Geometry H   Name: _____
11.2/11.5 Notes: Areas of Trapezoids, Rhombuses, Kites, and   Date: _____ Period: _____
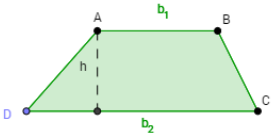   Sectors of Circles

- I can find areas of special quadrilaterals.
- I can find areas of sectors in circles.

Investigation 1: Use the diagram of trapezoid *ABCD* below to complete the following.
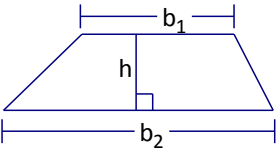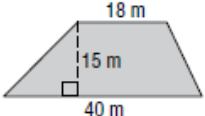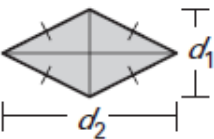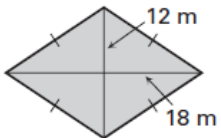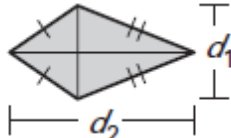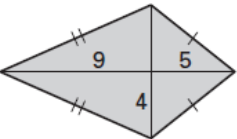

1) What type of quadrilateral is formed when *ABCD* is rotated 180° ? Explain.

2) What is the relationship between the area of trapezoid *ABCD* and the quadrilateral formed in step 1?

3) Using the quadrilateral formed in Step 1, write an equation to find the area of trapezoid *ABCD* using h, b_1 and b_2

**Investigation 2:** Use the diagram of the rhombus below to complete the following.
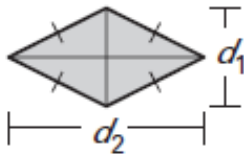
1) What do you know about the diagonals of a rhombus?

2) What type of triangles are formed by the diagonals? What do we know about all four triangles?

3) What are the side lengths of one triangle?

4) What is the area of one triangle?

5) Using your answer from question 4, write an equation to find the area of a rhombus in terms of d_1 and d_2.

*Note: We could do a similar proof to develop the area of a kite* ☺

Shape	Formula	Example
Trapezoid	$A=\dfrac{1}{2}h(b_1+b_2)$ b_1 h b_2	Find the area: 18 m 15 m 40 m
Rhombus	$A=\dfrac{1}{2}d_1d_2$ d_1 d_2	Find the area: 12 m 18 m
Kite	$A=\dfrac{1}{2}d_1d_2$ d_1 d_2	Find the area: 9 5 4

Example 1: One diagonal of a rhombus is three times as long as the other diagonal. The area of the rhombus is 24 square feet. What are the lengths of the diagonals?

Example 2: Please find the area of the polygon below.

11

21

50°
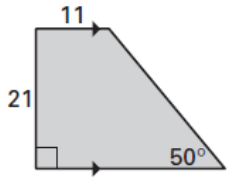
Example 3: Please find the area of the polygon below.
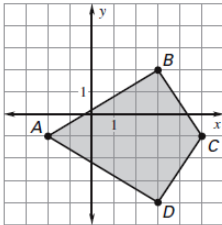
Q 2 ft

P

N 6 ft R

8 ft

S
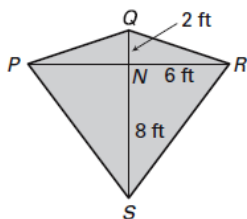
**Example 4: Solve for an unknown measure**
The height of a trapezoid is 10 meters and the area is 95 square meters. One base is 3 meters longer than the other base. What are the lengths of the bases?

Example 5: Find area in the coordinate plane
Find the area of the kite with vertices $A(-2, -1)$, $B(3, 2)$, $C(5, -1)$, and $D(3, -4)$.

A **sector of a circle** is the region bounded by two radii of the circle and their intercepted arc. In the diagram to the right, sector APB is bounded by $\overline{AP}$, $\overline{BP}$, and $\widehat{AB}$.
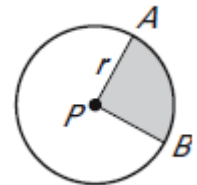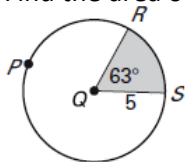

We can find the area of the sector two ways:

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

OR

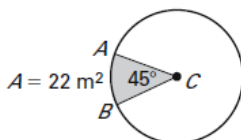$$Area\ of\ sector\ APB = \frac{\quad\quad}{\quad\quad} \cdot$$

Example 6: Find area of a sector
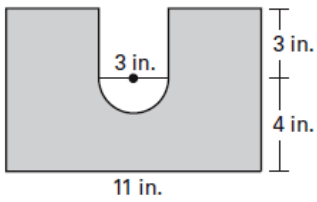Find the area of sectors formed by $\angle RQS$.

Example 7: Use Area of a Sector Theorem
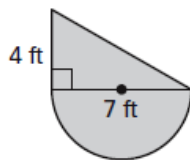Use the diagram to find the area of $\odot C$.

Example 8: Find an area
A contractor needs to cut a section out of a rectangular piece of wood as shown. To the nearest square inch, what is the area of the remaining wood?
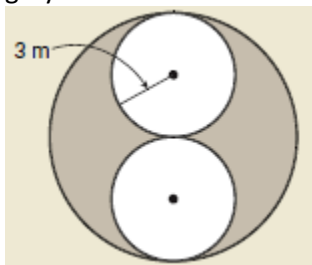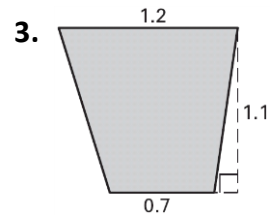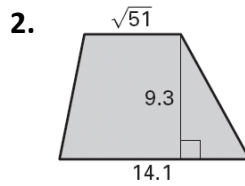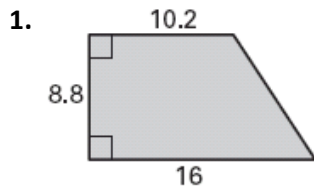

Example 9: Area of composite figures

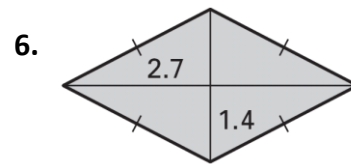   a) Find the area of the figure.

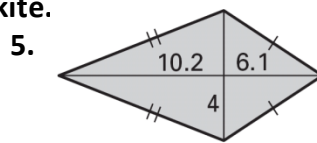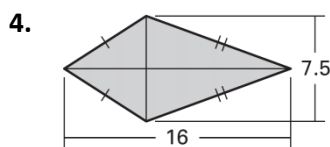

   b) The two white congruent circles just fit into the gray circle below. What is the area that appears gray?
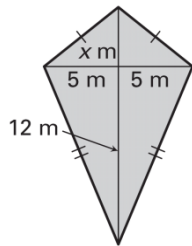
Find the area of the trapezoid.

1.

10.2

8.8

16

2.

$\sqrt{51}$

9.3

14.1

3.

1.2

1.1

0.7

Find the area of the rhombus or kite.
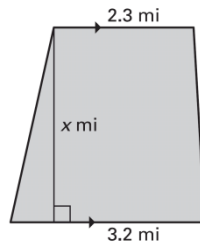
4.

7.5

16

5.

10.2   6.1

4

6.

2.7

1.4

Use the given information to find the value of *x*.

7. Area = 80 m^2

x m

5 m   5 m

12 m

8. Area = 5.5 mi^2

2.3 mi

x mi

3.2 mi

9. Area = 288.96 ft^2
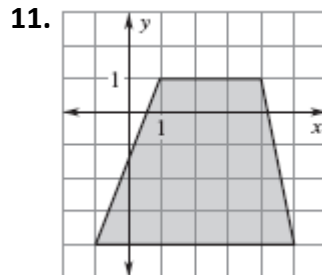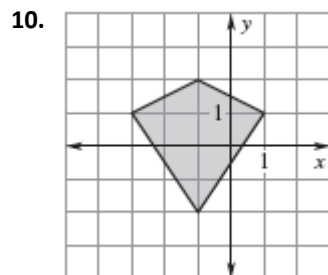
x ft

9.6 ft

40.2 ft

Find the area of the figure.

10.

y

1

1   *x*

11.

y
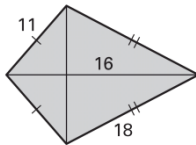
1

1

x

12.

y

1

2   *x*
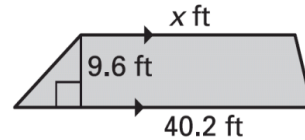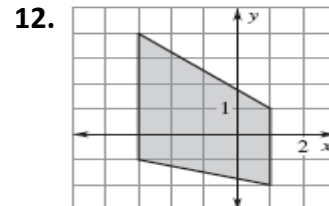
Find the lengths of the bases of the trapezoid described.

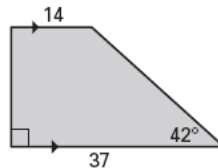**13.** The height is 5 meters. One base is three times as long as the other base. The area is 70 square meters.

14. The height is 10 feet. One base is 4 feet longer than the other base. The area is 120 square feet.
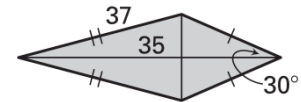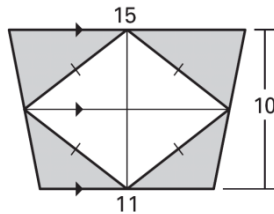
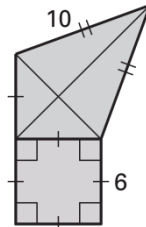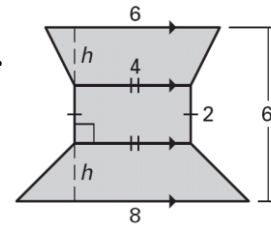**Find the area of the shaded region.**
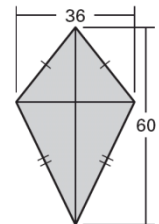
15.

16.

17.

18.

19.

20.

21. Making a Kite You are making a kite. The frame is to be made from two pieces of balsa wood, one measuring 60 inches and the other 36 inches. If you buy 1 square yard of material, will you have enough to piece together the covering for the kite? *Explain*

22. Advertising You are in charge of designing a sign to advertise for a pastry company. The sign will be shaped to resemble a pie. The template diagram is given at the right. Find the area of the sign in terms of *x* units.
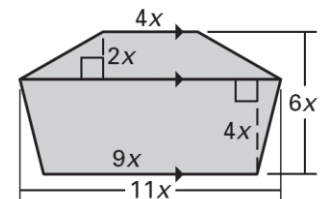
23. The garage roof shown is made from two isosceles trapezoids and two isosceles triangles. Find the area of the entire roof.

20 ft
15 ft
15 ft
45 ft
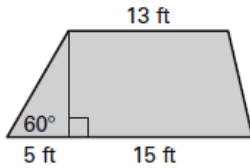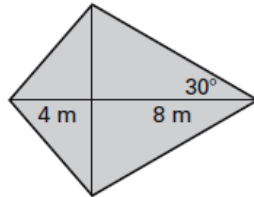25 ft
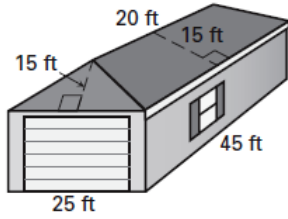
24. If the length of each diagonal of a rhombus is doubled, how is the area of the rhombus affected? *Explain your reasoning.*

Find the area of each figure. Round answers to nearest tenth, if necessary.

25.

13 ft
60°
5 ft   15 ft

26.

30°
4 m   8 m

27.

21 ft   22 ft
45°
18 ft
16 ft
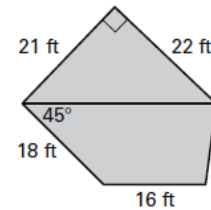
Find the area of the shaded sector formed by ∠ACB.

28.

8 in.
A   C
60°
B

29.

A
12.8 mm
110° C
B
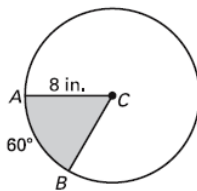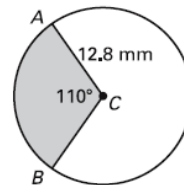
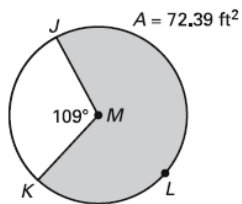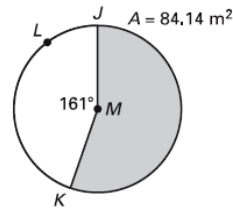**Use the diagram to find the indicated measure (you are given the area of the shaded sector).**

30. Find the area of ⊙M

A = 72.39 ft²

J
109° M
K   L

31. Find the radius of ⊙M

A = 84.14 m²

J
L
161° M
K

32. Three pizzas of a given diameter are cut as indicated. Which cut produces the largest pieces?
    a) An 8-inch pizza cut into 6 congruent slices
    b) A 12-inch pizza cut into 8 congruent slices
    c) A 16-inch pizza cut into 10 congruent slices.

| 8 in. | 12 in. | 16 in. |
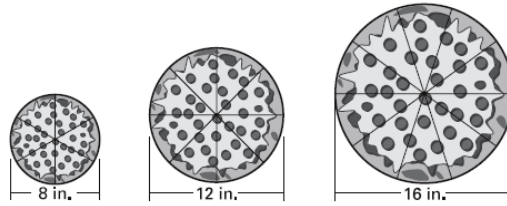
Answer Key
1. 115.28 square units
2. about 98.77 square units
3. 1.045 square units
4. 60 square units
5. 65.2 square units
6. 7.56 square units
7. 4 m
8. 2 mi
9. 20 ft
10. 8 square units
11. 22.5 square units
12. 16 square units
13. 7 m, 21 m
14. 10 ft, 14 ft
15. about 191.97 square units
16. about 528.1 square units
17. about 669.4 square units
18. 65 square units
19. about 92.4 square units
20. 30 square units
21. Yes, you will have enough material because a square yard contains 1296 in.^{2} and you only need 1080 in.^{2}
22. $55x^2$
23. 1350 ft^2
24. The area quadruples. If the lengths of the diagonals are doubled, then the $A = \frac{1}{2}(2d_1)(2d_2) = 2d_1d_2$
25. $\frac{165}{2}\sqrt{3} \approx 142.9 \ ft^2$
26. $32\sqrt{3} \approx 55.4 \ m^2$
27. $\approx 526.4 \ ft^2$
28. $\approx 33.51 \ in^2$
29. $\approx 157.28 \ mm^2$
30. $\approx 103.87 \ ft^2$
31. $\approx 6.96 \ m$
32. C. the 16-inch pizza