I can define, identify and illustrate the following terms:

- Polygon
- Regular Polygon
- Irregular Polygon
- Concave
- Convex
- Quadrilateral
- Pentagon
- Hexagon
- Heptagon
- Octagon
- Nonagon
- Decagon
- Dodecagon
- n-gon
- Parallelogram
- Rhombus
- Diagonal
- Kite
- Isosceles trapezoid

Naming and Classifying Polygons

☐ I can name polygons
☐ I can classify polygons

Practice: Complete Vocabulary Worksheet

Angles in Polygons

☐ I can find the sum of the measures of the interior angles in a polygon.
☐ I can find the sum of the measures of the exterior angles in a polygon.
☐ I can determine the polygon given the sum of the interior angles.
☐ I can determine the regular polygon given the measure of one interior angle or one exterior angle.

Practice: Angles in Polygons Practice Part 1

Properties of Parallelograms and Special Parallelograms

☐ I can state the properties of a parallelogram
☐ I can state the properties of the different special parallelograms
☐ I can compare and contrast the properties of a parallelogram, rectangle, rhombus, and square.

Practice: Angles in Polygons Practice Part 2

Properties of Parallelograms and Special Parallelograms

☐ I can state the properties of a parallelogram
☐ I can state the properties of the different special parallelograms
☐ I can compare and contrast the properties of a parallelogram, rectangle, rhombus, and square.

Practice: Quadrilaterals Properties Homework
Monday, 2/4

Using Properties of Parallelograms and Special Parallelograms

- I can use the properties of a parallelogram to solve problems
- I can use the properties of the different special parallelograms to solve problems.
- I can use the relationships of the special parallelograms and parallelograms to answer questions.

PRACTICE: Using Properties of Parallelograms Worksheet #1-24

Tuesday, 2/5

Using Properties of Parallelograms and Special Parallelograms

- I can use the properties of a parallelogram to solve problems
- I can use the properties of the different special parallelograms to solve problems.
- I can use the relationships of the special parallelograms and parallelograms to answer questions.

PRACTICE: Using Properties of Parallelograms Worksheet #25-39

Wednesday or Thursday, 2/6 – 2/7

Proving and Constructing Parallelograms and Special Parallelograms

- I can prove that a quadrilateral is a parallelogram, rectangle, rhombus, or square.
- I can justify that 4 points on a coordinate plane create a parallelogram, rectangle, rhombus, or square.
- I can recognize the construction of parallel lines and perpendicular lines used to create a specific quadrilateral.

PRACTICE: Quadrilaterals in a Coordinate Plane Worksheet

Friday, 2/8

Properties of Kites and Trapezoids

- I can use the properties of a kite to solve problems.
- I can use the properties of a trapezoid or isosceles trapezoid to solve problems.

PRACTICE: Trapezoids and Kites Assignment #1

Monday, 2/11

Properties of Kites and Trapezoids

- I can use the properties of a kite to solve problems.
- I can use the properties of a trapezoid or isosceles trapezoid to solve problems.
- I can prove that a quadrilateral is a kite, trapezoid, or isosceles trapezoid.
- I can justify that 4 points on a coordinate plane create a kite, trapezoid, or isosceles trapezoid.

PRACTICE: Trapezoids and Kites Assignment #2

Tuesday, 2/12

Review

PRACTICE: Review Worksheet

Wednesday or Thursday, 2/13 – 2/14

Test #9: Polygons and Quadrilaterals
Describe the following vocabulary terms based on the given examples.

Polygons | Non - Polygons
---|---
Convex | Concave

Irregular Polygons : ___________________________________________
Vocabulary Assignment

1) Tell why each shape is or is not a polygon. If it is a polygon, name it by the sides.

A.   B.   C.   D.

2) Tell why each shape is regular or irregular.

A.   B.   C.   D.

3) Tell why each shape is convex or concave.

A.   B.   C.   D.

4) Draw the following, or tell why it cannot be drawn.

A. Concave equilateral pentagon   B. Concave trapezoid
C. Irregular Equilateral triangle   D. Convex irregular heptagon

5) Tell whether each statement is Always, Sometimes, or Never true.
   A. An equiangular triangle is a regular convex polygon
   B. A convex pentagon is a regular polygon
   C. A equilateral dodecagon is equiangular
   D. A concave polygon is irregular.
   E. Regular octagons are similar polygons.
   F. A dodecagon has 12 sides.
   G. A nine sided polygon is a nonagon.

6) As the number of sides increases in a regular polygon, what geometric shape does it approach?

7) If 2 polygons are similar, then what is true about their angles and their sides?
<table>
<thead>
<tr>
<th>Name of polygon</th>
<th>Number of Sides</th>
<th>Number of Diagonals from a vertex</th>
<th>Number of triangles in polygon</th>
<th>Sum of interior angles</th>
<th>Measure of one interior angle (Regular Only)</th>
<th>Measure of one exterior angle (Regular Only)</th>
<th>Sum of exterior angles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triangle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quadrilateral</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pentagon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hexagon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heptagon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Octagon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonagon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decagon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$n$-gon</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Angles in Polygons – Assignment Part 1

I. Fill in the chart for the regular polygons.

<table>
<thead>
<tr>
<th>Polygon</th>
<th>Sum of Interior ∠’s</th>
<th>Each Interior ∠’s</th>
<th>Sum of Exterior ∠’s</th>
<th>Each Exterior ∠’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>octagon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>heptagon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-gon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pentagon</td>
<td></td>
<td></td>
<td></td>
<td>1440°</td>
</tr>
<tr>
<td>12-gon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-gon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hexagon</td>
<td></td>
<td></td>
<td></td>
<td>40°</td>
</tr>
<tr>
<td>36-gon</td>
<td></td>
<td>60°</td>
<td></td>
<td>90°</td>
</tr>
<tr>
<td>72-gon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

II. Solve the following word problems.
1) If the sum of the interior angles is 1980°, what is the name of the polygon?

2) If each of the exterior angles is 15°, what is the name of the polygon?

3) If each of the interior angles is 108°, what is the name of the polygon?

4) If it is a decagon, what is the sum of the exterior angles?

5) If the sum of the interior angles is 3600°, what is the name of the polygon?

6) If each of the exterior angles is 24°, what is the name of the polygon?

7) If each of the interior angles is 135°, what is the name of the polygon?

8) If each of the exterior angles is 60°, what is the name of the polygon?

9) If each interior angle is 160°, what is the name of the polygon?

Find the value of x in each of the following.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 10. \( x = \) | \[
\begin{align*}
(6x-58)^\circ & \quad (2x+4)^\circ \\
\end{align*}
\] |
|   |   |
| 11. \( x = \) | \[
\begin{align*}
105^\circ & \quad x^\circ \\
85^\circ & \quad 126^\circ \\
114^\circ & \quad 126^\circ \\
\end{align*}
\] |
|   |   |
| 12. \( x = \) | \[
\begin{align*}
130^\circ & \quad 130^\circ \\
90^\circ & \quad x^\circ \\
130^\circ & \quad 120^\circ \\
\end{align*}
\] |
|   |   |
| 13. \( n = \) | \[
\begin{align*}
5n^\circ & \quad 4n^\circ \\
R^n & \quad S^n \\
T^n & \quad 2n^\circ \\
\end{align*}
\] |
Angles in Polygons – Assignment Part 2

The sum of the interior angles of a polygon is the same as the sum of its exterior angles. What type of polygon is it?

A quadrilateral
B hexagon
C octagon
D decagon

The measures of the interior angles of a pentagon are $2x, 6x, 4x - 6, 2x - 16,$ and $6x + 2$. What is the measure, in degrees, of the largest angle?

A 28
B 106
C 170
D 174

A regular polygon has 12 sides. What is the measure of each exterior angle?

A 15°
B 30°
C 45°
D 60°

What is the measure of an exterior angle of a regular hexagon?

A 30°
B 60°
C 120°
D 180°

If the measure of an exterior angle of a regular polygon is 120°, how many sides does the polygon have?

A 3
B 4
C 5
D 6

Which equation could best be used to determine the value of $x$?

A $120° + 110° + x° + 135° + 155° + x° = 720°$
B $120° + 110° + x° + 135° + 155° + x° = 540°$
C $120° + 110° + x° + 135° + 155° + x° = 360°$
D $120° + 110° + x° + 135° + 155° + x° = 180°$

For the quadrilateral shown below, what is $m∠a + m∠c$?

A 53°
B 137°
C 180°
D 233°

What is $m∠1$?

A 34°
B 56°
C 64°
D 92°
Find the value of $r$. 

Three interior angles of a convex heptagon measure $125^\circ$, and two of the interior angles measure $143^\circ$. Which are possible measures for the other two interior angles of the heptagon?

- F $48^\circ$ and $48^\circ$
- H $100^\circ$ and $116^\circ$
- G $39^\circ$ and $100^\circ$
- J $89^\circ$ and $150^\circ$

For which polygon does the sum of the measures of the interior angles equal the sum of the measures of the exterior angles?

- (1) hexagon
- (2) pentagon
- (3) quadrilateral
- (4) triangle

A pentagon has two exterior angles that measure $(3x)^\circ$, two exterior angles that measure $(2x + 22)^\circ$, and an exterior angle that measures $(x + 41)^\circ$. If all of these angles have different vertices, what are the measures of the exterior angles of the pentagon?

What is the measure of $\angle GCD$?

Find the measure of $\angle RKL$.

- A $34^\circ$
- B $68^\circ$
- C $86^\circ$
- D $148^\circ$
- F $123^\circ$
- G $116^\circ$
- H $73^\circ$
- J $29^\circ$
Quadrilaterals Discovery

Use the 4 figures and patty paper to answer the following questions. There may be more than one answer to each question. ALWAYS LIST ALL THAT APPLY.

1. Which of these figures have congruent sides? How do you know they are congruent? Which sides are congruent? State the congruencies.

2. Which of these figures have congruent corner angles? How do you know they are congruent? Which angles are congruent? State the congruencies.

3. Are there any other angles in each figure that are congruent? How do you know they are congruent? State all congruent pairs.

4. Which of these figures have right angles in the corners? How do you know they are right angles? Are all corners right angles in these figures, or just some?

5. Which of these figures have bisected diagonals? How do you know they are bisected? Which pieces are congruent? State the congruencies.

6. Which of these figures have congruent diagonals? How do you know they are congruent? State the congruencies?
7. Which of these figures have bisected corner angles? How do you know they are bisected? State the congruencies.

8. Which of these figures have perpendicular diagonals? How do you know they are perpendicular?

9. Which of these figures have congruent triangles in them? Is there more than one pair of congruent triangles? List all congruent triangle pairs for each figure? How do you know they are congruent (which theorem did you use – SSS, SAS, ASA, AAS, HL)?

10. List all segment addition and angle addition equations for each figure. (Part + Part = whole)

SUMMARY:
Figure 1: Type of quadrilateral ____________________________
List of properties that apply to figure 1:

Figure 2: Type of quadrilateral ____________________________
List of properties that apply to figure 2:

Figure 3: Type of quadrilateral ____________________________
List of properties that apply to figure 3:

Figure 4: Type of quadrilateral ____________________________
List of properties that apply to figure 4:
Quadrilaterals Examples (in PPT):

1. In $\square\ CDEF$, $DE = 74$ mm, $DG = 31$ mm, and $m\angle FCD = 42^\circ$.
   Find $CF$.
   Find $m\angle EFC$.

2. $WXYZ$ is a parallelogram.
   Find $YZ$.
   Find $m\angle Z$.

3. $EFGH$ is a parallelogram.
   Find $FH$.

4. Carpentry The rectangular gate has diagonal braces.
   Find $HJ$.
   Find $HK$.

5. $TVWX$ is a rhombus.
   Find $TV$.
   Find $m\angle VZT$.
   Find $m\angle VTZ$. 
Quadrilateral Properties HW

Answer each of the following questions.
1. If a property is true in a square, what other figure(s) must it be true in?
2. If a property is true in a rectangle, what other figure(s) must it be true in?
3. If a property is true in a rhombus, what other figure(s) must it be true in?
4. If a property is true in a parallelogram, what other figure(s) must it be true in?
5. If a figure is a rectangle, what else MUST it be?
6. If a figure is a parallelogram, what else MUST it be?
7. If a figure is a square, what else MUST it be?
8. If a figure is a rhombus, what else MUST it be?

Tell whether the following are true or false. If false, state or draw a counterexample.
9. A square is always a parallelogram.

10. A parallelogram is always a square.
11. A rectangle is always a rhombus.
12. A rhombus can never be a square.
13. Every rectangle is also a square.
14. Every parallelogram is regular.
15. A rhombus is always irregular.
For each shape, finish the statements.

Parallelogram

\[ \overline{XW} \equiv \quad \overline{XY} \equiv \quad \overline{XV} \equiv \quad \overline{WV} \equiv \quad \]
\[ XV + VZ = \quad WY - WV = \quad \]
\[ m\angle WXY = \quad m\angle WXY + m\angle XWZ = \quad \]

Rectangle

\[ RS \equiv \quad SP \equiv \quad QZ \equiv \quad PR \equiv \quad \]
\[ QZ + SZ = \quad PR - ZR = \quad m\angle QZR = \quad \]
\[ m\angle PQR = \quad m\angle PQZ + \quad = m\angle PQR \quad \]
\[ \triangle QPS \equiv \quad \triangle QZR \equiv \quad \]

Rhombus

\[ \overline{XW} \equiv \quad \overline{XY} \equiv \quad \overline{XZ} \equiv \quad \overline{WZ} \equiv \quad \]
\[ XZ + VZ = \quad WY - \quad = WZ \quad = 90^\circ \quad \]
\[ m\angle WXY = \quad m\angle WXY + m\angle XWV = \quad \]
\[ m\angle VWZ = \quad \triangle WZV \equiv \quad \triangle WYV \equiv \quad \]

Square

\[ QR \equiv \quad QP \equiv \quad QT \equiv \quad QS \equiv \quad \]
\[ QT + \quad = QS \quad RP - TR = \quad \quad = 90^\circ \quad \]
\[ m\angle PQR = \quad m\angle QPT + \quad = m\angle QPS \quad \]
\[ m\angle QRT = \quad \triangle QTR \equiv \quad \triangle RQP \equiv \quad \]
USING QUADRILATERAL PROPERTIES

Properties of a parallelogram:

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

EXAMPLE 1
Complete each statement regarding the parallelogram below.

a) Name the parallelogram:__________

b) \( AB \parallel \) ________

c) \( DA \cong \) ________

d) \( \angle CDA \cong \) ________

e) \( DE \cong \) ________

EXAMPLES
For each parallelogram, find the values of ‘x’, ‘y’, and ‘z’.

2.

\[
\begin{array}{c}
\begin{array}{c}
80^\circ \\
\hline
\end{array}
\end{array}
\quad
\begin{array}{c}
\begin{array}{c}
x^\circ \\
\hline
\end{array}
\end{array}
\quad
\begin{array}{c}
\begin{array}{c}
y^\circ \\
\hline
\end{array}
\end{array}
\end{array}
\]

\[ x = \quad ; \; y = \quad ; \; z = \quad \]

3.

\[
\begin{array}{c}
\begin{array}{c}
120^\circ \\
\hline
\end{array}
\end{array}
\quad
\begin{array}{c}
\begin{array}{c}
x^\circ \\
\hline
\end{array}
\end{array}
\quad
\begin{array}{c}
\begin{array}{c}
y^\circ \\
\hline
\end{array}
\end{array}
\end{array}
\]

\[ x = \quad ; \; y = \quad ; \; z = \quad \]

4.

\[
\begin{array}{c}
\begin{array}{c}
30^\circ \\
\hline
\end{array}
\end{array}
\quad
\begin{array}{c}
\begin{array}{c}
70^\circ \\
\hline
\end{array}
\end{array}
\quad
\begin{array}{c}
\begin{array}{c}
x^\circ \\
\hline
\end{array}
\end{array}
\end{array}
\]

\[ x = \quad ; \; y = \quad ; \; z = \quad \]
Properties of a rectangle:

1. Opposite sides are parallel.
2. Opposite sides congruent.
3. Opposite angles congruent.
4. Consecutive angles supplementary.
5. Diagonals bisect each other.
6. Four right angles.
7. Diagonals are congruent.

EXAMPLE 5

Use the rectangle KLMN and the given information to find the following.

\[
\begin{align*}
    m\angle 1 &= 70^\circ & m\angle 6 &= \_\_\_\_\_\_\_ \\
    m\angle 2 &= \_\_\_\_\_\_ & m\angle 7 &= 20^\circ \\
    m\angle 3 &= \_\_\_\_\_\_ & m\angle 8 &= \_\_\_\_\_\_ \\
    m\angle 4 &= \_\_\_\_\_\_ & m\angle 9 &= \_\_\_\_\_\_ \\
    m\angle 5 &= \_\_\_\_\_\_ & m\angle 10 &= \_\_\_\_\_\_ \\
\end{align*}
\]

CN = 15                     KL = 16
CM = _______                KM = _______
CL = _______                KN = _______
CK = _______                NM = _______
NL = _______                LM = _______
Properties of a rhombus:

1. Opposite sides parallel.
2. Opposite sides congruent.
3. Opposite angles congruent.
4. Consecutive angles supplementary.
5. Diagonals bisect each other.
6. Four congruent sides.
7. Diagonals are perpendicular.
8. Diagonals bisect opposite angles.

EXAMPLE 6
Given Rhombus RSTV, if \( \angle RST = 67^\circ \), find \( \angle RSW \).

EXAMPLE 7
Given Rhombus RSTV, find \( \angle SVT \) if \( \angle STV = 135^\circ \).

EXAMPLE 8
In rhombus DLMP, DM = 24, \( \angle LDO = 43^\circ \), and DL = 13. Find each of the following.

a) \( OM = \) _____________

b) \( \angle DOL = \) _____________

c) \( \angle DLO = \) _____________

d) \( \angle DML = \) _____________

e) \( DP = \) _____________
### Properties of a square:

1. Opposite sides parallel.
2. Opposite sides congruent.
3. Opposite angles congruent.
4. Consecutive angles supplementary.
5. Diagonals bisect each other.
6. Four right angles.
7. Diagonals congruent.
8. Four congruent sides.
9. Diagonals are perpendicular.
10. Diagonals bisect opposite angles.

#### EXAMPLE 9

MATH is a square.

- a) If MA = 8, then AT = ________
- b) \( \text{m} \angle \text{HST} = \) ________
- c) \( \text{m} \angle \text{MAT} = \) ________
- d) If HS = 2, then HA = ________ and MT = ________
- e) \( \text{m} \angle \text{HMT} = \) ________
USING THE PARALLELOGRAM PROPERTIES ASSIGNMENT

1. Name the parallelogram: _______________

2. If AD = 10, then BC = _______________

3. If AC = 15, then AX = _______________

4. If m ∠ CDA = 111°, then m ∠ ABC = __________

5. If m ∠ DAB = 69°, then m ∠ ABC = __________

If each quadrilateral is a parallelogram, find the values of ‘x’, ‘y’, and ‘z’.

6. x = __________
   y = __________
   z = __________

7. x = __________
   y = __________
   z = __________

8. x = __________
   y = __________
   z = __________

Use rectangle STUV and the given information to find each measure.

9. m ∠ 3 = __________  If m ∠ 4 = 30°, find m ∠ 3.

10. m ∠ 4 = __________  m ∠ 6 = 57°, what is m ∠ 4?

11. m ∠ 2 = __________  If m ∠ 5 = 16°, what is m ∠ 2.

12. KT = __________  If SK = 15, find KT.

13. SV = __________  If SU = 15 and ST = 12, find SV.

14. TU = __________  If KV = 5 and ST = 8, find TU.
Use rhombus ABCD and the given information to find each value.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15.</td>
<td>$m\angle ACD=$</td>
<td>If $m\angle BAF = 28^\circ$, find $m\angle ACD$.</td>
</tr>
<tr>
<td>16.</td>
<td>$m\angle ABC =$</td>
<td>If $m\angle ACD = 34^\circ$, find $m\angle ABC$.</td>
</tr>
</tbody>
</table>

Use rhombus PQRS and the given information to find each value.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>17.</td>
<td>SQ =</td>
<td>If ST = 13, find SQ.</td>
</tr>
<tr>
<td>18.</td>
<td>$m\angle QRS =$</td>
<td>If $m\angle PRS = 17^\circ$, find $m\angle QRS$.</td>
</tr>
<tr>
<td>19.</td>
<td>$m\angle STR =$</td>
<td>Find $m\angle STR$.</td>
</tr>
</tbody>
</table>

Use the rhombus ABCD and the given information to find each measure.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20.</td>
<td></td>
<td>Find $m\angle BEC$.</td>
</tr>
<tr>
<td>21.</td>
<td></td>
<td>Find $m\angle BCE$.</td>
</tr>
<tr>
<td>22.</td>
<td></td>
<td>Find AC.</td>
</tr>
<tr>
<td>23.</td>
<td></td>
<td>Find $m\angle ABD$.</td>
</tr>
<tr>
<td>24.</td>
<td></td>
<td>Find AD.</td>
</tr>
</tbody>
</table>
25. Which of the following statements describes properties and characteristics of squares?

I. Consecutive angles are supplementary.
II. Diagonals are perpendicular bisectors and angle bisectors.
III. It is the only regular quadrilateral.
IV. Four right isosceles triangles form from the intersection of the diagonals.

A All of the above statements are true.
B II, III, and IV only
C I, III, IV only
D I, II, and III only
E I, II, and IV only

26. Which choice must be true about parallelograms?

A The diagonals are congruent.
B Two pairs of sides are parallel.
C The diagonals are perpendicular bisectors.
D The diagonals are angle bisectors.
E All quadrilaterals are parallelograms.

27. The figure below is rectangle \(ABCD\) with point \(E\) as the intersection of diagonals \(AC\) and \(DB\).

28. Which of the following procedures can be used to find \(m\angle AEB\)?

A Find the complement of \(\angle 1\), multiply the result by 2, and then subtract from 180.
B Find the supplement of \(\angle 5\), divide by 2, and then subtract the result from 180.
C Add \(\angle 1, \angle 3,\) and \(\angle 4\) together. Then subtract the result from 180.
D Add \(\angle 2, \angle 3,\) and \(\angle 5\) together. Then subtract the result from 180.
29. In rhombus $ABCD$, $m\angle DCB$ is $120^\circ$. What is $m\angle ABD$?

A 20°  B 30°  C 60°  D 120°

30. Choose the best counterexample for the conditional statement below:

“If a quadrilateral has a pair of parallel sides and a pair of congruent sides, then the quadrilateral is a parallelogram.”

A  

B  

C  

D  

31. The figure shows Rectangle $ABCD$. What is the length of $AD$ and $DC$?

A $AD = 31$ and $DC = 44$

B $AD = 8$ and $DC = 6$

C $AD = 10$ and $DC = 26$

D $AD = 30$ and $DC = 10$

33. The figure below shows interior angles of a quadrilateral. Find the value of $x$ that would make the figure a parallelogram.

Record your answer in the grid provided.

34. Parallelogram $ABCD$ has coordinates $A(1,5)$, $B(6,3)$, $C(3,-1)$, and $D(-2,1)$. What are the coordinates of $E$, the intersection of diagonals $AC$ and $BD$?

(1) (2,2)  (3) (3,5,2)

(2) (4,5,1)  (4) (−1,3)
35. If $ABCD$ is a parallelogram, what is the length of segment $BD$?

![Diagram of parallelogram with segments labeled] 

A 10  
B 11  
C 12  
D 14

36. Which figure can serve as a counterexample to the conjecture below?

If one pair of opposite sides of a quadrilateral is parallel, then the quadrilateral is a parallelogram.

A rectangle  
B rhombus  
C square  
D trapezoid

37. Quadrilateral $ABCD$ is a parallelogram. If adjacent angles are congruent, which statement must be true?

A Quadrilateral $ABCD$ is a square.  
B Quadrilateral $ABCD$ is a rhombus.  
C Quadrilateral $ABCD$ is a rectangle.  
D Quadrilateral $ABCD$ is an isosceles trapezoid.

38. In parallelogram $ABCD$ shown below, diagonals $AC$ and $BD$ intersect at $E$.

![Diagram of parallelogram with diagonals intersecting] 

Which statement must be true?

(1) $AC \cong DB$  
(2) $\angle ABD = \angle CBD$  
(3) $\triangle AED \cong \triangle CEB$  
(4) $\triangle DCE \cong \triangle BCE$

39. In the diagram below, $MATH$ is a rhombus with diagonals $\overline{AH}$ and $\overline{MT}$.

![Diagram of rhombus with angles labeled] 

If $m\angle HAM = 12\degree$, what is $m\angle AMT$?

(1) 12  
(2) 78  
(3) 84  
(4) 156
### Which Parallelogram Am I?

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$\angle 7 \equiv \angle 8 \equiv \angle 6$</td>
<td>B</td>
<td>$\overline{BE} \equiv \overline{AE}$</td>
</tr>
<tr>
<td>C</td>
<td>$\triangle BEC \equiv \triangle DEA$</td>
<td>D</td>
<td>$m\angle 7 = m\angle 8$</td>
</tr>
<tr>
<td>E</td>
<td>$\overline{AB} \parallel \overline{CD} ; \overline{AB} \perp \overline{BC}$</td>
<td>F</td>
<td>$\angle ABE$ and $\angle CBE$ are complementary $\angle ABC$ and $\angle BEC$ are supplementary</td>
</tr>
<tr>
<td>G</td>
<td>$m\angle 7 = m\angle 4$</td>
<td>H</td>
<td>$m\angle E = 90^\circ$</td>
</tr>
<tr>
<td>I</td>
<td>$\triangle AED$ is an isosceles right triangle.</td>
<td>J</td>
<td>If $\overline{AE} = 9$, then $\overline{DE} = 9$</td>
</tr>
<tr>
<td>K</td>
<td>$E$ is the midpoint of $\overline{BD}$ and $\overline{AC}$</td>
<td>L</td>
<td>$\angle 7 \equiv \angle 3 ; \angle 1 \equiv \angle 5$</td>
</tr>
</tbody>
</table>

### Parallelogram

A parallelogram is a quadrilateral with opposite sides that are equal and parallel.

### Rhombus

A rhombus is a parallelogram with all sides of equal length.

### Rectangle

A rectangle is a parallelogram with all right angles.

### Square

A square is a rectangle with all sides of equal length.
QUADRILATERALS ON THE COORDINATE PLANE

We use ____________ of parallelograms to __________ if it is a square, rectangle, and/or rhombus.

---

**Example:**
* I know a square must have 4 equal sides and all 4 angles are perpendicular.
* I need to find the length of PI, IN, NK, and KP.
* I need to compare the slopes of PI and IN to see if they are perpendicular (negative reciprocals).

**Show work:**
*Distance formula/PT –

**Slopes –**

---

**Rectangle: (draw and label first)**
A. Sides-

B. Angles-

C. Diagonals-

**Show work:**
Use the diagonals to determine whether a parallelogram with the given vertices is a rectangle rhombus, or square. Give all the names that apply.

Example

P(-1, 4), Q (2, 6), R(4, 3), S(1, 1)

Step 1- Graph \(\square{PQRS}\).

Step 2- Find PR and QS to determine if PQRS is a rectangle.

\[
\begin{align*}
PQ &= \quad \\
RS &= \\
\end{align*}
\]

The diagonals are \______________, therefore \(PQRS\) is a \______________.

Step 3- Determine if \(\square{PQRS}\) is a rhombus.

\[
\begin{align*}
\text{Slope of PR} &= \\
\text{Slope of QS} &= \\
\end{align*}
\]

Since \__________, \__________, \(\square{PQRS}\) is a rhombus.

Step 4- Determine if \(\square{PQRS}\) is a square.

Since \(\square{PQRS}\) is a \______________ and a \______________, it has four \___________ angles and four \______________ sides. So \(\square{PQRS}\) is a square by \______________.
YOUR TURN!!! WHOO HOO!!!
W(0, 1), X(4, 2), Y(3, –2), Z(–1, –3)
2. Show that FGHJ is a parallelogram using the following points: (F(-4, -2), G(-2, 2), H(4, 3), and J(2, -1).

3. Rachel graphs a parallelogram with the coordinates A(5,4), B(5, 10), C(9, 8), D(9, 2). What is the coordinates of the point where the diagonals meet?

4. Use the diagonals to determine whether a parallelogram with the given vertices is a rectangle, rhombus, or square. Give all the names that apply.

   P(-5, 2), Q(4, 5), R(6, -1), S(-3, -3)
**Trapezoid and Kite Examples**

**Trapezoid**

Ex. 1 Find $m\angle C$

$$\frac{(8x + 34) \circ}{(7x - 4) \circ}$$

Ex. 2 Find $m\angle F$

Ex. 3 $JN = 10.6$, and $NL = 14.8$. Find $KM$.

Ex. 4 Find the value of $a$ so that $PQRS$ is isosceles.

**Kites**

Ex. 1 Find $KL$

Ex. 2 In kite $PQRS$, $m\angle PQR = 78^\circ$, and $m\angle TRS = 59^\circ$. Find $m\angle QPS$. 

Ex. 5 Find $EF$

Ex. 6. Find $EH$
Trapezoid and Kites Assignment

I. For each shape finish the statements.

\[ \overline{QR} \cong \quad \overline{PS} \cong \quad \overline{PT} \cong \quad \triangle QRT \cong \]
\[ \triangle PTS \cong \]
\[ \overline{QT} \cong \] \( \overline{QR} \parallel \) \[ \overline{RT} \cong \quad \angle RPS \cong \]
\[ \angle RQT \cong \] \[ \angle RT - PT = \] \[ \angle QP + PS = \]
\[ \angle QTS = \] \[ \angle QRS + \angle RST = \]
\[ \overline{AX} \cong \quad \overline{CD} \cong \quad 2(\overline{AX}) = \frac{1}{2} (\overline{CD}) = \]
\[ \overline{AX} + BX = \] \[ CD - \_ = YD \quad \frac{1}{2} (\overline{BC} + \overline{AD}) = \]
\[ 2(\_ ) = \overline{BC} + \overline{AD} \quad \angle BAX + \_ = 180^\circ \]

II. Answer the following questions.

1. Draw the following and label the 2 bases: TRAP is an isosceles trapezoid with diagonals \( \overline{RP} \) and \( \overline{TA} \).

2. Draw the following quadrilateral: ABCD, \( \overline{AB} \parallel \overline{CD} \), \( \angle A \cong \angle B \), and \( \overline{AB} \neq \overline{CD} \).

3. The measures of the bases of a trapezoid are 8 and 26. What is the measure of the midsegment of the trapezoid?

4. Which statement is never true for a kite?
   a. The diagonals are perpendicular
   b. One pair of opposite angles are congruent
   c. One pair of opposite sides are parallel
   d. Two pairs of consecutive sides are congruent.
III. Please answer the following questions as Always, Sometimes, or Never true

5. If a quadrilateral is a trapezoid then it is an isosceles trapezoid.
6. If a quadrilateral is an isosceles trapezoid then it is a trapezoid.
7. If the diagonals of a quadrilateral are perpendicular then it is a kite.
8. If a quadrilateral has exactly one pair of parallel sides, then it is a parallelogram.

IV. Mark the symbols on each figure to match the given definition.

9. Kites are quadrilaterals with perpendicular diagonals.
10. Kites are quadrilaterals with exactly one pair of congruent opposite angles.

11. Kites are quadrilaterals with exactly two pairs of congruent consecutive sides.
12. Trapezoids are quadrilaterals with exactly one pair of parallel sides.

13. Isosceles trapezoids are trapezoids with congruent legs.
14. Isosceles trapezoids are trapezoids with two pairs of congruent base angles.

15. Isosceles trapezoids are trapezoids with congruent diagonals.
Trapezoid and Kites Assignment #2

1. In the diagram below, \(LATE\) is an isosceles trapezoid with \(LE = AT\), \(LA = 24\), \(ET = 40\), and \(AT = 10\). Altitudes \(LF\) and \(AG\) are drawn. What is the length of \(LF\)?
   - (1) 6
   - (2) 8
   - (3) 3
   - (4) 4

2. In the diagram below, \(EF\) is the median of trapezoid \(ABCD\).
   - If \(AB = 5x - 9\), \(DC = x + 3\), and \(EF = 2x + 2\), what is the value of \(x\)?
     - (1) 5
     - (2) 2
     - (3) 7
     - (4) 8

3. In the diagram below, isosceles trapezoid \(ABCD\), \(AB = CD = 25\), \(AD = 26\), and \(BC = 12\).

   What is the length of an altitude of the trapezoid?
   - (1) 7
   - (2) 14
   - (3) 19
   - (4) 24

4. In kite \(WXYZ\), \(m\angle WXY = 104^\circ\), and \(m\angle VYZ = 49^\circ\).
   Find each measure.
   - (4) \(m\angle ZYV\)
   - (5) \(m\angle VXW\)
   - (6) \(m\angle XWZ\)

7. Find \(m\angle A\).

8. \(RW = 17.7\), and \(SV = 23.3\).
   Find \(TW\).

9. Find the value of \(z\) so that \(EFGH\) is isosceles.

10. \(MQ = 7y - 6\), and \(LP = 4y + 11\).
    Find the value of \(y\) so that \(LMPQ\) is isosceles.

11. Find \(QR\).

12. Find \(AZ\).
13. Find AD, AB, and the perimeter of the kite.

![Diagram of a kite with labeled vertices A, B, C, D, and AD, AB labeled.]

14. \( \text{m\angle DAX} \) 
15. \( \text{m\angle ABC} \) 
16. \( \text{m\angle BCD} \)

17. Find \( \text{m\angle Q} \).

![Diagram of a quadrilateral with labeled vertices L, M, N, P, and \( \text{m\angle Q} = 118^\circ \).]

18. \( \text{SZ} = 62.6 \), and \( \text{KZ} = 34 \). Find \( \text{RJ} \).

![Diagram of a trapezoid with labeled vertices A, B, C, D, and \( \text{SZ} = 62.6 \), \( \text{KZ} = 34 \).]

19. Find \( \text{PQ} \).

![Diagram of a trapezoid with labeled vertices A, B, P, Q, and \( \text{PQ} \).]

20. In kite \( \text{KLMN} \), find the measure of \( \text{\angle M} \).

![Diagram of a kite with labeled vertices K, L, M, N, and \( \text{\angle M} \).]

21. Find \( \text{KR} \).

![Diagram of a quadrilateral with labeled vertices K, M, N, J, and \( \text{KR} \).]

Give the best name for the quadrilateral with the given vertices. Justify using slopes and/or distance.

22. \((-4, -1), (-4, 6), (2, 6), (2, -4)\)

![Graph paper with coordinate grid showing points \((-4, -1), (-4, 6), (2, 6), (2, -4)\).]

23. \((-4, -3), (0, 3), (4, 3), (8, -3)\)

![Graph paper with coordinate grid showing points \((-4, -3), (0, 3), (4, 3), (8, -3)\).]

24. \((-5, 2), (-5, 6), (-1, 6), (2, -1)\)

![Graph paper with coordinate grid showing points \((-5, 2), (-5, 6), (-1, 6), (2, -1)\).]
Unit 9 Review

1. Circle which the properties that are common to the rectangle, rhombus, and square

<table>
<thead>
<tr>
<th>Equiangular</th>
<th>Diagonals bisect the angles</th>
<th>Diagonals are perpendicular to</th>
</tr>
</thead>
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<tr>
<td>Regular</td>
<td>Diagonals bisect each other</td>
<td>each other</td>
</tr>
<tr>
<td>Convex</td>
<td>Opposite Angles Congruent</td>
<td>Consecutive Angles</td>
</tr>
<tr>
<td>Equilateral</td>
<td>Opposite Sides Congruent</td>
<td>Supplementary</td>
</tr>
</tbody>
</table>

2. Complete the following

<table>
<thead>
<tr>
<th>Number of Sides</th>
<th>Number of Diagonals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triangle</td>
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</tr>
<tr>
<td>Quadrilateral</td>
<td></td>
</tr>
<tr>
<td>Pentagon</td>
<td></td>
</tr>
<tr>
<td>Hexagon</td>
<td></td>
</tr>
</tbody>
</table>

How many diagonals would you have with a 17 a gon? ________________

What is the pattern used? ________________

3. A(12,0) B(4,0) C(8,5) D(4,10). ABCD form a parallelogram. What is the coordinate of where the diagonals meet?

4. List the properties of the parallelogram

_________________________   ______________________
_________________________   ______________________

5. List the properties of the Isosceles Trapezoid

_________________________   ______________________
_________________________   ______________________

6. Amber draws a quadrilateral that has perpendicular bisectors. Name all the different types of quadrilaterals that she could of drawn. ____________________________________________

7. ABCD is a rhombus. A(-3,5) B(2,7) C(4,2) D(-1,0). What is its perimeter?

8. In Rhombus ABCD, in the problem above(#7), what is the equation of diagonal AC?

9. Name the different ways you can prove a quadrilateral is a parallelogram.
10. Two interior angles of an octagon are 126° and 146°. The other six angles are congruent. Which equation could be used to find the measure of the six congruent angles.

A. 126 + 146 + x = 1080
B. 126 + 146 + 8x = 1440
C. 126 + 146 + 6x = 1080
D. 126 + 146 = 1440 – 6x

11. Given Isosceles Trapezoid PQRM with the coordinates (-4,-3) (0,3) (4,3) and (8, -3), What is the slope of the midsegment?

12. Tell whether each statement is sometimes, always, or never true.
   a. A rectangle is a parallelogram __________
   b. A parallelogram is a rhombus __________
   c. A square is a rhombus __________
   d. A square is a rectangle __________
   e. A rhombus is a square __________
   f. A rhombus is a rectangle __________
   g. A rectangle is a quadrilateral __________
   h. A rectangle is a square __________

13) Make sure you know all the properties of the various quadrilaterals we have studied.

14) Give the best classification for the following figure (-5,2) (-5,6) (-1,6) (2,1)

15) If m∠1 = 54°, find m∠2.

16) If XT = 2y – 3 and US = 32, find the value of ‘y’.

17) Find x
18) Find y
19) TA =
20) Measure of angle A =