrt{3}$

In general,



$A_{triangle} = \frac{1}{2}bh$

$= \frac{1}{2}(x)(\frac{x\sqrt{3}}{2})$

$= \frac{x^2\sqrt{3}}{4}$

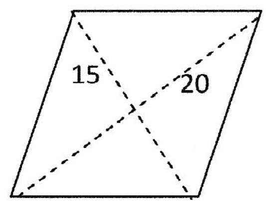
$A_{equilateral\ \Delta} = \frac{x^2\sqrt{3}}{4}$ where x is side of Δ

Example 1

Find the height of a trapezoid that has an area of 287 square inches and bases of 38 inches and 44 inches. $A_{trapezoid} = \frac{1}{2}h(b_1 + b_2)$

Example 2

Sonja wants to place a decorative brick edging around a flower garden that is in the shape of a rhombus. One diagonal is 30 feet long, and the area is 600 square feet. How many bricks must she purchase if each brick is one foot long?



Example 3

Find the area of an equilateral triangle with perimeter 60 cm.

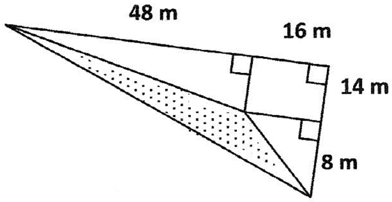
Geometry
Worksheet - 10.1-10.2

Name________________________________
Date____________________ Period________

1. The area of a trapezoid is 80 square units. If its height is 8 units, find the length of its median.

2. A rhombus has an angle measure of 120, and its shorter diagonal has a length of 10 inches. Find the area of the rhombus.

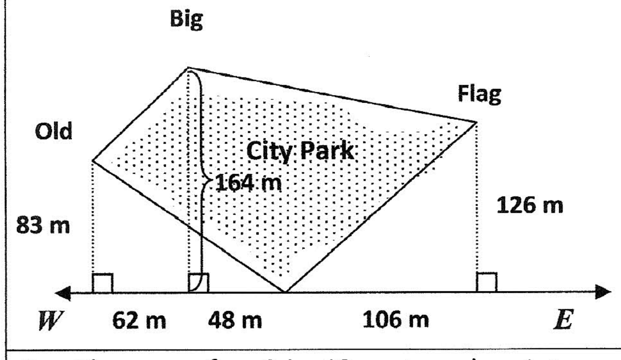
3. A developer wanted to blacktop the shaded portion of this corner building site. How much will it cost if blacktopping costs $5 per square meter?



4. The area of an isosceles trapezoid is 76 square inches, the height is 4 inches, and the congruent sides of the trapezoid are 5 inches long. Find the lengths of the bases.

5. Suppose the perimeter of rhombus ABCD is 20 and AC = 8. Find the area of the rhombus.

6. A city planner measured the distances shown from the old oak, the big rock, and the flag to the east-west line. Other distances along the line are shown. What is the area of the city park?

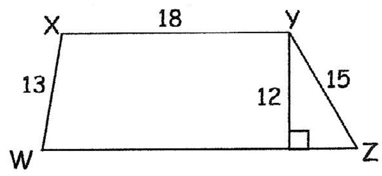


7. The area of an 8 by 10 rectangular picture and its white border of uniform width is 120 u^2. How wide is the border?

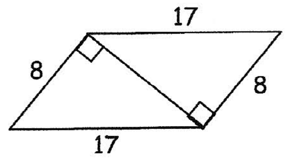
8. The shorter diagonal of a rhombus has the same length as a side. Find the area if the longer diagonal is 12 cm. long.

9. Find the area of an isosceles triangle with base angles each measuring 30° and the legs measuring 10 cm. each.

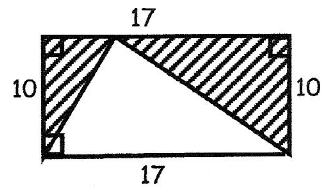
10. Find the area of trapezoid WXYZ.



11. Find the total area of the parallelogram.

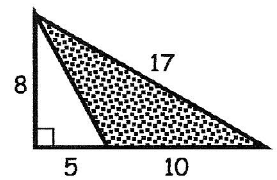


12. Find the area of the shaded region.

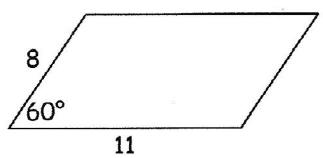


13. A walk 3 feet wide surrounds a rectangular grass plot 30 feet long and 18 feet wide. Find the area of the walk.

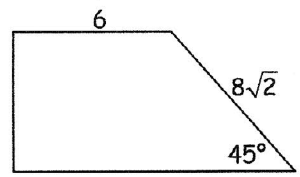
14. Find the area of the shaded region.



15. Find the area of the parallelogram.

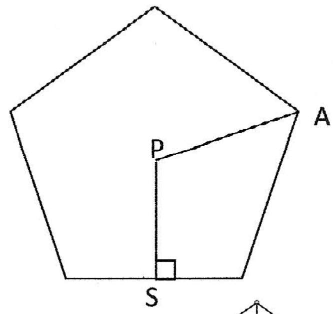


16. Find the area of the trapezoid.

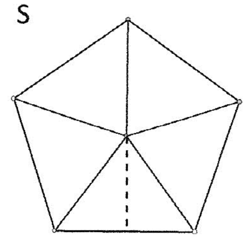


Notes for sections 10.3 and 10.5 – Area of Regular Polygons

In a regular polygon, a segment drawn from the center of the polygon perpendicular to a side of the polygon is called an apothem. In the figure at the right $\overline{PS}$ is an apothem. A segment drawn from the center of the polygon to a vertex is called a radius of the polygon. In the figure at the right, $\overline{PA}$ is a radius.



The area of a regular polygon can be found by dividing the polygon into congruent isosceles triangles. For example, the pentagon above can be divided into 5 triangles by drawing all five radii. If a regular polygon has n sides then it can be divided into n triangles.



Now find the area of one of the triangles (note: area of triangle = ½ bh). The height of the triangle will be the apothem. The base of the triangle is the length of one side, s, of the polygon. Therefore, area of the triangle = ½ sa.

Since there are n triangles, multiply the area of the triangle by n to get the area of the polygon.

Area of polygon = n[1/2s·a] or ½ n·s·a

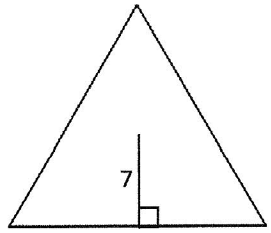
However, n·s is just the perimeter, P, of the polygon. Therefore, the area of a regular polygon with perimeter P and apothem a is

A = ½ Pa

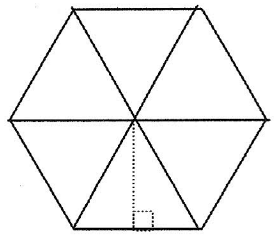
Ex. 1 Find the area of a regular pentagon with perimeter 54.49 m and an apothem of 7.5 m.	Ex. 2 Find the area of a regular hexagon with an apothem of $5\sqrt{3}$ cm and each side 10 cm.

Equilateral triangles are sometimes easier to work with $A = \dfrac{s^2\sqrt{3}}{4}$

Ex. 3 Find the apothem, area, and perimeter of the equilateral triangle below.

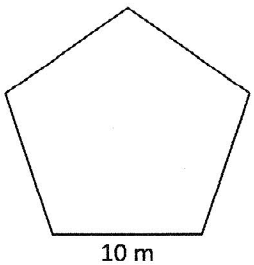


Ex. 4 Hexagons are made up of 6 congruent equilateral triangles so the area of a regular hexagon can be found using: $A = 6 \times \left(\dfrac{s^2\sqrt{3}}{4}\right)$. Find the apothem, perimeter, and area of a regular hexagon that has a side of 8 in.

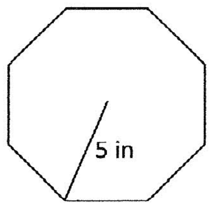


Find the apothem, perimeter, and area of each regular polygon. Round your answers to the nearest tenth.

Ex. 5



Ex. 6 radius = 5 in.



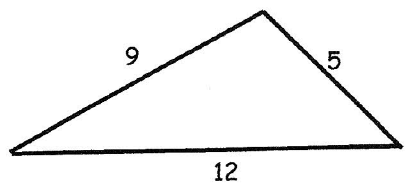
Notes – Use Heron's Formula to find the area of a triangle

If you know the lengths of the sides of a triangle, you can use Heron's formula to find the area.

The area, A, of a triangle with sides measuring a, b, and c is:

$$A = \sqrt{s(s-a)(s-b)(s-c)}\ , \quad \text{where } s = \frac{a+b+c}{2} \quad \text{(sometimes called the semi-perimeter)}$$

Example 1: Use Heron's formula to find the area of the triangle.



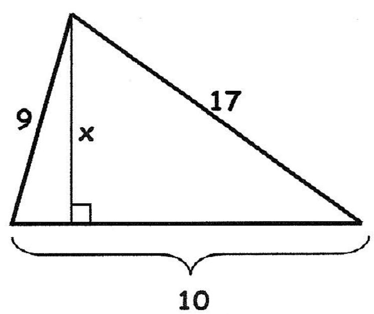
Example 2: Find the area of a triangle with sides a = 9, b = 11, and c = 13.

Can any three numbers be the sides of a triangle?

Practice problems:

1. Use Heron's formula to find the area of a triangle with sides 4, 6, and 8.

2. Find x:



Geometry Worksheet
Heron's Formula & Circle Areas

Name________________________________
Date______________________**Period**________

1. Given a triangle with sides 10, 12, and 14 inches long, find the length of the altitude upon the 12 inch side.

2. Find the area of a parallelogram with two adjacent sides 8 inches and 10 inches long and one diagonal 12 inches long.

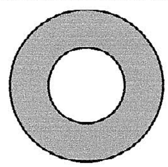
3. Find the area of quadrilateral RSTV if $m\angle R = 90$, RS = 12, ST = 8, TV = 7, and VR = 5

4. Given a triangle with sides 4, 6 and 8 inches long, find the length of the altitude upon the shortest side.

5. Find the area and circumference of a circle whose radius is 7.

6. Find the area and circumference of a circle whose diameter is 10.

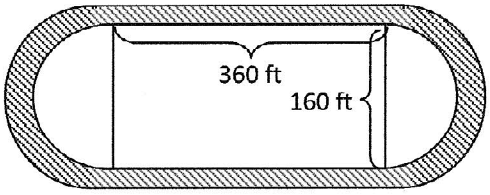
7. Find the area of the region bounded by two concentric circles with radii 10 inches and 6 inches.



8. The size of a bicycle is determined by the diameter of the wheel. If the bicycle is a 26" bike, and the wheel turns 10,000 revolutions, how far did the bicycle travel?

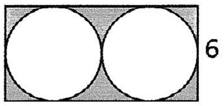
9. In order to travel a mile (5280 ft), how many revolutions would the wheel have to make?

10. A track is formed around a football field by adding a semicircle to each end. How far will an athlete run if he makes one lap around the track (running on the inside of the lane)?



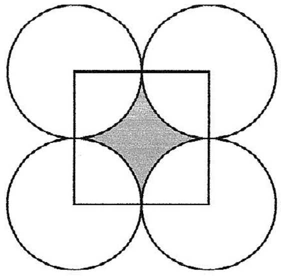
11. If the track lane is to be 4 feet wide, what will the area of the lane be?

12. The following circles are tangent to each other and to the sides of the rectangle. Find the area of the shaded region.



13. Find the perimeter of the shaded region.

14. The following four congruent are tangent and a square is created by joining the centers of the circles. (The side of the square has measure 14.) Find the area of the shaded region.



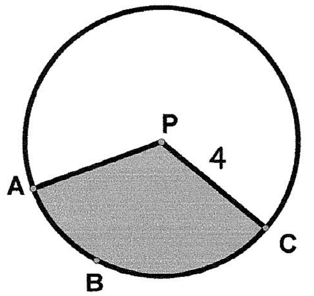
15. Find the perimeter of the shaded region.

Geometry Notes – Arc Length and Areas of Sectors and Segments of Circles

Arc length = $\frac{m}{360}C$ where m is the measure of the central angle and C is the circumference.

Area of sector = $\frac{m}{360}\pi r^2$ where m is the measure of the central angle and r is the radius of the circle.

Example 1: Given: $\odot P$ and $m\angle APC = 120°$



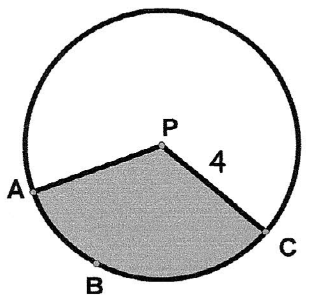
a. Find the length of $\overparen{ABC}$

Arc length = $\frac{120}{360}\pi(8)$

Arc length = $\frac{1}{3}(8\pi)$

$\boxed{\text{Arc length} = \frac{8\pi}{3} \text{ units}}$

Given: $\odot P$ and $m\angle APC = 120°$



b. Find the area of the shaded sector.

$A_{sector} = \frac{120}{360}\pi r^2$

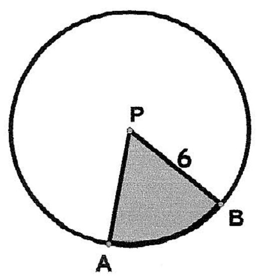
$A_{sector} = \frac{1}{3}\pi 4^2$

$\boxed{A_{sector} = \frac{16\pi}{3} \text{ units}^2}$

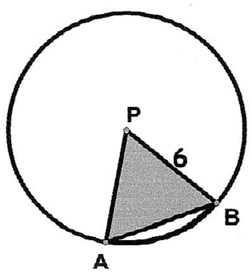
Example 2:

Note: Sector of Circle – Triangle = Segment of Circle

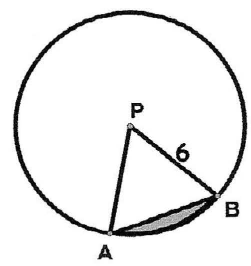
Given: $\odot P$ and $m\angle APB = 60°$



-



=



$$\frac{60}{360}\pi 6^2 - \frac{6^2\sqrt{3}}{4} = \boxed{6\pi - 9\sqrt{3} \text{ units}^2}$$

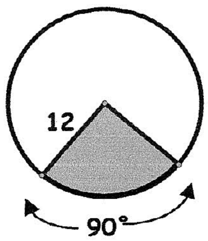
Geometry Worksheet
Arc Length, Sector Area, Segment Area

Name______________________________
Date____________________Period__________

Find the shaded area. On problems 1-3, find the arc length for the shaded sector also.

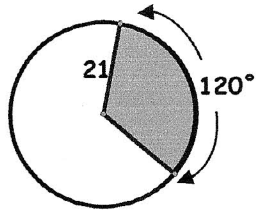
1. A_{sector} = ______________

Arc length = ___________



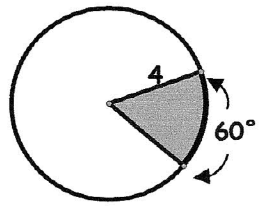
2. A_{sector} = ______________

Arc length = ___________

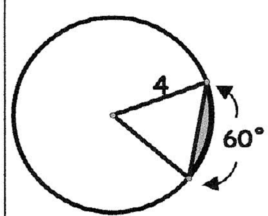


3. A_{sector} = ______________

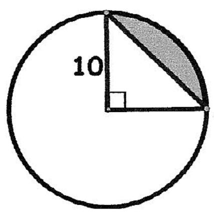
Arc length = ___________



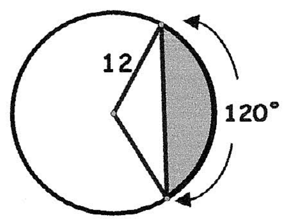
4. $A_{segment}$ = ______________



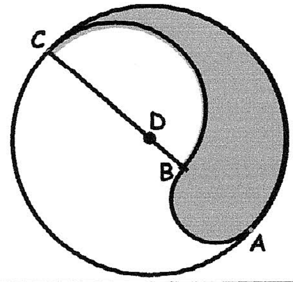
5. $A_{segment}$ = ______________



6. $A_{segment}$ = ______________



7. If BC = 2AB, what fraction of the circle is shaded? (Hint: Let the AB = 2x. D is the center of the big circle. AB is the diameter of a little circle and BC is the diameter of a medium circle. Find the areas in terms of x.)



8. Find the degree measure of the arc of a sector with area 36π if the area of the circle is 144π.

9. Two circles have radii 3 cm. and 5 cm. Find the ratio of their areas.

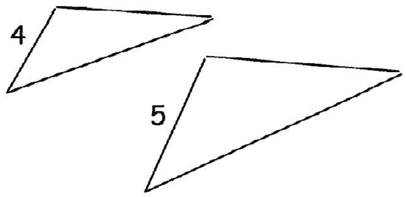
10. The areas of two circles are in the ratio 16 to 9. Find the ratio of their radii.

Study Guide - 10-4 Perimeters and Areas of Similar Figures

If the similarity ratio of two similar figures is $\frac{a}{b}$, then

(1) the ratio of their perimeters is $\frac{a}{b}$ and

(2) the ratio of their areas is $\frac{a^2}{b^2}$.



Example 1: The triangles at the right are similar.

(a) Find the ratio (larger to smaller) of the perimeters.

(b) If the perimeter of the smaller triangle is 18 cm, find the perimeter of the larger triangle.

(c) Find the ratio (larger to smaller) of the areas.

(d) If the area of the larger triangle is 410 cm^2, find the area of the smaller triangle.

Example 2: The ratio of the lengths of the corresponding sides of two regular octagons is $\frac{8}{3}$. The area of the larger octagon is 320 ft^2. Find the area of the smaller octagon.

Example 3: Benita plants the same crop in two rectangular fields, each with side lengths in a ratio of 2:3. Each dimension of the larger field is $3\frac{1}{2}$ times the dimension of the smaller field. Seeding the smaller field costs $8. How much money does seeding the larger field cost?

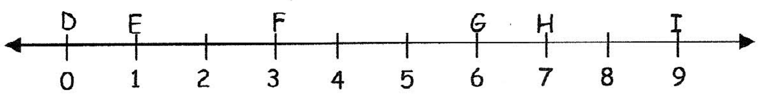
Example 4: The areas of two similar polygons are 32 $in.^2$ and 72 $in.^2$ If the perimeter of the smaller polygon is 15 in, find the perimeter of the larger polygon.

Notes - 10.8 - Geometric Probability

Length Probability Postulate:

If a point on $\overline{AB}$ is chosen at random and C is between A and B, then the probability that the point is on $\overline{AC}$ is:

$$\frac{\text{length}\,\overline{AC}}{\text{length}\,\overline{AB}}$$

Ex. 

What is the probability a point chosen at random on $\overline{DI}$ is also a part of:

(a) $\overline{EF}$

(b) $\overline{FI}$

Area Probability Postulate

If a point in region A is chosen at random, then the probability that the point is in region B, which is in the interior of region A, is:

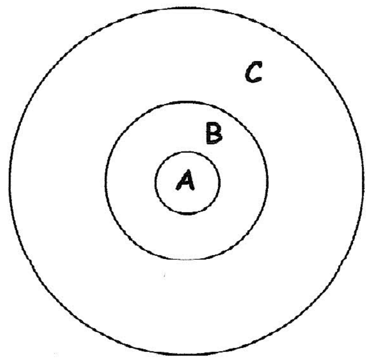
$$\frac{\text{area of region } B}{\text{area of region } A}$$

Ex. Joanna designed a new dart game. A dart in section A earns 10 points; a dart in section B earns 5 points; a dart in section C earns 2 points. Find the probability of earning each score.

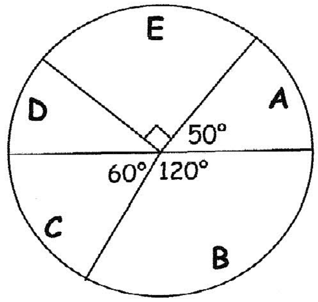
radius of circle A = 2 in.

radius of circle B = 5 in.

radius of circle C = 10 in.



Ex. Find the probability that a point chosen at random in this circle will be in the given section.



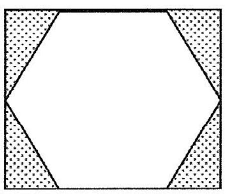
(a) A

(b) C

(c) D

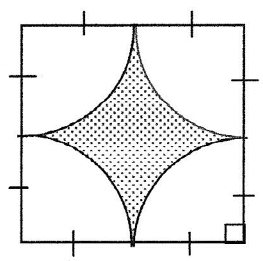
Ex. Find the probability that a point chosen at random in each figure lies in the shaded region. Round your answer to the nearest hundredth.

(a)



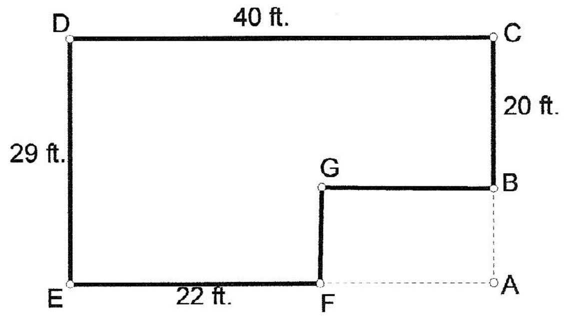
Regular hexagon (sides = 12 cm) inside a rectangle

(b)

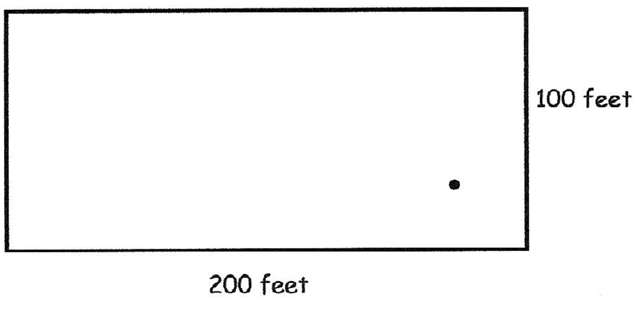


Shaded Areas

1. Dog Leash Problem - The garage at Juan's house is outlined by polygon BCDEFG, and the adjacent yard is fenced along segments AB and AF. Juan tied his dog Ginger at point H which is 12 ft. from point B on segment GB. The leash on his dog is 15 ft. There is a small door for Ginger to go inside the garage at point G. Ginger has also dug a hole to get under the fence at point B.
Shade and find the total area which Ginger can reach. Show your work to explain your reasoning.

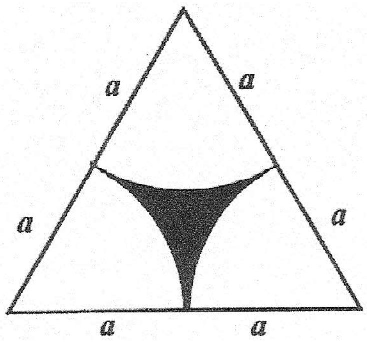


2. A farmer has a rectangular piece of property that is 100 feet by 200 feet. The farmer owns a goat but he doesn't want the goat getting into the vegetable garden so the goat is tethered (tied) to a stake in the ground using a 30 foot rope. The stake is 18 feet from the fence on the south side of the property and 15 feet from the east side of the property. How many square feet (round to the nearest square foot) of grass can the goat reach?

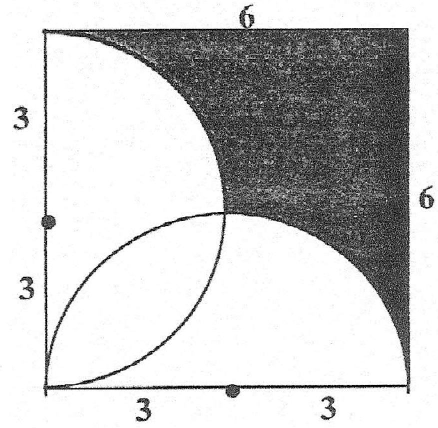


Find the area of the shaded portion in each figure. The "dots" are centers of circles.

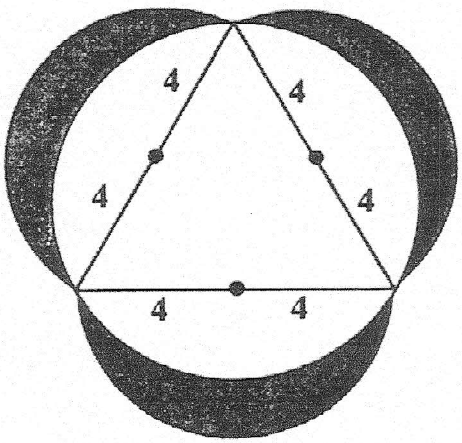
3.



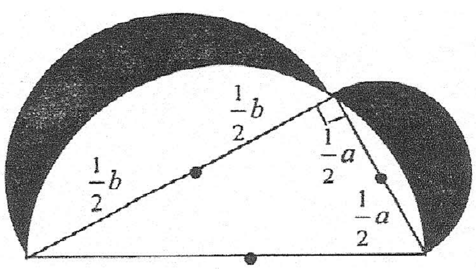
4.



5.



6.



GT/Honors Geometry

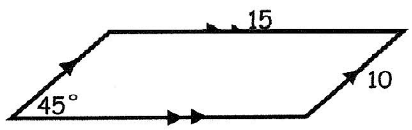
Chapter 10 Review – Area

Name______________________________

Date____________________Period________

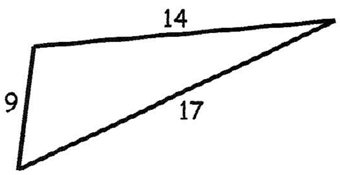
For the following problems, find the area of the entire figure if nothing is shaded, or find the area of the shaded region if there is one. All answers should be exact unless you are asked to round.

1. A=______________

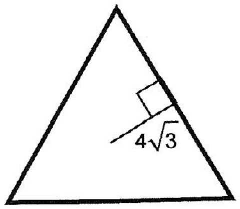


2. A=____________ The area of a circle is 24π cm^2. Find the circumference of this circle.

3. A=__________________

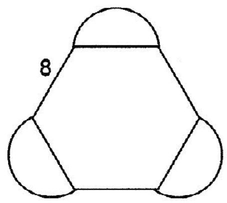


4. A=________________ Equilateral Triangle

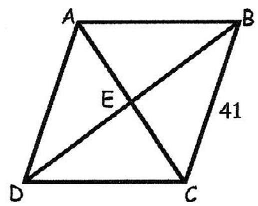


5. A=__________________; p = ________________

Regular hexagon with semicircles attached



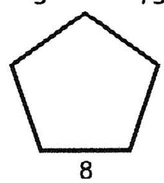
6. A=__________ ABCD is a rhombus with AC=18



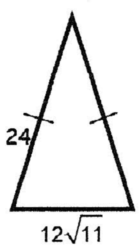
7. A=____________ Find the area of a regular nonagon with sides of length 12 cm. Round to the nearest tenth.

8. A=____________

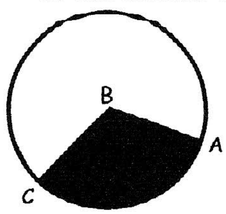
Regular Polygon, round to the nearest tenth.



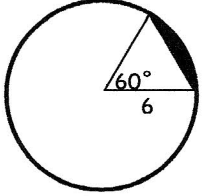
9. A=______________



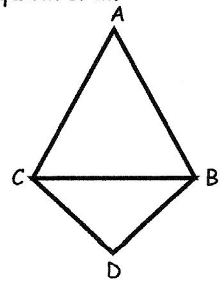
10. Given: $m\angle ABC=100°$, CB = 15; A=____________;
arc length = ____________; probability of landing in the shaded area (exact) = ____________



11. A=__________ P = ________ probability of landing in the shaded area (nearest hundredth) = __________



12. A=____________ ΔABC is equilateral. BD=DC=10. $m\angle DCB = 30°$.

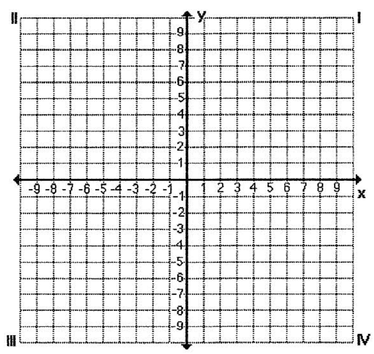


13. Find the area of an isosceles trapezoid that has bases 8 cm. and 18 cm. and that has legs that are 13 cm. long.

14. Find the area of ΔMNP if m = 14, p = 16, and $m\angle MNP = 63°$. Round your answer to the nearest tenth.

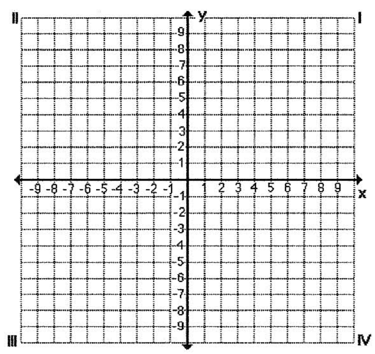
15. Find the area of the triangle bounded by

x = -2, y = 4 and y = 3x – 2.



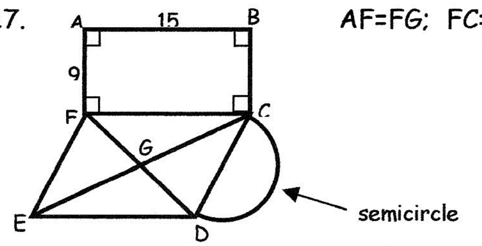
A=____________

16. Find the area of the quadrilateral ABCD with coordinates A(-1,5), B(6,4), C(2,-2), D(-5,2).



A=____________

17. AF=FG; FC=ED=FE=CD.



A=______________

P = ______________

18. Joey has his dog on a leash tied to the corner of the garage. The garage is 20 feet by 30 feet. If the leash is 24 feet long, how much area can the dog access?