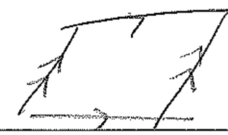
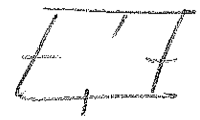
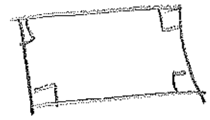
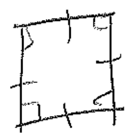
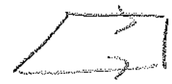
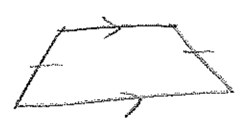
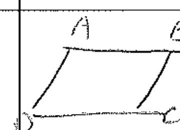
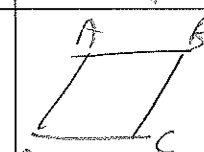
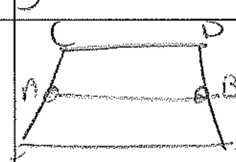
Geometry Unit 5 Vocabulary

Word	Definition	Diagram/other information
parallelogram	quadrilateral with 2 pairs of opposite sides parallel	
rhombus	parallelogram with 4 ≅ sides	
rectangle	parallelogram w/ 4 ≅ ∡s	
square	parallelogram w/ 4 ≅ ∡s and 4 ≅ sides	
kite	quadrilateral with no pairs of parallel sides	
trapezoid	quadrilateral with 1 pair of opposite sides parallel	
Isosceles trapezoid	trapezoid with ≅ legs	
Opposite sides/angles	angles or sides across from each other	 AB + opposite CD or ∡B is opposite ∡D
Consecutive sides/angles	angles or sides next to each other	 ∡A + ∡B or side AB + side BC
Trapezoid midsegment theorem	the segment joining the midpoints of the legs of a trapezoid	 AB is the midsegment $AB = \frac{1}{2}(CD + EF)$ AB is parallel to CD + EF
Convex polygon		

Polygon interior angle sum theorem	$(n-2)180$	
Polygon exterior angle sum theorem	360	

	Parallelogram	rhombus	rectangle	square	kite	trapezoid	isosceles trapezoid	
Opposite sie parallel	X	X	X	X				
opposite sides congruent	X	X	X	X				
opposite angles congruent	X	X	X	X				
consecutive angles supplementary	X	X	X	X				
diagonals bisect eachother	X	X	X	X				
Four right angles			X	X				
Four congruent sides		X		X				
Diagonals congruent			X	X				
Diagonals perpendicular		X		X				
Diagonals bisect opposite angles		X		X				
Exactly one set of opposite sides parallel						X	X	
Two pairs of consecutive angles supplementary						X	X	
Base angles congruent							X	
one pair of opposite sides congruent							X	
one pair of opposite angles congruent					X			
one set of opposite angles bisected by the diagonals					X			
2 pais of consecutive congruent sides					X			
only one diagonal bisected					X			

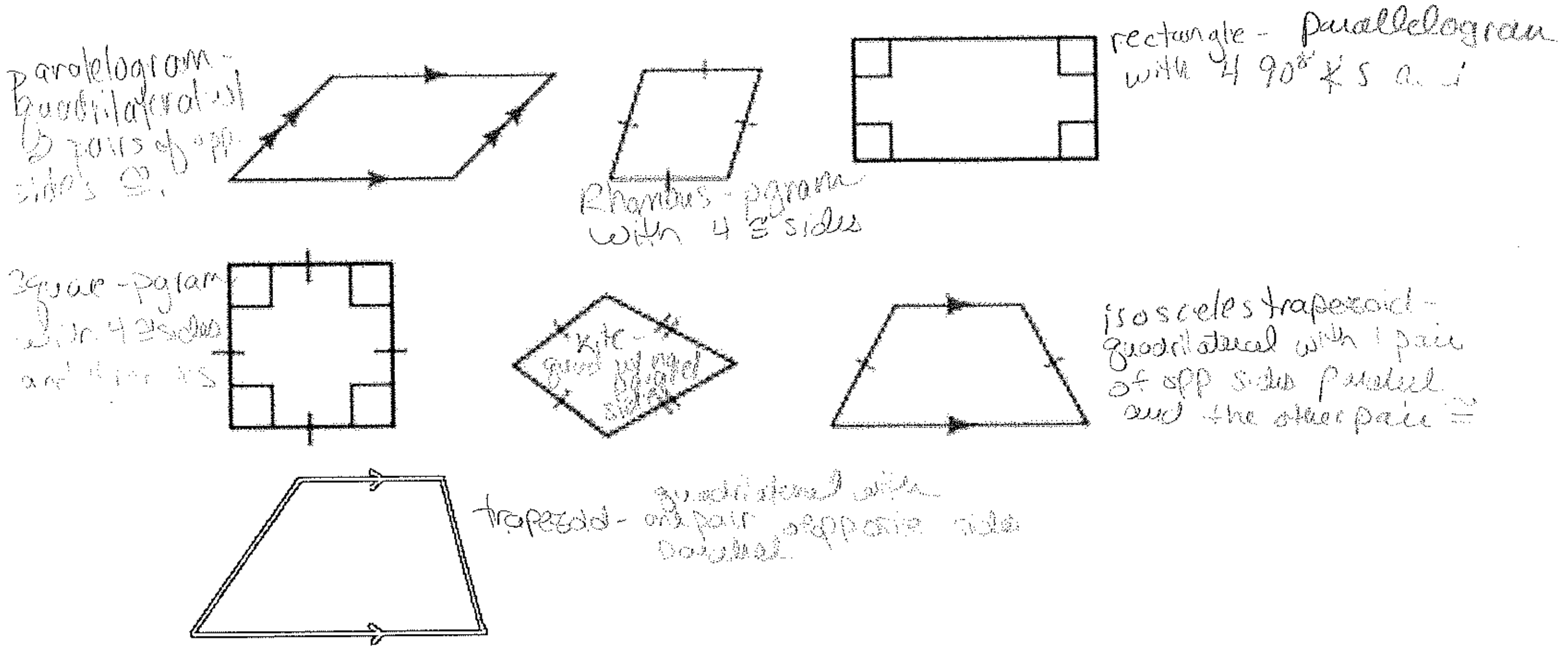
Geometry Unit 5 Day 1 Developing Definitions for Quadrilaterals

Learning Target – Students will develop definitions for quadrilaterals and use them to name given quadrilaterals.

Classifying Quadrilaterals

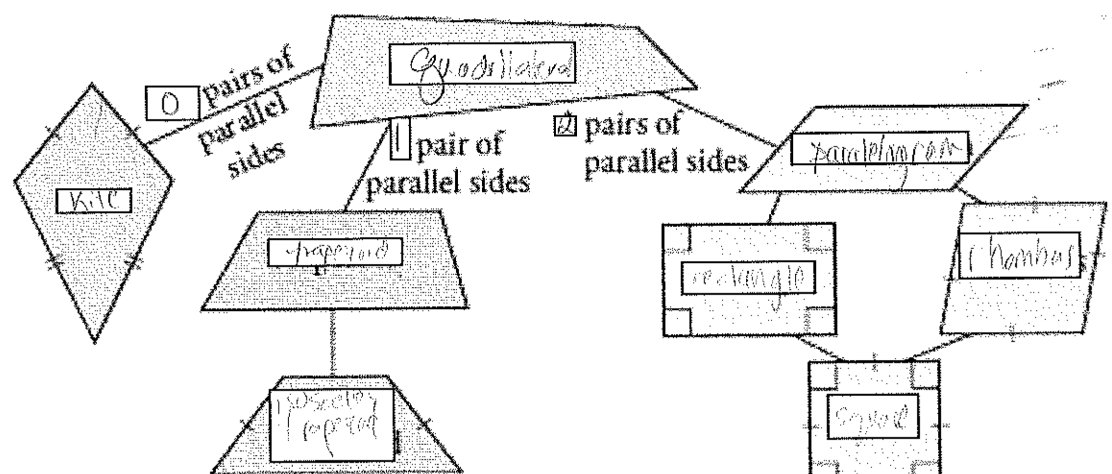
Add directions – use the internet – coordinate this with google slides? → change to give them the words ?

Each picture below is a special type of quadrilateral. Name each quadrilateral shown. Then develop a definition with your group that is specific to that type of quadrilateral. Write your definitions on a piece of chart paper.

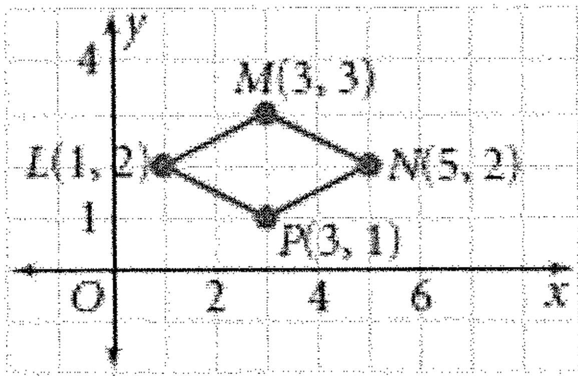


Fill in the missing names and relationships on the diagram below based on the definitions that you developed.

The diagram below shows the relationships among special quadrilaterals.



Coordinate Geometry Determine the most precise name for quadrilateral $LMNP$. Justify your thinking.



Slopes

$MN = \frac{2-3}{5-3} = \frac{-1}{2}$

$PN = \frac{1-2}{3-5} = \frac{-1}{-2} = \frac{1}{2}$

$PL = \frac{1-2}{3-1} = \frac{-1}{2}$

$LM = \frac{3-2}{3-1} = \frac{1}{2}$

- since MN + PL have = slopes $MN \parallel PL$
- since PN + LM have = slopes $PN \parallel LM$

Since no slopes are opposite reciprocals there are no right ∠s

Distance

$MN = \sqrt{(2-3)^2 + (5-3)^2}$
$= \sqrt{(-1)^2 + (2)^2} = \sqrt{5}$

$NP = \sqrt{(5-3)^2 + (2-1)^2}$
$= \sqrt{2^2 + 1^2} = \sqrt{5}$

$PL = \sqrt{(3-1)^2 + (1-2)^2}$
$= \sqrt{2^2 + (-1)^2} = \sqrt{5}$

$ML = \sqrt{(3-1)^2 + (3-2)^2} =$
$\sqrt{(2)^2 + 1^2} = \sqrt{5}$

all 4 sides are ≅

LMNP is a rhombus b/c it's a parallelogram (2 pr of ∥ lines) with all 4 sides ≅.

ABCD is a square. Which classifications from this lesson also apply? Which do *not* apply?

yes
parallelogram, rectangle, rhombus

no
kite, trapezoid, isosceles trapezoid

Geometry Unit 5 Day 1 HW

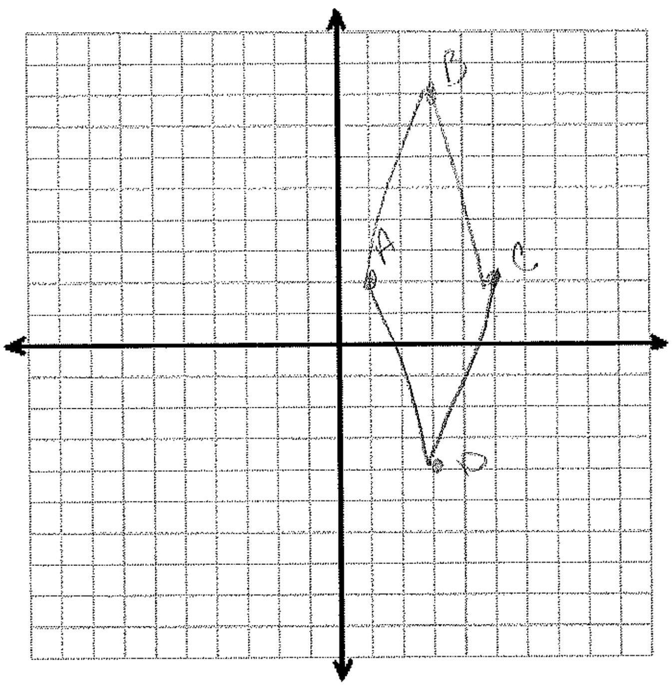
1. Classify the Polygon

a) Graph and label the quadrilateral with the given vertices.

b) Determine the most precise name for the quadrilateral. (*hint: Use distance and slope formulas)*

c) Explain your reasoning.

A (1, 2), B(3, 8), C(5, 2), D(3, -4)



Slopes

$AB = \frac{8-2}{3-1} = \frac{6}{2} = 3$

$BC = \frac{2-8}{5-3} = \frac{-6}{2} = -3$

$CD = \frac{-4-2}{3-5} = \frac{-6}{-2} = 3$

$AD = \frac{-4-2}{3-1} = \frac{-6}{2} = -3$

AB + CD are ∥ b/c they have = slopes

BC + AD are ∥ b/c they have = slopes

No right ∡s b/c no opposite reciprocal slopes

Distance

$AB = \sqrt{(8-2)^2+(3-1)^2} = \sqrt{6^2+2^2} = \sqrt{40} = 2\sqrt{10}$

$BC = \sqrt{(2-8)^2+(5-3)^2} = \sqrt{(-6)^2+(2)^2} = \sqrt{40} = 2\sqrt{10}$

$CD = \sqrt{(-4-2)^2+(3-5)^2} = \sqrt{(-6)^2+(2)^2} = \sqrt{40} = 2\sqrt{10}$

$AD = \sqrt{(-4-2)^2+(3-1)^2} = \sqrt{(-6)^2+(2)^2} = \sqrt{40} = 2\sqrt{10}$

Since all 4 sides are ≅ and 2 pairs of opposite sides are ∥, this is a Rhombus!

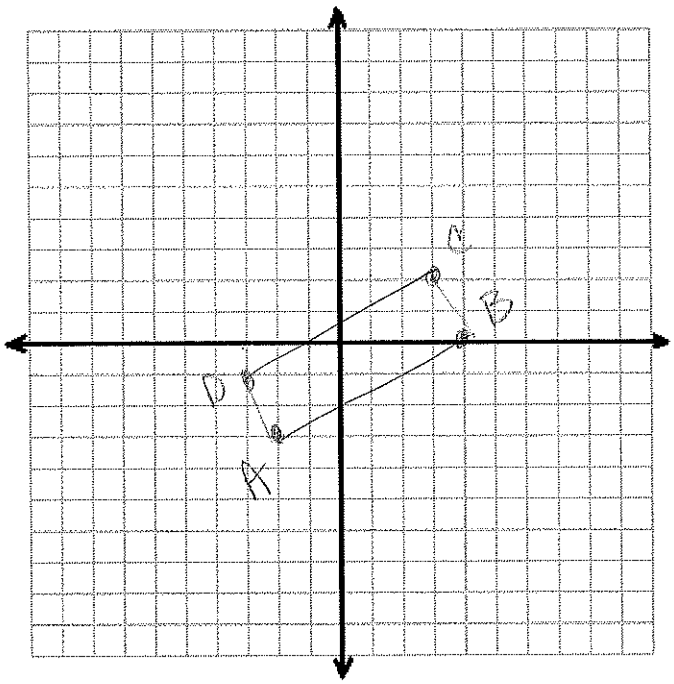
2. Classify the Polygon

a) Graph and label the quadrilateral with the given vertices.

b) Determine the most precise name for the quadrilateral. (*hint: Use distance and slope formulas)*

c) Explain your reasoning.

A (-2, -3), B(4, 0), C(3, 2), D(-3, -1)



Slopes

$AB = \frac{0 - -3}{4 - -2} = \frac{3}{6} = \frac{1}{2}$

$BC = \frac{2 - 0}{3 - 4} = \frac{2}{-1} = -2$

$CD = \frac{-1 - 2}{-3 - 3} = \frac{-3}{-6} = \frac{1}{2}$

$DA = \frac{-1 - -3}{-3 - -2} = \frac{2}{-1} = -2$

AB + CD are parallel b/c they have = slopes

BC + DA are parallel b/c they have = slopes

There are 4 pairs of ⊥ sides b/c $\frac{1}{2}$ + -2 are opposite reciprocals so there are 4 right ∡s

Distance

$AB\ d = \sqrt{(0 - -3)^2 + (4 - -2)^2} = \sqrt{(3)^2 + (6)^2} = \sqrt{45} = 3\sqrt{5}$

$BC = \sqrt{(2 - 0)^2 + (3 - 4)^2} = \sqrt{2^2 + (-1)^2} = \sqrt{5}$

$CD = \sqrt{(-1 - 2)^2 + (-3 - 3)^2} = \sqrt{(-3)^2 + (-6)^2} = \sqrt{45} = 3\sqrt{5}$

$DA = \sqrt{(-1 - -3)^2 + (-3 - -2)^2} = \sqrt{2^2 + (-1)^2} = \sqrt{5}$

Not all 4 sides are =

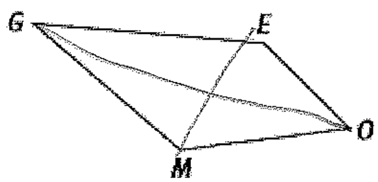
Since 2 pairs of opposite sides are parallel + there are 4 right ∡s, this is a rectangle.

Geometry Unit 5 Day 2

Learning target – students will apply the properties of trapezoids and kites to solve problems.

Mr. Cortez, the owner of a tile store, wants to create a database of all of the tiles he sells in his store. All of his tiles are quadrilaterals, but he needs to learn the properties of different quadrilaterals so he can correctly classify the tiles in his database.

Mr. Cortez begins by exploring convex quadrilaterals. The term *quadrilateral* can be abbreviated "quad."



1. Given quad *GEOM*.
   a. List all pairs of opposite sides.

      MO + GE
      GM + EO

   b. List all pairs of consecutive sides.

      MO + MG　　EG + EO
      MG + GE　　EO + MO

   c. List all pairs of opposite angles.

      $\angle G$ + $\angle O$
      $\angle M$ + $\angle E$

   d. List all pairs of consecutive angles.

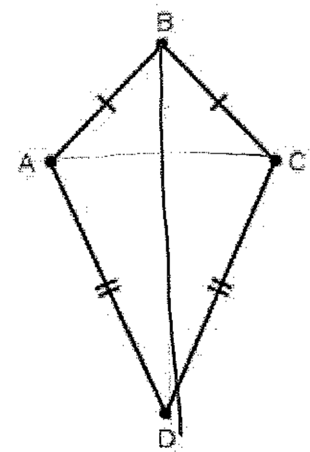
      $\angle M$ + $\angle O$　　$\angle E$ + $\angle G$
      $\angle O$ + $\angle E$　　$\angle G$ + $\angle M$

   e. Draw the diagonals, and list them.

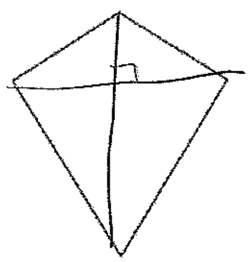
      $\overline{GO}$ + $\overline{ME}$

<u>Kite</u> - A quadrilateral with no pairs of parallel sides and adjacent sides congruent.

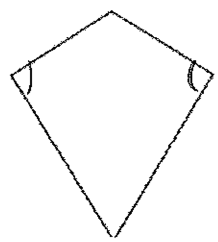
1. **Draw in the diagonal ~~AC~~ BD of kite ABCD. You create 2 isosceles triangles. Are they congruent?** Yes
2. **Draw in the other diagonal of kite ABCD. Are there any congruent triangles created?** yes 2 sets
3. **Use markings or equations to illustrate/represent the 3 Properties of a kite:**



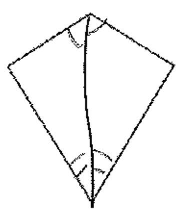
- The diagonals of a kite are perpendicular.



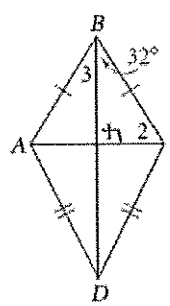
- One pair of opposite angles is congruent.



- One diagonal of a kite bisects one pair of opposite angles

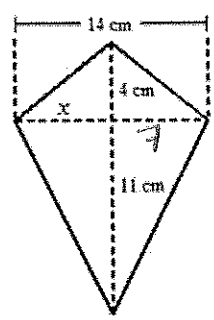


1. Find $m\angle 1, m\angle 2$, and $m\angle 3$ in the kite.

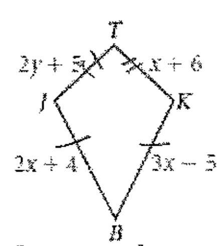


$m\angle 1 = 90$
$m\angle 2 = 180-(90+32)$
$= 58°$
$m\angle 3 = 32°$

2. Find the value of x. Then find the length of each side of the kite.



$X = 7$



5. Algebra Find the values of the variables for the kite.

$JB = KB$
$2x+4 = 3x-5$
$9 = x$

Explain your method.

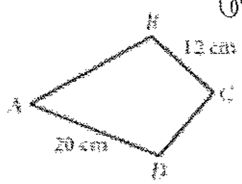
$TJ = TK$
$2y+5 = x+6$
$2y+5 = 9+6$
$2y+5 = 15$
$2y = 10$
$y = 5$

Solve each problem.

1.

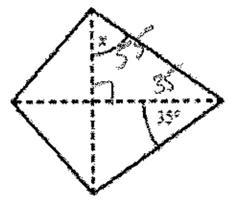
ABCD is a kite.

perimeter = ? 12+12+20+20
64



3.

1. The figure below is a kite.

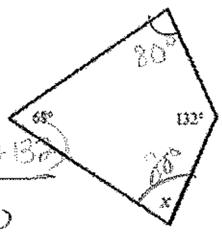


$x = 55°$

What is the value of x?

2.

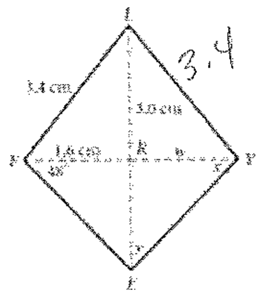
The figure shown is a kite.



$\frac{360-(68+132)}{2} = \frac{360-200}{2} = \frac{160}{2} = 80$

hat is the value of x?

4. FEYL is a kite. RE=2.0 cm. Find w, x, y and the length of FE.



3.4

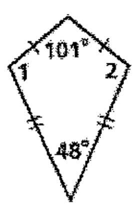
$x = 48°$
$y = 42°$

$w^2+3^2=3.4^2$
$w^2=2.56$
$w=1.6$

Geometry Unit 5 Day 2 HW

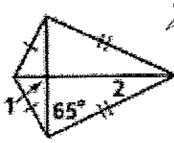
Find the measures of the numbered angles in each kite.

10.



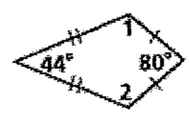
$115.5 = \angle 1 = \angle 2$

11.



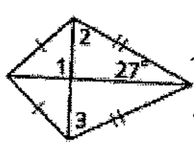
$\angle 1 = 90°$
$\angle 2 = 25°$

12.



$\angle 1 = \angle 2 = 118$

13.

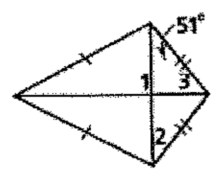


$\angle 1 = 90°$
$\angle 2 = 63°$

14.

$\angle 1 = 42$
$= 107$

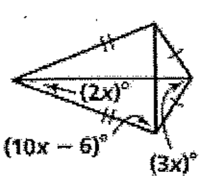
15.



$\angle 1 = 90°$
$\angle 2 = 51$
$\angle 3 = 39°$

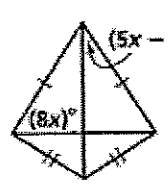
Algebra **Find the value(s) of the variable(s) in each kite.**

16.



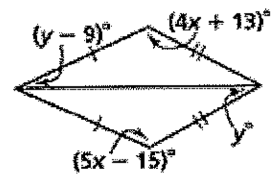
$x = 6$

17.



$x = 7$

18.

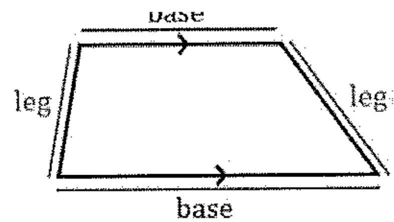


$x = 28$
$y = 32$

Geometry Unit 5 Day 3 Notes

Students will use the properties of trapezoids to solve problems.

<u>Trapezoid</u> - A quadrilateral with exactly one pair of parallel sides.



•The bases of a trapezoid are it's parallel sides.

•The nonparallel sides are it's legs.

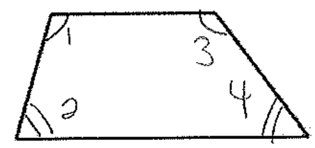
•The two angles that share a base of the trapezoid are it's base angles.

Use markings or equations to illustrate/represent the 1 Properties of a trapezoid:

- Same side interior angles are supplementary

$\measuredangle 1 + \measuredangle 2 = 180$

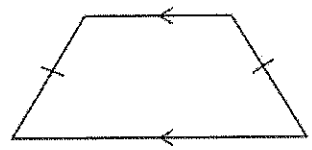
$\measuredangle 3 + \measuredangle 4 = 180$



1. How does a trapezoid differ from a kite?

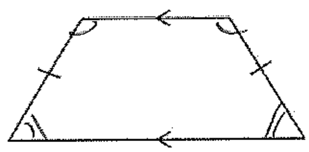
a kite has no pairs of parallel sides

<u>Isosceles Trapezoid</u> - A trapezoid with nonparallel sides congruent.

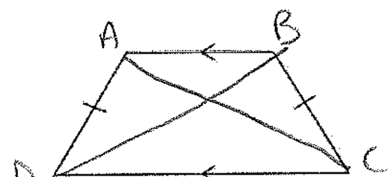


Use markings or equations to illustrate/represent the 1 Properties of a trapezoid:

The base angles of an isosceles trapezoid are congruent.

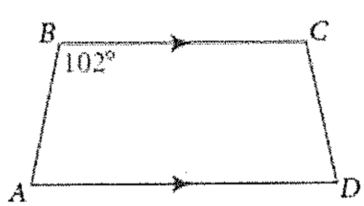


The diagonals of an isosceles trapezoid are congruent.



$\overline{CA} \cong \overline{DB}$

ABCD is an isosceles trapezoid and $m\angle B = 102$. Find $m\angle A$, $m\angle C$, and $m\angle D$.



$\measuredangle C = 102$

$\measuredangle A = \measuredangle D = 180 - 102 = 78°$

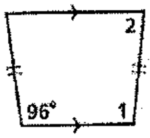
49. In the trapezoid at the right, $BE = 2x - 8$, $DE = x - 4$, and $AC = x + 2$.
   a. Write and solve an equation for x. 12
   b. Find the length of each diagonal. 14

$BE + ED = AC$
$2x-8+x-4=x+2$
$3x-12=x+2$
$2x=24$
$x=12$

Solve each problem about trapezoids and isosceles trapezoids.

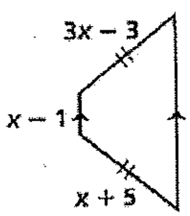
1. Find the measure of angle 1 and angle 2 in each figure below.

$\angle 2 = 62°$
$\angle 1 = 180 - 62 = 118°$



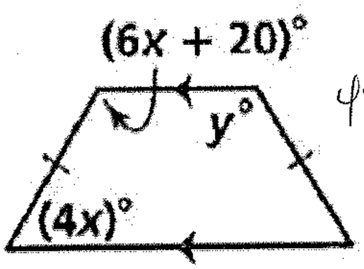
$\angle 1 = 96°$
$\angle 2 = 180 - 96 = 84°$

2. Find the value of x and the lengths of the 3 given sides.



$3x - 3 = x + 5$
$2x = 8$
$x = 4$

3. Find the value of x and y.

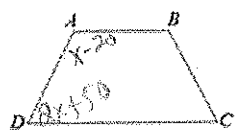


$4x + 6x + 20 = 180$
$10x = 160$
$x = 16$

4. In the isosceles trapezoid below, AC = 6x − 4 and BD = 3x + 4. Find x, then Find A

$AC = BD$
$6x - 4 = 3x + 4$
$3x = 8$
$x = 8/3$

5. In the trapezoid below ∡A = x − 20 and ∡D = 2x + 50. Find x, m∡A and m∡D

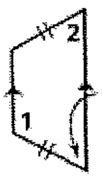


$x - 20 + 2x + 50 = 180$
$3x + 30 = 180$
$3x = 150$
$x = 50$
$m\angle A = 30°$
$m\angle D = 150°$

Geometry Unit 5 Day 3 HW

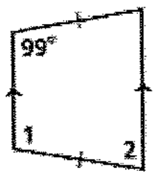
Find the measures of the numbered angles in each isosceles trapezoid.

1.



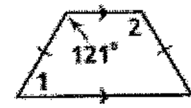
∡2=62
∡1=118°

2.



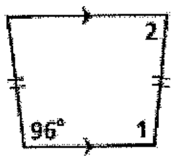
∡1=99
∡2=81

3.



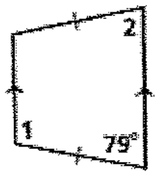
∡2=121
∡1=59

4.



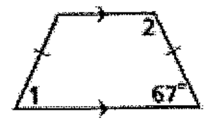
∡1=96
∡2=84

5.



∡2=79
∡1=101

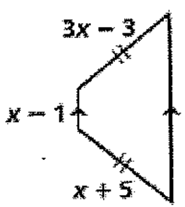
6.



∡1=67
∡2=113

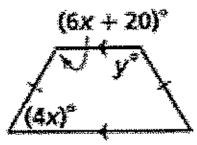
Algebra **Find the value(s) of the variable(s) in each isosceles trapezoid.**

7.



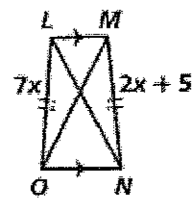
x=4

8.



x=16
y=116

9.



x=1

Geometry Unit 5 Day 4 The trapezoid midsegment theorem

Students will use the trapezoid midsegment theorem to solve problems.

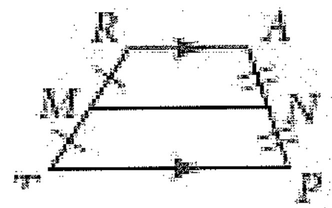
1. Complete Glass Ceiling as review

The midsegment of a trapezoid joins the midpoints of the nonparallel opposite sides.

2 properties

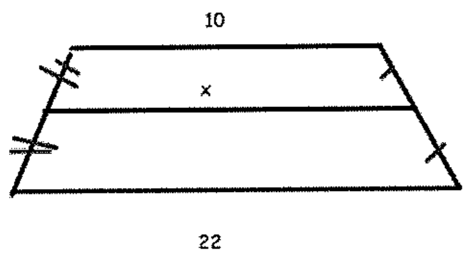
a. parallel to the bases

b. Length if half the sum of the lengths of the bases.



$$\overline{MN} \parallel \overline{TP}, \overline{MN} \parallel \overline{RA}, \text{ and } MN = \frac{1}{2}(TP + RA).$$

2. Find the value of x in each.



$X = \frac{1}{2}(10+22)$

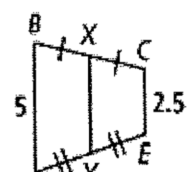
$X = \frac{1}{2}(32)$

$X = 16$

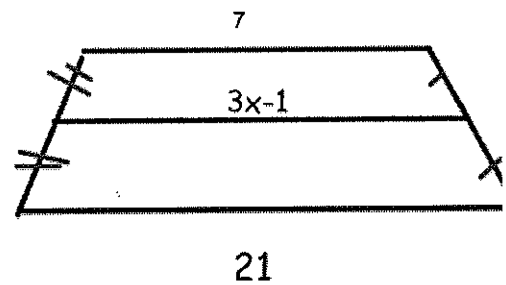
Geometry Unit 5 Day 3 HW

Find XY in each trape

11.



$XY = 3.75$



$\frac{1}{2}(7+21) = 3x-1$

$\frac{1}{2}(28) = 3x-1$

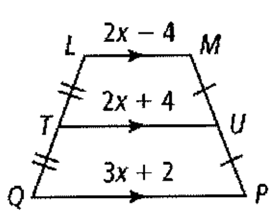
$14 = 3x-1$

$15 = 3x$

$5 = x$

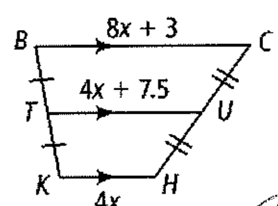
Algebra Find the lengths of the segments with variable expressions.

15.



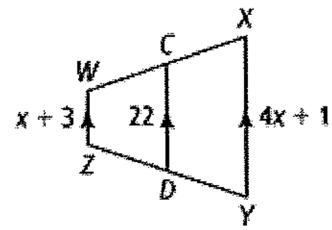
$x = 10$

16.



$x = 3$

17. $\overline{CD}$ is the midsegment of trapezoid *WXYZ*.



a. What is the value of *x*? 8

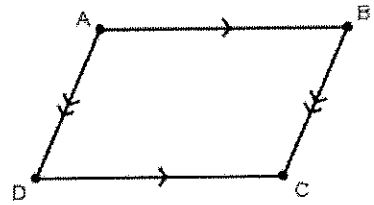
b. What is *XY*? 33

c. What is *WZ*? 11

Geometry Unit 5 Day 5 Parallelograms

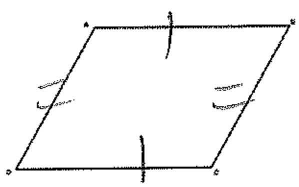
Learning Target – Students will use the properties of parallelograms to solve problems.

Parallelogram - A quadrilateral with both pairs of opposite sides parallel.



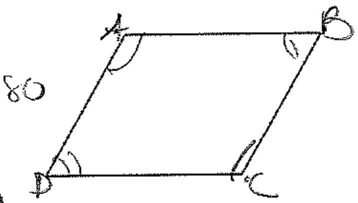
Use markings or equations to illustrate/represent the 4 Properties of parallelogram:

- 2 pairs of opposite sides of a parallelogram are congruent.

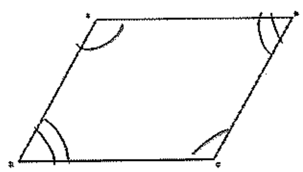


- Consecutive angles of a parallelogram are supplementary.

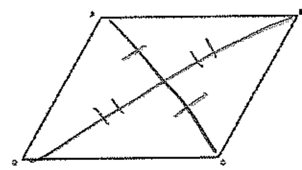
$\measuredangle A + \measuredangle B = 180$
$\measuredangle B + \measuredangle C = 180$
$\measuredangle C + \measuredangle D = 180$
$\measuredangle D + \measuredangle A = 180$



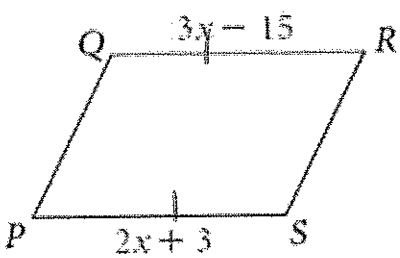
- 2 pairs of opposite angles of a parallelogram are congruent.



- The diagonals of a parallelogram bisect each other.

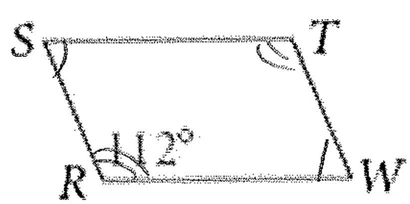


1. PQRS is a parallelogram. Find the value of x.



$3x - 5 = 2x + 3$
$x = 8$

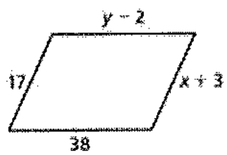
2. STWR is a parallelogram. Find the measure of each angle.



$\measuredangle S = 68° = \measuredangle W$
$\measuredangle T = 112°$

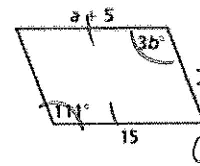
In Exercises 1–4, find the value of each variable in the parallelogram.

1.



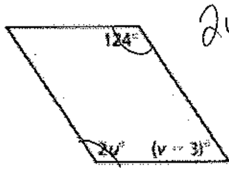
$y - 2 = 38$
$y = 40$
$x + 3 = 17$
$x = 14$

2.



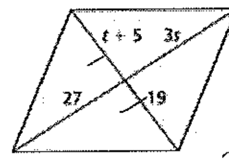
$111 = 3b$
$37 = b$
$a + 5 = 15$
$a = 10$

3.



$2u = 124$
$u = 62$
$124 + v - 3 = 180$
$v + 121 = 180$
$v = 59$

4.

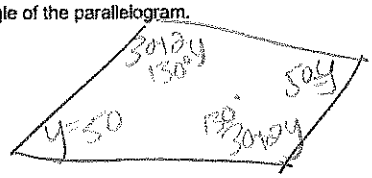


$t + 5 = 19$
$t = 14$
$3s = 27$
$s = 9$

5. The measure of one interior angle of a parallelogram is 30 degrees more than two times the measure of another angle. Draw a diagram and label missing angles with expressions. Then find the measure of each angle of the parallelogram.

x = one ∠
y = another ∠

$x = 30 + 2y$



$30 + 2y + y = 180$
$30 + 3y = 180$
$3y = 150$
$y = 50$
$50, 50, 130°, 130°$

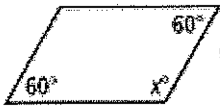
Summary – parallelogram properties

1. Opposite sides are congruent
2. Opposite angles are congruent
3. Consecutive angles are supplementary
4. Diagonals bisect each other

Geometry Unit 5 Day 5 HW

Find the value of x in each parallelogram.

1.

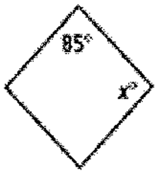


120°

2.

65°

3.



95

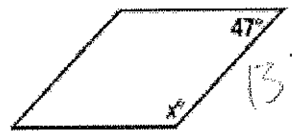
4.

145

5.

153°

6.



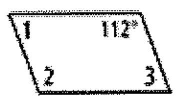
133°

Find the measures of the numbered angles for each parallelogram.

17.

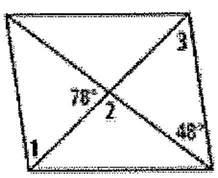
∡1 = 105°
∡2 = 75

18.



∡1 = ∡3 = 68°
∡2 = 112°

19.

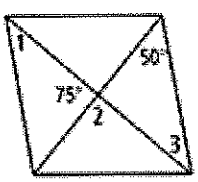


∡2 = 102
∡1 = ∡3 = 54°

20.

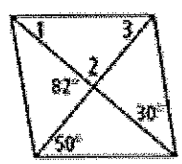
∡1 = ∡2 = 60°

21.



∡1 = ∡3 = 55°
∡2 = 105°

22.

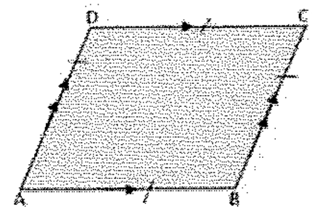


∡2 = 98°
∡3 = 50°
∡1 = 32°

Geometry Unit 5 Day 6 Rectangles, Rhombi, and squares

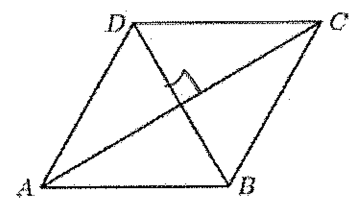
Learning Target – Students will use properties of rectangles, rhombi, and squares to solve problems.

<u>Rombus</u> - A parallelogram with 4 congruent sides.

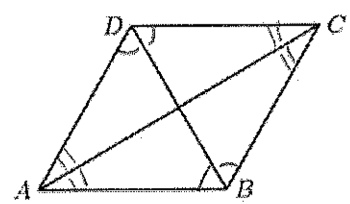


Use markings or equations to illustrate/represent the 2 Properties of rhombus:

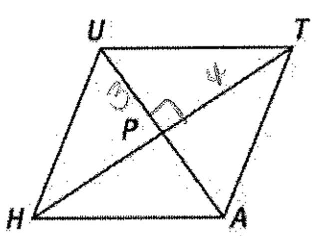
- The diagonals of a rhombus are perpendicular.



- The diagonals of a rhombus bisect the opposite angles.



UTAH is a rhombus.



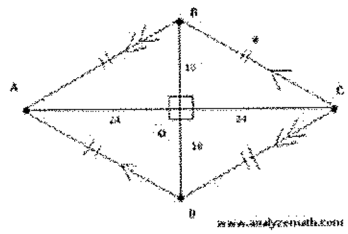
1. Solve for x if $m\angle UPT = 4x + 18$.

$4x+18=90$
$4x=72$
$x=18$

2. If UP =3, PT=4, Find UT.

$a^2+b^2=c^2$
$3^2+4^2=UT^2$
$9+16=UT^2$
$25=UT^2$
$5=UT$

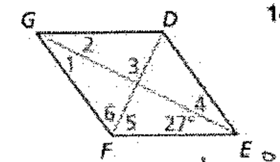
1. ABCD is a rhombus, solve for a



$18^2 + 24^2 = a^2$
$900 = a^2$
$30 = a$

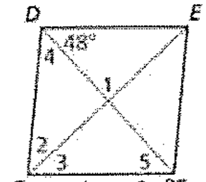
In Exercises 13–16, find the measures of the numbered angles in rhombus *DEFG*. *(See Example 3.)*

13.



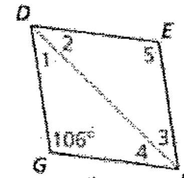
$\measuredangle 4 = \measuredangle 2 = \measuredangle 1 = 27°$
$\measuredangle 3 = 90°$
$\measuredangle 6 = \measuredangle 5 = 63°$

14.



$\measuredangle 1 = 90°$
$\measuredangle 4 = \measuredangle 5 = 48°$
$\measuredangle 2 = \measuredangle 3 = 42°$

15.

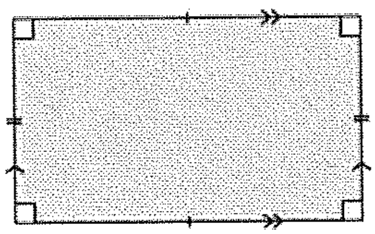


$\measuredangle 5 = 106°$
$\measuredangle 1 = \measuredangle 2 = \measuredangle 3 = \measuredangle 4 = 37°$

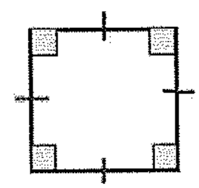
17. If the perimeter of rhombus ABCD is 68, what is the length of each side?

$68/4 = 17$

Rectangle - A parallelogram with 4 right angles.



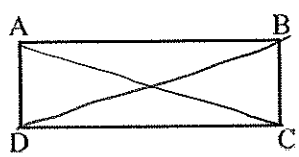
Square - A parallelogram with 4 congruent sides and 4 right angles.



- All properties of parallelograms, rectangles, and rhombus apply. (10 properties total)
  - Parallelogram
    - opp. sides ∥
    - opp side ≅
    - opp ∡s ≅
    - Consecutive ∡s supplementary
    - Diagonals bisect eachother
  - Rhombus
    - Diagonals bisect opposite ∡s
    - 4 ≅ sides
    - Diagonals are ⊥.
  - Rectangle
    - the diagonals are ≅
    - 4 right ∡s

Use markings or equations to illustrate/represent the new property of a rectangle:

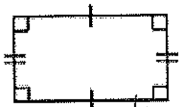
- The diagonals of a rectangle are congruent.



$\overline{AC} \cong \overline{DB}$

Geometry Unit 5 Day 6 HW

Decide whether the parallelogram is a *rhombus*, a *rectangle*, or a *square*. Explain.

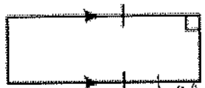
1.

rectangle

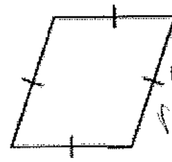
2.

square

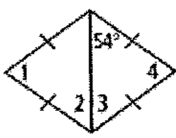
3.

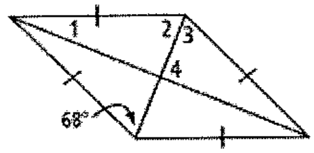
rhombus

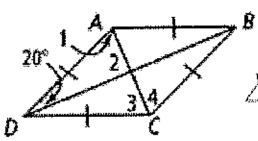
4.

rectangle

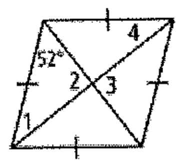
5.

rhombus

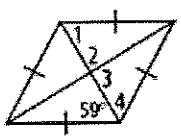
Find the measures of the numbered angles in each rhombus.

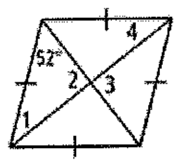
6.

$\angle 1 = \angle 4 = 36^\circ$
$\angle 2 = 54^\circ$
$\angle 3 = 54^\circ$

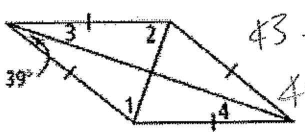
7.

$\angle 2 = \angle 3 = 68^\circ$
$\angle 4 = 90^\circ$
$\angle 1 = 22^\circ$

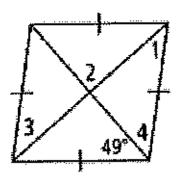
8.

$\angle 2 = 90^\circ$
$\angle 1 = \angle 3 = \angle 4 = 70$

9.

$\angle 2 = \angle 3 = 90^\circ$
$\angle 1 = \angle 4 = 38^\circ$

10.

$\angle 2 = \angle 3 = 90^\circ$
$\angle 1 = \angle 4 = 59^\circ$

11.

$\angle 2 = \angle 3 = 90^\circ$
$\angle 4 = \angle 1 = 38^\circ$

12.

$\angle 3 = \angle 4 = 39^\circ$
$\angle 1 = \angle 2 = 51^\circ$

13.

$\angle 2 = 90^\circ$
$\angle 4 = 49^\circ$
$\angle 1 = \angle 3 = 41^\circ$

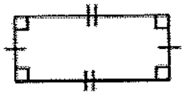
Determine the most precise name for each quadrilateral.

20.

pgram

21.

square

21.

rectangle

23.

rhombus

Geometry Unit 5 Day 7 Proving a figure is a parallelogram

Learning Target – Students will prove a figure is a parallelogram.

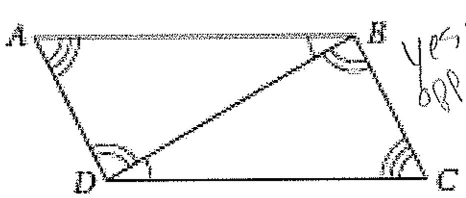
In addition to the definition of a parallelogram – both pairs of opposite sides are congruent, there are 4 other ways to prove a figure is a parallelogram.

1. If the diagonals bisect each other, then the figure is a parallelogram.
2. If both pairs of opposite sides are congruent, then the figure is a parallelogram.
3. If both pairs of opposite angles are congruent, then the figure is a parallelogram.
4. If one pair of opposite sides is both congruent and parallel, then the figure is a parallelogram.

Can you prove the quadrilateral is a parallelogram from what is given? Explain.

a. Given: $\angle ABD \cong \angle CDB$, $\angle BDA \cong \angle DBC$, $\angle A \cong \angle C$

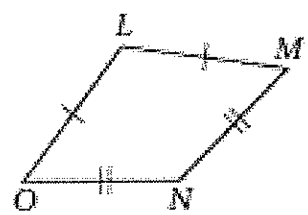
Prove: $ABCD$ is a parallelogram.



yes
opp $\angle$s
$\cong$

b. Given: $\overline{LM} \cong \overline{LO}$, $\overline{NM} \cong \overline{ON}$

Prove: $LMNO$ is a parallelogram.

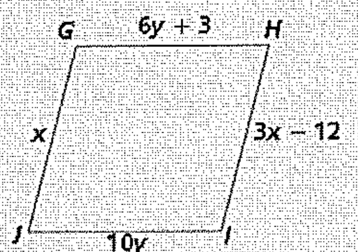


NO

1.

Find the values of the variables for which *GHIJ* must be a parallelogram.

1.

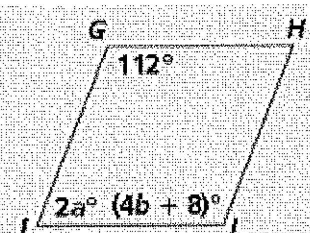


$x = 3x - 12$
$-2x = -12$
$x = 6$
$6y + 3 = 10y$
$3 = 4y$
$3/4 = y$

2.

Find the values of the variables for which *GHIJ* must be a parallelogram.

2.

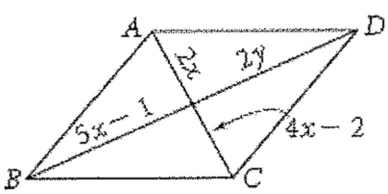


$112 = 4b + 8$
$104 = 4b$
$26 = b$

$2a + 112 = 180$
$2a = 68$
$a = 34$

3. **Find the values of x and y for which $ABCD$ must be a parallelogram.**

8.

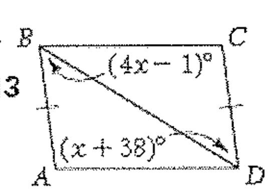


$2x = 4x - 2$
$-2x = -2$
$x = 1$

$5(1) - 1 = 2y$
$4 = 2y$
$2 = y$

4. **Find the values of the variables that will make *ABCD* a parallelogram.**

6.



13

$4x - 1 = x + 38$
$3x = 39$
$x = 13$

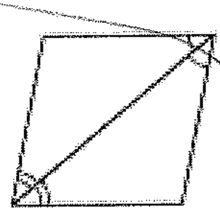
Proving that a figure is a special parallelogram

If you know a figure is a parallelogram then you may be able to prove that it is a rectangle, rhombus or square.

1. If one diagonal of a parallelogram bisects two angles, then the parallelogram is a rhombus.
2. If the diagonals are perpendicular, then the parallelogram is a rhombus.
3. If the diagonals are congruent, then the parallelogram is a rectangle.
4. If you can show the parallelogram is both a rhombus and a rectangle, then it is a square.

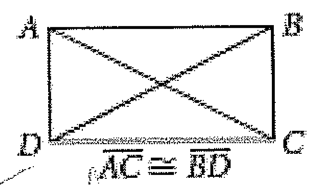
Can you conclude that the parallelogram is a rhombus or a rectangle? Explain.

a.



Rhombus

b.

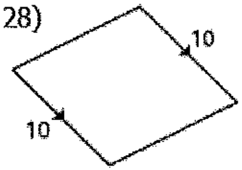


Rectangle

Proofs and Practice for Activity 16

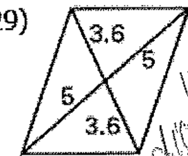
Can you prove that the quadrilateral is a parallelogram based on the the given information? Explain

28)



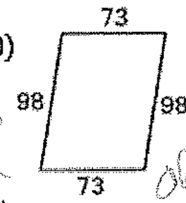
yes 1 pair of opp sides both ≅ + ∥

29)



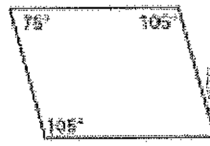
yes, diagonals bisect each other

30)



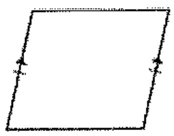
yes Both pairs of opp sides are ≅

31)



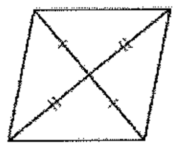
yes both pairs of opp ∠s ≅

1.



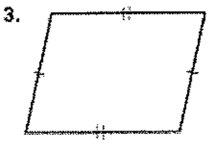
yes

2.



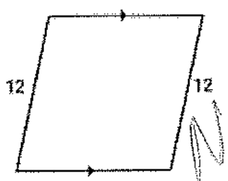
yes

3.



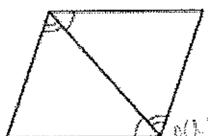
yes

4.



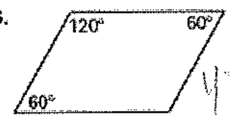
NO

5.



yes Both pairs opp sides are ∥

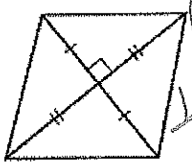
6.



yes

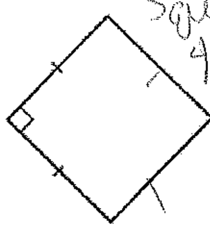
Each figure is a parallelogram. Identify the special type and explain your reasoning.

1.



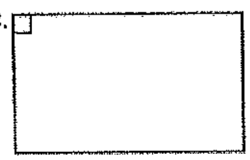
Rhombus ⊥ diagonals

2.



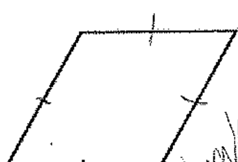
Square 4 ≅ sides 4 rights ∠s

3.



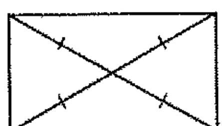
rectangle right ∠s

4.



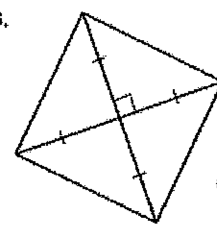
yes Rhombus if it's a pgram, the opp sides are ≅ all 4 sides are ≅ here

5.



Rectangle ≅ diagonals

6.



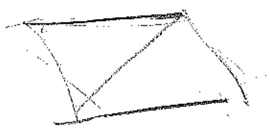
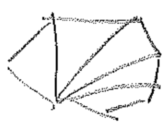
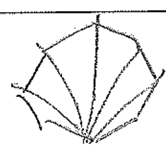
⊥ diagonals + ≅ diagonals square

Geometry Unit 5 Day 8 Polygon Angle Sums

Angles of a Convex Polygon investigation

1. Complete the following table for each polygon. Choose one vertex and make all possible diagonals from that vertex.

Add clum

Polygon	Diagram: including drawn diagonals	Number of Sides	Number of Triangles	Sum of the Measures of the Interior Angles of the Polygon
Quadrilateral		4	2	360
Pentagon		5	3	540
Hexagon		6	4	720
Heptagon		7	5	900
Octagon		8	6	1080
n-gon		n	n-2	**Formula:** 180(n-2)

2. Look for a pattern in the measures of the interior angles. How do they relate to the number of triangles in the polygon?

   180 × # of △s

3. How does the measures of the interior angles relate to the number of sides of the polygon?

   (n-2) 180

4. What formula could you use to find the sum of the measures of the interior angles of a n sided polygon? Explain why this formula works. Fill in the n-gon row of the table based on your formula.

$(n-2)180$

5. Use the formula you found for the **n-gon** and find the sum of the interior angles for the following polygons.

   a) Decagon
   $(10-2)180$
   1440

   b) Dodecagon
   $(12-2)180$
   1800

   c) 20-gon
   $(20-2)180$
   3240

6. Find the number of sides of a polygon which has an interior angle sum of 2,340°

$2340=(n-2)180$
$n=15$

7. Find the number of sides of a polygon which has an interior angle sum of 4,500°

$4500=(n-2)180$
27

8. A **regular polygon** is both equiangular and equilateral. Assume each polygon is regular. Add and complete a column to your table titled "measure of each interior angle."

9. Write a formula you could use to find the measure of each individual angle of a polygon with n sides.

$\frac{(n-2)180}{n}$

10. Find the measure of <u>**each interior angle**</u> for the following regular polygons:

   a) Decagon
   $\frac{1440}{10}=144$

   b) 15-gon
   $\frac{(15-2)180}{15}=156$

   c) 20-gon
   $\frac{3240}{20}=162$

11. If the measure of each interior angle of a regular polygon is 160°, find the number of sides of the polygon.

$160=\frac{(n-2)180}{n}$

$160n=180n-360$
$-20n=-360$
$n=18$

12. *An **exterior angle** is formed adjacent to each interior angle by extending one side of each vertex of the polygon.*

13.

SHAPE	LINEAR PAIRS	TOTAL (interior & exterior)	SUM of INTERIOR (n - 2)180	SUM of EXTERIOR (TOTAL - interior
Triangle	3	540	180	540-180 =360
Quadrilateral	4	720	360	360
Pentagon	5	900	540	360
Hexagon	6	1080	720	360
N-gon	N	(n-2)180+360	(n-2)180	360

CHECKPOINT:

1. The sum of the EXTERIOR ANGLES of a polygon is always ___360___.

2. What is the relationship between the number of exterior angles and number of sides?

they are =

3. What is the sum of the exterior angles of a polygon that has 387 sides? 360°

4. What is the measure of an exterior angle if it is adjacent to an interior angle of a polygon that measures 120º? 60°

MEASURE of EACH EXTERIOR ANGLE of a REGULAR polygon

REGULAR POLYGON: *a polygon with all sides and angles congruent*

Number of Sides of a Regular Polygon	3	4	5	6	7	15
Sum of Measures of Exterior Angles	360°	360°	360°	360°	360°	360°
Measure of Each Exterior Angle	120°	90°	72°	60°	51.43°	24

Questions:

1. If all the interior angles are congruent in a regular polygon, what does it tell you about the exterior angles? also $\cong$

2. If the sum of the exterior angles is always 360 degrees, how do you find the measure of EACH exterior angle?

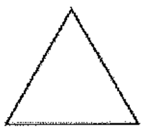
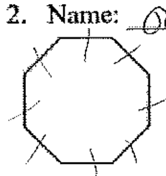
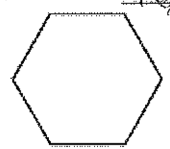
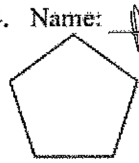
$$\frac{360}{n}$$

3. Fill in the last space in the chart. (show work below)

4. Derive the formula to find the measure of each exterior angle of an n-gon.

$$\frac{360}{n}$$

Geometry Unit 10 Day 8 HW

1. Name: triangle  Sum of Interior ∠'s: 180 One Interior ∠: 60 Sum of Exterior ∠'s: 360 One Exterior ∠: 120	2. Name: octagon  Sum of Interior ∠'s: 1080 One Interior ∠: 135 Sum of Exterior ∠'s: 360 One Exterior ∠: 45	3. Name: hexagon  Sum of Interior ∠'s: 720 One Interior ∠: 120 Sum of Exterior ∠'s: 360 One Exterior ∠: 60
4. Name: pentagon  Sum of Interior ∠'s: 540 One Interior ∠: 108 Sum of Exterior ∠'s: 360 One Exterior ∠: 72	5. Nonagon Sum of Interior ∠'s: 1260 One Interior ∠: 140 Sum of Exterior ∠'s: 360 One Exterior ∠: 40	6. Dodecagon Sum of Interior ∠'s: 1800 One Interior ∠: 150 Sum of Exterior ∠'s: 360 One Exterior ∠: 30

7. If the sum of the interior angles of a regular polygon is 900°, find the number of sides.

$900 = (n-2)180$
$n = 7$

8. If the measure of one interior angle of a regular polygon is 144°, find the number of sides.

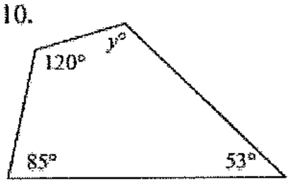
$144 = \frac{(n-2)180}{n}$
$144n = 180n - 360$
$-36 = -360$
$n = 10$

9. If the measure of one interior angle of a regular polygon is 160°, find the number of sides.

$160 = \frac{(n-2)180}{n}$
$160n = 180n - 360$
$-20n = -360$
$n = 18$

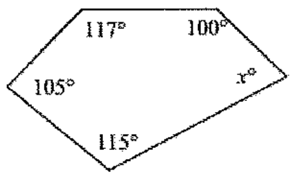
Find the value of each variable.

10.



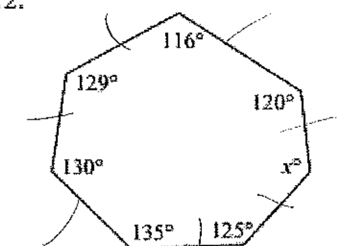
102

11.



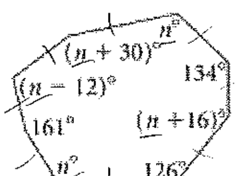
$X = 103$

12.



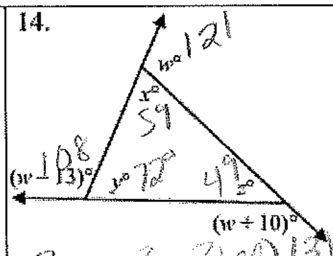
$X = 145°$

13.



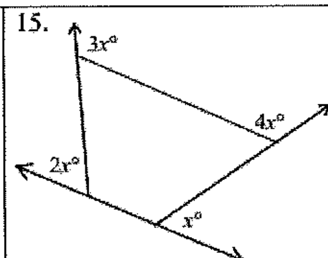
$n + 5n + 455 = 1080$
$n = 125$

14.



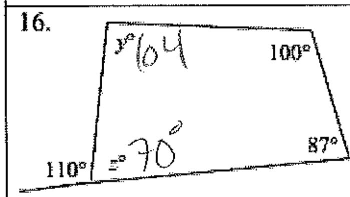
$3w - 3 = 360$ 121
$3w = 363$
$w = 121$

15.

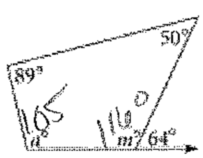


$10x = 360$
$x = 36$

16.



17.



18.