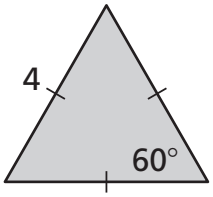
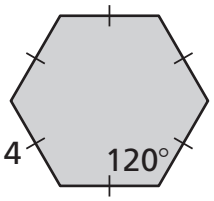
11.3 Start Thinking

Consider the regular polygon shown in the diagram. Discuss how you could determine the area of the polygon.

1. Triangle



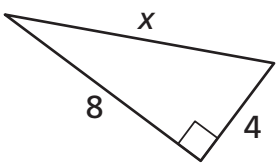
2. Hexagon



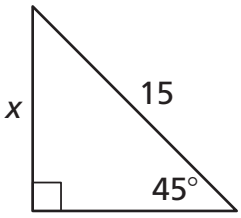
11.3 Warm Up

Find the value of *x* in the right triangle.

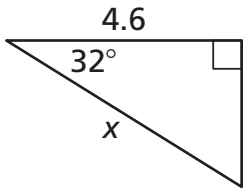
1.



2.



3.



11.3 Cumulative Review Warm Up

Determine if the statement is always true, sometimes true, or never true.

1. Isosceles triangles are similar.

2. The sum of the lengths of two sides of a triangle is greater than the length of the third side.

3. A square is a rhombus.

4. Opposites sides of a kite are parallel.

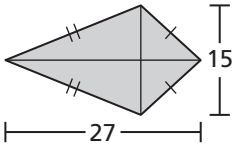
5. The diagonals of a parallelogram bisect each other.

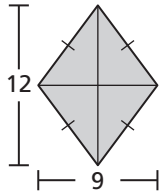
6. An equilateral polygon is regular.

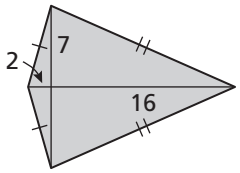
Name_____ Date _____

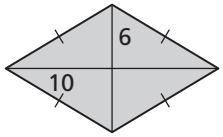
11.3 Practice A

In Exercises 1–4, find the area of the kite or rhombus.

1. 

2. 

3. 

4. 

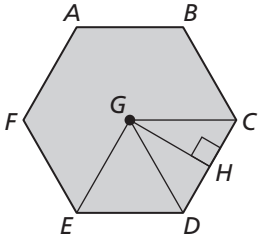
In Exercises 5–8, find the measure of a central angle of a regular polygon with the given number of sides. Round answers to the nearest tenth of a degree, if necessary.

5. 9 sides **6.** 16 sides **7.** 20 sides **8.** 28 sides

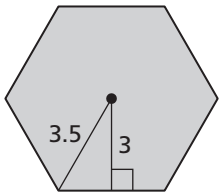
In Exercises 9–12, find the given angle measure for regular hexagon *ABCDEF*.

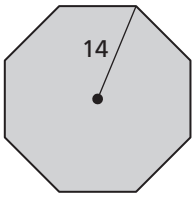
9. $m\angle CGD$ **10.** $m\angle CGH$

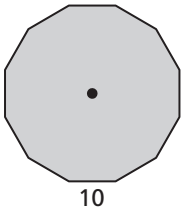
11. $m\angle HCG$ **12.** $m\angle EGC$



In Exercises 13–17, find the area of the regular polygon.

13. 

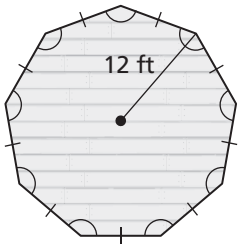
14. 

15. 

16. a pentagon with an apothem of 7 centimeters

17. a decagon with a radius of 20 meters

18. Use the figure of the gazebo floor.



a. An arm rail is built around the perimeter of the gazebo. What is the length of the arm rail?

b. A container of wood sealer covers 200 square feet. How many containers of sealer do you need to cover the entire floor of the gazebo? Explain your reasoning.

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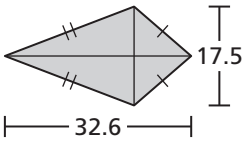
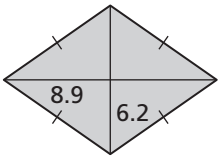
11.3 Practice B

In Exercises 1–4, find the area of the kite or rhombus.

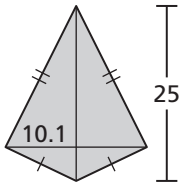
1.



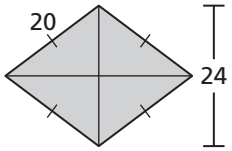
2.



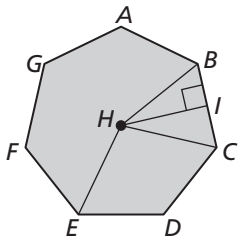
3.



4.



In Exercises 5–8, find the given angle measure for regular heptagon *ABCDEFG*. Round your answer to the nearest tenth of a degree, if necessary.



5. $m\angle BHC$

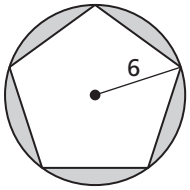
6. $m\angle BHI$

7. $m\angle IBH$

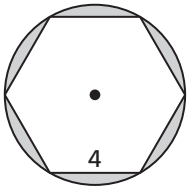
8. $m\angle EHB$

In Exercises 9–11, find the area of the shaded region.

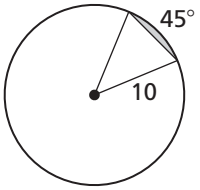
9.



10.



11.



12. The area of a kite is 384 square feet. One diagonal is three times as long as the other diagonal. Find the length of each diagonal.

13. The area of a rhombus is 484 square millimeters. One diagonal is one-half as long as the other diagonal. Find the length of each diagonal.

14. You are laying concrete around a gazebo that is a regular octagon with a radius of 8 feet. The concrete will form a circle that extends 15 feet from the vertices of the octagon.

a. Sketch a diagram that represents this situation.

b. What is the area of the concrete to the nearest square foot?

15. The perimeter of a regular 11-gon is 16.5 meters. Is this enough information to find the area? If so, find the area and explain your reasoning. If not, explain why not.

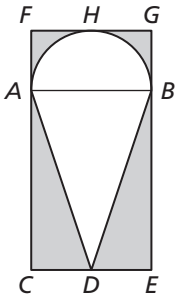
Name_____ Date _____

11.3 Enrichment and Extension

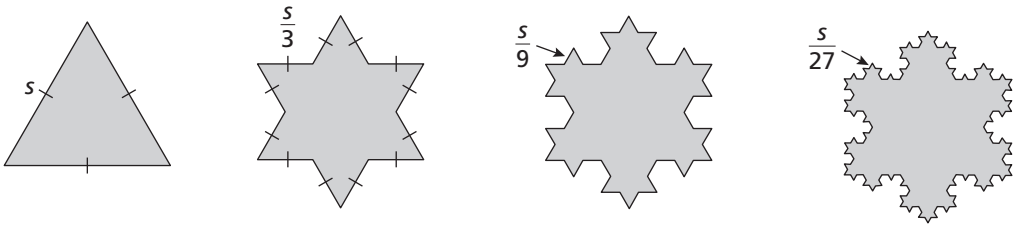
Areas of Polygons

1. A circle is inscribed in a rhombus with diagonals of 2 feet and 4 feet. What is the area (in square feet) of the region of the rhombus that is outside the circular region? Round your answer to the nearest tenth.

2. A sign has a shape consisting of a semicircle and an isosceles triangle. A rectangular board of wood enclosing the sign measures 2 feet by 4 feet. The shaded regions will be removed. $BE = 3BG$ and $\overline{AB}$ is parallel to $\overline{CE}$. Find the area of the sign itself.



The diagram below shows the first four stages in the construction of the Koch Snowflake.



Stage 0 Stage 1 Stage 2 Stage 3

3. What is the area of A_0 of the snowflake at Stage 0 in terms of s?

4. What is the area of each triangle *added* at Stage 1 in terms of s?

5. How many triangles are added at Stage 1? What is the total area A_1 of the snowflake at Stage 1?

6. What is the total area A_2 of the snowflake at stage 2?

7. What is the total area A_3 of the snowflake at stage 3?

After several calculations, it can be shown that a formula for the area of the snowflake at any stage n, where n is greater than 0, is $A_n = \frac{\sqrt{3}}{4}s^2 + \frac{\sqrt{3}}{12}\left(1 + \frac{4}{9} + \frac{4^2}{9^2} + \cdots + \frac{4^{n-1}}{9^{n-1}}\right)s^2$. The part of the formula $\left(1 + \frac{4}{9} + \frac{4^2}{9^2} + \cdots + \frac{4^{n-1}}{9^{n-1}}\right)$ is called an infinite geometric series where the ratio between consecutive terms is $\frac{4}{9}$. A formula for finding the sum of an infinite geometric series is $S = \frac{a}{1 - r}$, where a is the first time and r is the ratio between terms.

8. Use the formula to find the sum S.

9. What is the area of the Koch Snowflake?

Name _____ Date _____

11.3 Puzzle Time

What Dog Keeps The Best Time?

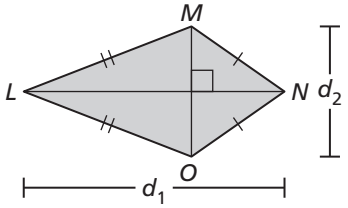
Circle the letter of each correct answer in the boxes below. The circled letters will spell out the answer to the riddle.

Complete the sentence.

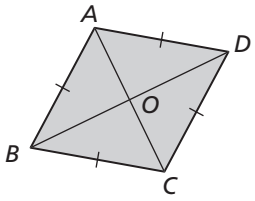
1. The center of a regular polygon is the center of its _____ circle.
2. The distance from the center to any side of a regular polygon is called the _____ of the polygon.
3. A(n) _____ angle of a regular polygon is an angle formed by two radii drawn to consecutive vertices of the polygon.
4. The area of a regular n-gon with side length s is one half the product of the apothem and the _____.
5. The area of a rhombus or kite is half the product of the _____.

Find the area. Round your answer to the nearest whole number.

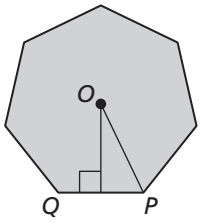
6. $d_1 = 14, d_2 = 7$



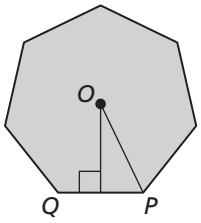
7. $AO = 8, BO = 11$



8. $OP = 11, OQ = 5$



9. $OP = 9, QP = 4$



A	P	O	O	W	A	T	D	C
diagonals	right	outside	sides	central	perimeter	343	tangent	49
L	**H**	**E**	**D**	**C**	**O**	**H**	**G**	**O**
88	226	256	apothem	radius	176	98	circumscribed	185