9.1 Notes: Angles of Quadrilaterals and Polygons

Objectives:
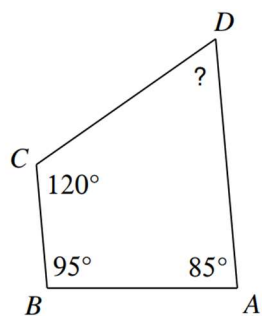- **Students will be able to find missing angles in a quadrilateral.**
- **Students will be able to find the sum of the angles in a polygon.**

Exploration: Use the following **TWO** links: https://www.geogebra.org/m/XjSKUQBz and https://www.geogebra.org/m/xwbvZyhv. Move the vertices of the quadrilateral around and observe what happens to the angles. Make a conjecture about the sum of the angles in a quadrilateral.
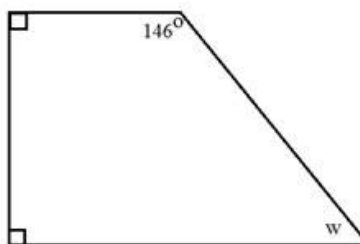
Sum of the Angles in a Quadrilateral	**The sum of the angles of a quadrilateral is always _____.**	

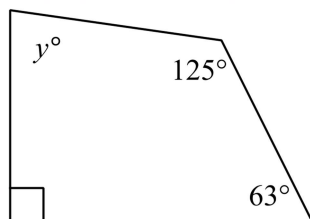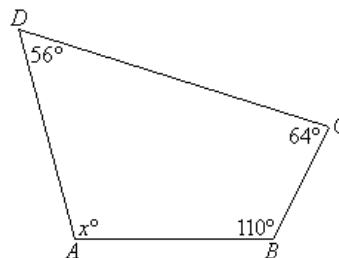**For #1–4: Find the missing angle in each quadrilateral.**
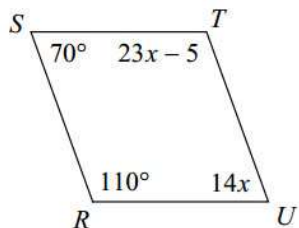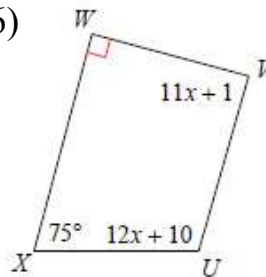
1)

2)

You try #3 – 4!
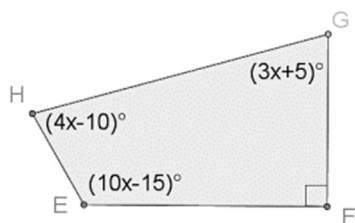
3)

4)

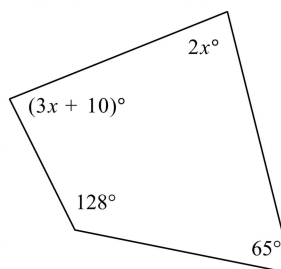**For #5–8: Find the value of the variable.**

5)

S T
$70°$ $23x-5$

$110°$ $14x$
R U

6)

W

$11x+1$ V

$75°$ $12x+10$
X U

You try #7 – 8! Round to one decimal place, if needed.

7)

G
$(3x+5)°$
H
$(4x-10)°$

$(10x-15)°$
E F

8)

$2x°$

$(3x + 10)°$

$128°$

$65°$

9) Find the measure of the largest angle in the quadrilateral shown below.

B
$8x°$
                    C
          $(3x + 30)°$
A $(5x + 20)°$

$(9x - 10)°$
D

10) All four angles of a quadrilateral are congruent to each other. Find the measure of each angle in the quadrilateral.

Sum of the Angles in a Polygon	The **sum of the angles of a polygon** can be found by using the formula _____, where *n* is the number of sides.

For #11 – 16, find the sum of the angles in each polygon.

11) octagon   12) hexagon   13) nonagon

You try #14 – 16!

14) pentagon   15) decagon   16) quadrilateral

The Measure of One Interior Angle of a Regular Polygon	The **measure of one interior angle of a regular polygon** can be found by using the formula _____, where *n* is the number of sides.

17) Assume all the angles of a hexagon are congruent (the hexagon is *regular*). Find the measure of *one* interior angle of the hexagon.

You Try!
18) Find the measure of one angle of a regular pentagon.

9.2 Notes: Parallelograms

Objective:
- **Students will be able to use properties of parallelograms to solve problems.**

Exploration: **A parallelogram is a quadrilateral that has both pairs of opposite sides parallel.**   Use the given link to fill in the properties of a parallelogram in the table below:
https://www.geogebra.org/m/amdzUqFu

Opposite Sides of a Parallelogram	The **opposite sides** of a parallelogram are _____ and _____.	
Opposite Angles of a Parallelogram	The **opposite angles** of a parallelogram are _____.	
Consecutive Angles of a Parallelogram	The **consecutive angles** of a parallelogram are _____.	
Diagonals of a Parallelogram	The **diagonals** of a parallelogram _____ each other.	

1) Find the measure of the missing angles and the lengths of the missing sides.

$\angle A =$ _____

$\angle B =$ _____

$\angle D =$ _____

$\overline{BC} =$ _____

$\overline{CD} =$ _____

8 cm

12 cm

48°

You Try!

2) Find the measure of the missing angles and the lengths of the missing sides.

$\angle A =$ _____

$\angle B =$ _____

$\angle C =$ _____

$\overline{AD} =$ _____

$\overline{AB} =$ _____

14

6

130°

For #3–6: Given that each quadrilateral shown is a parallelogram, find the value of the variable(s). Use the properties that opposite angles are congruent and consecutive angles are supplementary.
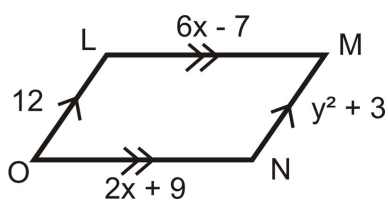
3)

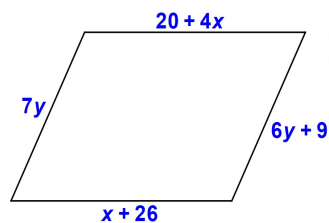45° $a°$

$5b°$

4)

$(3x+2)°$ $(2y+22)°$

$(2x+3)°$ $(4y+5)°$

You try #5 – 6!

5)

$(4x)°$

$(3x + 14)°$

6)

A B

$x°$ $y°$

$(z-15)°$ $(2z)°$

D C

For #7 – 8: For each parallelogram shown below, find each variable. Use the property that states that opposite sides are congruent.

7)

L — 6x - 7 — M
12
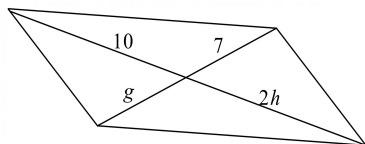O — 2x + 9 — N
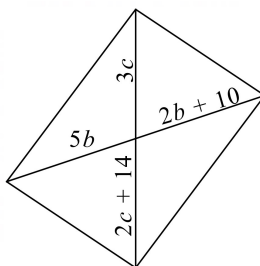y² + 3

You try! 8)

20 + 4x
7y
6y + 9
x + 26

For #9–11: Find the value of each variable, given that the quadrilateral is a parallelogram. Use the property that states the diagonals bisect each other.
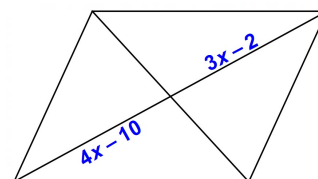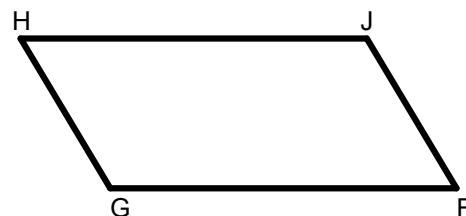
9)

10   7
g   2h

10)

3c
2b + 10
5b
2c + 14

You try!11)

3x – 2
4x – 10

12) What is the measure of ∠F in Parallelogram *FGHJ* ?

$\overline{FG} = 3x - 44$

$\overline{HJ} = 61$

$m\angle G = (4x + 10)°$

H   J
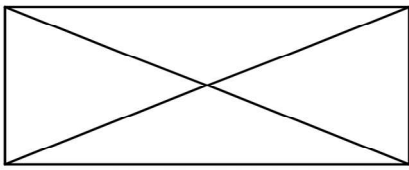
G   F

9.3 Notes: Rectangles and Squares
Objectives:
- **Students will be able to solve problems using properties of rectangles & squares.**

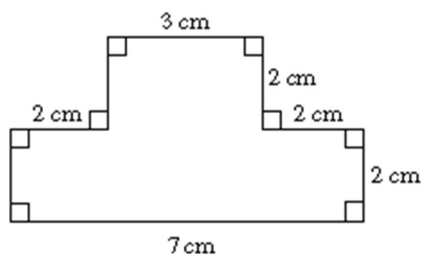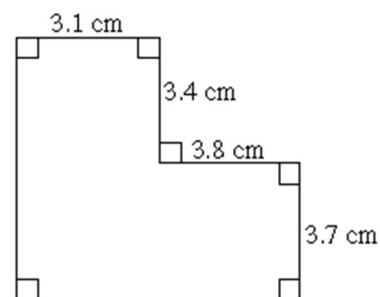**Exploration:** Use this link to fill in the properties of rectangles in the table below:
https://www.geogebra.org/m/RCAX5KZa

Opposite Sides of a Rectangle	The **opposite sides of a rectangle** are _____ and _____.	
Angles of a Rectangle	The **angles of a rectangle** are each a _____ angle.	
Diagonals of a Rectangle	The **diagonals of a rectangle** are _____ and _____ each other.	

For #1–3: Find the perimeter of each shape shown below. Use the property that says opposite sides of a rectangle are congruent.
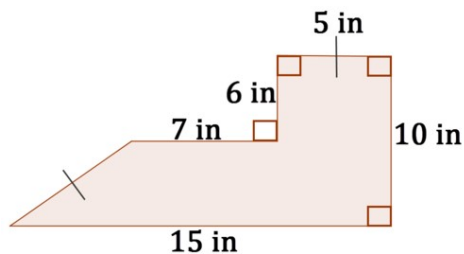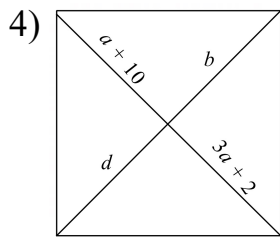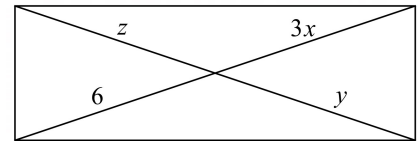
1)
3 cm
2 cm
2 cm
2 cm
2 cm
2 cm
7 cm

You Try! 2)
3.1 cm
3.4 cm
3.8 cm
3.7 cm

You Try! 3) Pay attention to congruent segments.
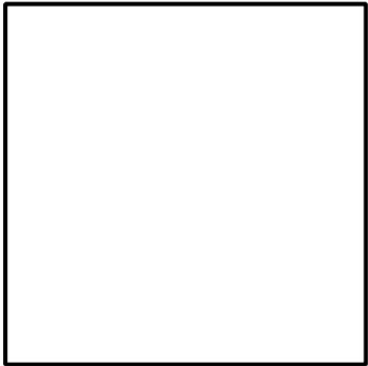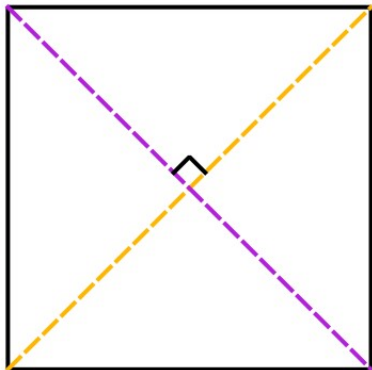5 in
6 in
7 in
10 in
15 in

For #4 – 5: Find the missing variables for each rectangle. Use the properties that the diagonals of a rectangle are congruent and bisect each other.
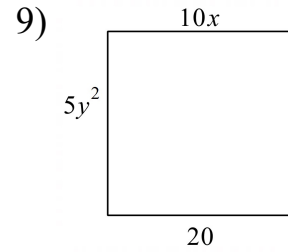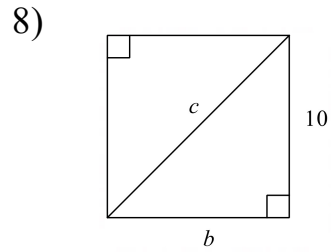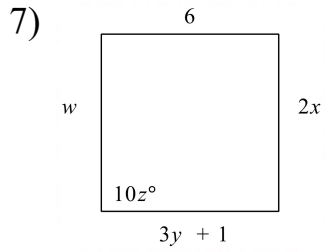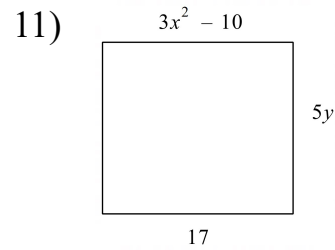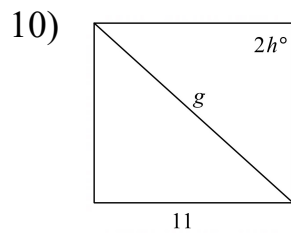
4)　　　　　　　　　　　　　　　　　　**You try! 5)**

6) A rectangle has a length of 7 cm and a width of 24 cm. Find the length of one diagonal. Hint: draw a diagram.

Sides of a Square	**The sides of a square are all** _____.	
Angles of a Square	**The angles of a square are all** _____ **angles.**	
Diagonals of a Square	**The diagonals of a square are** _____ **and** _____ _____ **of each other.**	

For #7–11: Find the missing variables in each square.

7)

8)

9)

You Try #10-11!
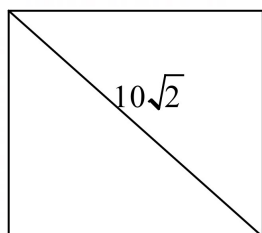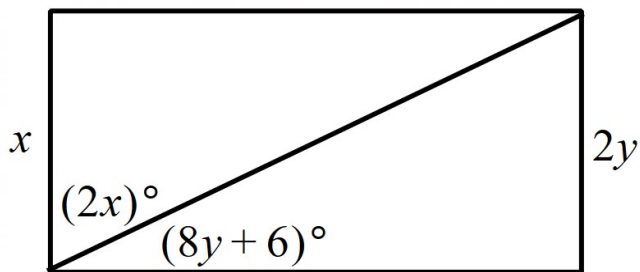
10)

11)

12) A square has a perimeter of 32 inches. Find the area of the square. (Reminder: $A = s^2$)

13) Find the perimeter of the square shown below.

14) Given that a rectangle and a square both have a perimeter of 24 mm. If the length and width of the rectangle is 3 cm and 9 cm, then which has the larger area, the square or the rectangle?
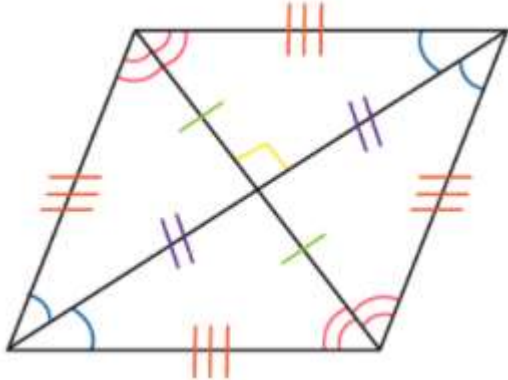
Challenge! Solve for the variables in the rectangle below.
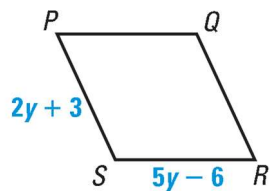
9.4 Notes: Rhombi and Kites

Objectives:
- **Students will be able to name regular polygons by the sides.**
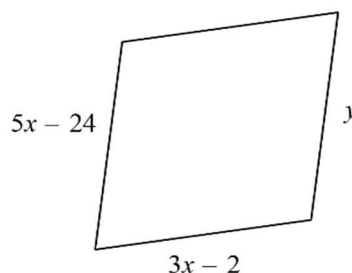- **Students will be able to find the area of a regular polygon.**

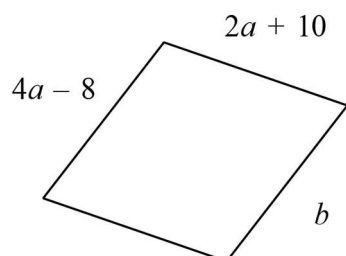| Properties of a Rhombus	Sides	A rhombus is a parallelogram where **all four sides are** _____.	
	Diagonals	The **diagonals of a rhombus** are _____ _____ of each other.	
	Diagonals and Angles	The **diagonals of a rhombus** _____ the **angles** of the rhombus.	

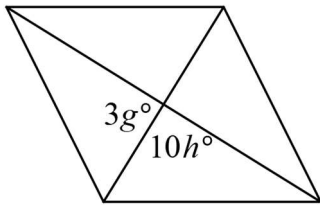**For #1-3: Find the variables in each rhombus.**

1)

P   Q
$2y + 3$
S $5y - 6$ R

2)

$5x - 24$ y
$3x - 2$

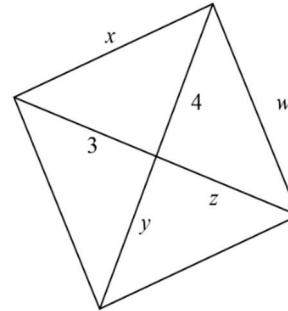**You try!** 3)

$2a + 10$
$4a - 8$
b

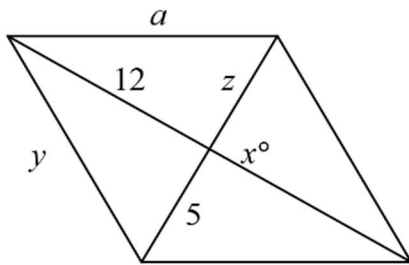**For #4-6: Find the missing variable in each rhombus.**
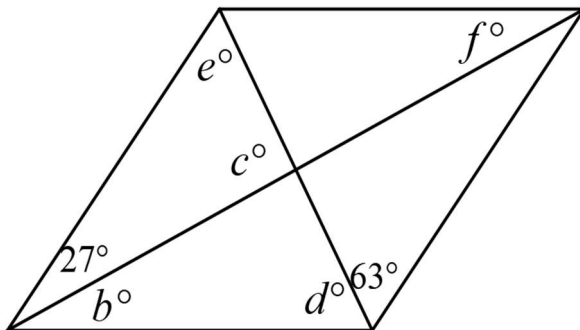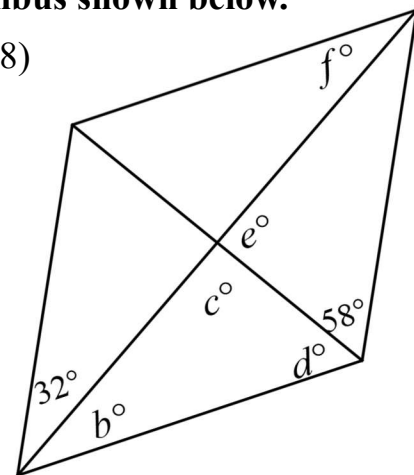
4)

5)

You Try! 6)

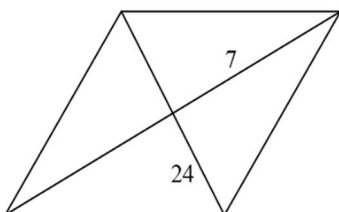**For #7-8: Find the measure of each variable for each rhombus shown below.**

7)

You Try! 8)

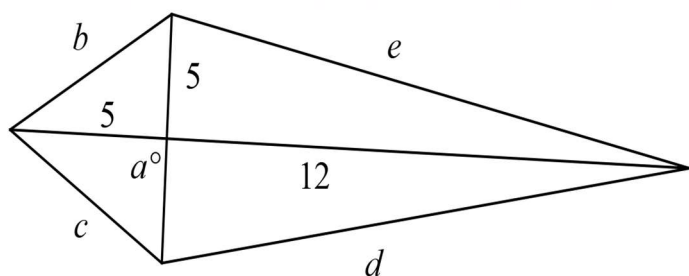9) Find the perimeter of the rhombus shown below.

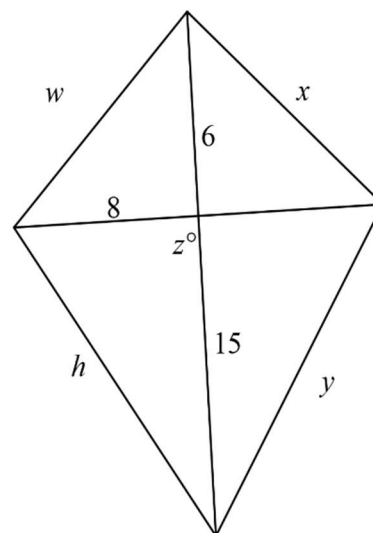|			
Properties of a Kite	**Sides**	**A kite is a quadrilateral that has two pairs of consecutive sides that are _____.**	
	Diagonals	**One diagonal of a kite is the _____ _____ of the other.**	

Note: there are other properties about kites (specifically about the angles) that we are not studying this year.

For #10-11: Find the measure of each variable for each kite shown below.

10)

You Try! 11)

12) Find the perimeter of the kite shown below.