UNIT 10B: QUADRILATERALS AND POLYGONS

I can define, identify and illustrate the following terms:
- Quadrilateral
- Parallelogram
- Rhombus
- Rectangle
- Square
- Trapezoid
- Isosceles trapezoid
- Kite
- Concave polygon
- Convex Polygon
- Regular Polygon
- Diagonal

Dates, assignments, and quizzes subject to change without advance notice.

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Wednesday, 1/30 or Thursday, 1/31

6-2 & 6-4: Properties of Parallelograms and Special Parallelograms

- I know the properties of a parallelogram.
- I know the properties of a rectangle.
- I know the properties of a rhombus.
- I know the properties of a square.
- I know the relationship between the different special parallelograms.

PRACTICE: Quadrilaterals Properties Worksheet

Friday, 2/1

6-2 & 6-4: Properties of Parallelograms and Special Parallelograms

- I know and can use the properties of a parallelogram to solve problems.
- I know and can use the properties of all the special parallelograms to solve problems.
- I know the relationship between the different special parallelograms.


Monday, 2/4

6-3 & 6-5: Determining and Constructing Parallelograms and Special Parallelograms

- I can determine the best name for parallelogram and/or special parallelogram.
- I know and can use the properties of a parallelogram to solve problems.
- I can identify or construct a parallelogram or special parallelogram.

PRACTICE: pg. 402 (#3-5, 11-13, 17-19, 26); pg. 422 (11-19, 24-26, 28, 39); Worksheet

Tuesday, 2/5

Quadrilaterals on the Coordinate Plane

- I can use the properties of quadrilaterals to prove that a figure in the coordinate plane is a parallelogram, rhombus, rectangle, square, or trapezoid.

PRACTICE: Quadrilateral on the Coordinate Plane Worksheet
Wednesday, 2/6 or Thursday 2/7

Quadrilateral Proofs

☐ I can write a two-column proof using properties of quadrilaterals.
☐ I can use the properties of quadrilaterals to draw conclusions about their relationships.

PRACTICE: Quadrilateral Proofs Worksheet

Friday, 2/8

6-6: Properties of Kites and Trapezoids

☐ I know and can use the properties of a trapezoid to solve problems.
☐ I know and can use the properties of an isosceles trapezoid to solve problems.

PRACTICE: pg. 433 (#19 -23, 30, 32, 34-36, 47) and Worksheet

Monday, 2/11

6-6: Properties of Kites and Trapezoids

☐ I know and can use the properties of a kite to solve problems.

PRACTICE: pg. 433 (3-6, 24-25, 28-29, 31, 48) and Worksheet

Tuesday, 2/12

Review

☐ I can use properties and attributes of polygons and quadrilaterals to solve problems and write proofs.

PRACTICE: pg. 438 (5-28, 31-49, 53-67); pg. 443 (1-5) (Hint: look over old assignments also!!)

Wednesday, 2/13 or Thursday, 2/14

➢ Test 10 Part 2: Quadrilaterals
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:
Examples

1. In $\square CDEF$, $DE = 74 \text{ mm}$, $DG = 31 \text{ mm}$, and $m\angle FCD = 42^\circ$.

Find $CF$.

Find $m\angle EFC$.

Find $DF$.

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 $m\angle VTZ$. 
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**

\[ \overline{XW} \cong \quad \overline{XY} \cong \quad \overline{XV} \cong \quad \overline{WV} \cong \]

\[ XV + \overline{VZ} = \quad \overline{WY} - \overline{WV} = \]

\[ m\angle WXY = \quad m\angle WXY + m\angle XWZ = \]

**Rectangle**

\[ \overline{RS} \cong \quad \overline{SP} \cong \quad \overline{OZ} \cong \quad \overline{PR} \cong \]

\[ QZ + \overline{SZ} = \quad PR - \overline{ZR} = \quad m\angle QZR = \]

\[ m\angle PQR = \quad m\angle PQZ + \quad = m\angle PQR \]

\[ \triangle QPS \cong \quad \triangle QZR \cong \]

**Rhombus**

\[ \overline{XW} \cong \quad \overline{XY} \cong \quad \overline{XZ} \cong \quad \overline{WZ} \cong \]

\[ XZ + \overline{VZ} = \quad \overline{WY} - \quad = \overline{WZ} \quad \quad = 90^\circ \]

\[ m\angle WXY = \quad m\angle WXY + \quad = m\angle XWV \]

\[ m\angle VWZ = \quad \triangle WZV \cong \quad \triangle WVY \cong \]

**Square**

\[ \overline{QR} \cong \quad \overline{QP} \cong \quad \overline{QT} \cong \quad \overline{QS} \cong \]

\[ QT + \quad = QS \quad RP - \overline{TR} = \quad \quad = 90^\circ \]

\[ m\angle PQR = \quad m\angle QPT + \quad = m\angle QPS \]

\[ m\angle QRT = \quad \triangle QTR \cong \quad \triangle RQP \cong \]
### Determine, Justify, and Construct Examples

#### Conditions for Parallelograms

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<td>quadrilateral with 1 pair of opposite sides ( \parallel ) and ( \cong )</td>
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<td>quadrilateral with 2 pairs of opposite sides ( \cong )</td>
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<tr>
<td>quadrilateral with 2 pairs of opposite ( \neq ) ( \cong )</td>
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<tr>
<td>quadrilateral with any pair of consecutive ( \neq ) supplementary</td>
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<tr>
<td>quadrilateral with diagonals bisecting each other</td>
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Determine whether each quadrilateral must be a parallelogram. Justify your answer.

Ex. 1: 

Ex. 2: 

Ex. 3: 

\[ x^2 \quad (180 - x)^2 \]

\[ x^2 \]

---

### 6-5 Conditions for Special Parallelograms

You can use the following conditions to determine whether a parallelogram is a rectangle.

If one angle is a right angle, then \( \square JKLM \) is a rectangle.

If the diagonals are congruent, then \( \square JKLM \) is a rectangle.

You can use the following conditions to determine whether a parallelogram is a rhombus.

If one pair of consecutive sides are congruent, then \( \square TUWV \) is a rhombus.

If the diagonals are perpendicular, then \( \square TUWV \) is a rhombus.

If one diagonal bisects a pair of opposite angles, then \( \square TUWV \) is a rhombus.

Determine whether the conclusion is valid. If not, tell what additional information is needed to make it valid.

Ex. 4: \( EFGH \) is a rectangle.

Ex. 5: \( MPQR \) is a rhombus.

Ex. 6: What is needed to prove a square?

2. Book Work: pg. 422 (#11-19, 24-26, 28, 39)

3. 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

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

5. 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.

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

Which statement must be true?

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

7. 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
Quadrilateral on the Coordinate Plane

How can we prove ABCD is a parallelogram, rectangle, rhombus, or a square?

Given points:
A(0,2)   B(3,6)   C(8,6)  D(5,2)

\[ m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x} = \text{rise} \]
\[ = \frac{\text{run}}{\text{run}} \]

*Perpendicular lines have opposite reciprocal slopes
ex: \( m = \frac{3}{2} \) & \( -\frac{2}{3} \)

*Parallel lines have the same slope
ex: \( m = 3 \) & \( 3 \)

Step 1: Is ABCD a parallelogram?  
* are slopes parallel

\[ AB = \]
\[ BC = \]
\[ CD = \]
\[ DA = \]

Step 2: Is ABCD a rectangle or a square?  
*are slopes perpendicular?

Step 3: Is ABCD a rhombus?  
*are length congruent?

\[ AB = \]
\[ BC = \]
\[ CD = \]
\[ DA = \]

\[ d = \sqrt{(y_2 - y_1)^2 + (x_2 - x_1)^2} \]
Quadrilaterals in the Coordinate Plane

1 – 2: Show that the quadrilateral with the given vertices is a parallelogram.
1. \( A(-3, 2), B(-2, 7), C(2, 4), \) and \( D(1, -1) \)  
2. \( J(-1, 0), K(-3, 7), L(2, 6), \) and \( M(4, -1) \)

3. The vertices of square \( PQRS \) are \( P(-4, 0), Q(4, 3), R(7, -5), \) and \( S(-1, -8) \). Show that the diagonals of square \( PQRS \) are congruent perpendicular bisectors of each other.

4 – 5: Use the diagonals to determine whether a parallelogram with the given vertices is a rectangle, rhombus, or square. Give all names that apply.
4. \( A(-10, 4), B(-2, 10), C(4, 2), \) and \( D(-4, -4) \)  
5. \( J(-9, -7), K(-4, -2), L(3, -3), \) and \( M(-2, -8) \)
6 – 8: Give the best name for a quadrilateral with the given vertices.
6. (–4, –1), (–4, 6), (2, 6), (2, –4)  7. (–4, –3), (0, 3), (4, 3), (8, –3)

8. (–8, –4), (–5, 1), (1, –5), and (–2, –10)  9. Which of the following is the best name for figure WXYZ with vertices W(–3, 1), X(1, 5), Y(8, –2), and Z(4, –6)?
   (a) Parallelogram   (b) Rectangle
   (c) Rhombus   (d) Square

10. Four lines are represented by the equations below:
   \( l: y = -x + 1 \)  \( m: y = -x + 7 \)  \( n: y = 2x + 1 \)  \( p: y = 2x + 7 \)
   a. Graph the four lines in the coordinate plane.
   b. Classify the quadrilateral formed by the lines.
   c. Suppose the slopes of lines \( n \) and \( p \) change to 1. Reclassify the quadrilateral.
Directions: Write all proofs on notebook paper.

1) **GIVEN:** Parallelogram $ABCD$ with diagonal $\overline{AC}$
   **PROVE:** $\Delta ABC \equiv CDA$

2) **GIVEN:** $ABCD$ is a quadrilateral
   $\overline{AB} \equiv CD, \angle 1 \equiv \angle 2$
   **PROVE:** $ABCD$ is a parallelogram

3) **GIVEN:** $PQRS$ is a quadrilateral
   $\angle 1 \equiv \angle 2, \angle 3 \equiv \angle 4$
   **PROVE:** $PQRS$ is a parallelogram

4) **GIVEN:** $PQRS$ is a quadrilateral
   $\overline{PT} \equiv \overline{RM}$
   **PROVE:** $TQMS$ is a parallelogram

5) **GIVEN:** $PQRS$ is a parallelogram
   $\overline{PE} \perp \overline{SQ}, \overline{RF} \perp \overline{SQ}$
   **PROVE:** $\overline{SE} \equiv \overline{QF}$

6) **GIVEN:** $ABCD$ is a parallelogram
   $\overline{FG}$ bisects $\overline{DB}$
   **PROVE:** $DB$ bisects $\overline{FG}$
7) **GIVEN:** ABCD is a rectangle
   M is the midpoint of \( AB \)
   \[ \text{PROVE: } DM \cong CM \]

8) **GIVEN:** SQUA is a rectangle
   \( \overline{QU} \equiv \overline{UA} \)
   \[ \text{PROVE: SQUA is a square} \]

9) Complete the given proof
   **GIVEN:** ABCD is a rectangle, \( BE \equiv CF \)
   **PROVE:** \( DE \equiv AF \)

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<th>Reason</th>
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<td>1) Given</td>
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<tr>
<td>2)</td>
<td>2) Given</td>
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<tr>
<td>3) ( BE = CF )</td>
<td>3)</td>
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<tr>
<td>4) ( AB \equiv DC )</td>
<td>4)</td>
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<tr>
<td>5) ( \angle B, \angle C ) are right angles</td>
<td>5)</td>
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<td>6) ( EF = EF )</td>
<td>6) All right angles are congruent</td>
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<td>7) ( EF = EF )</td>
<td>7)</td>
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<tr>
<td>8) ( )</td>
<td>8) Segment Addition Postulate</td>
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<tr>
<td>9) ( )</td>
<td>9) Segment Addition Postulate</td>
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<tr>
<td>10) ( BF = CE )</td>
<td>10)</td>
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<tr>
<td>11) ( BF \equiv CE )</td>
<td>11)</td>
</tr>
<tr>
<td>12) ( \triangle ABF \equiv \triangle DCE )</td>
<td>12)</td>
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<tr>
<td>13) ( DE \equiv AF )</td>
<td>13)</td>
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Trapezoid and Kite Examples

Ex. 1 Find $\angle C$

$$\angle C = (8x + 34)^\circ$$

Ex. 2 Find $\angle F$

$$\angle F = 49^\circ$$

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

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

Ex. 5 Find $EF$

Ex. 6 Find $EH$

Ex. 7 Find $XT$
Trapezoid Assignment

I. For each shape finish the statements.

\[ \overline{QT} \cong \overline{QR} \parallel \overline{RT} \cong \overline{RPS} \]
\[ \angle RQT \cong \angle RT - PT = \angle QP + PS = \]
\[ m\angle QTS = m\angle QRS + m\angle RST = \]

\[ \overline{AX} \cong \overline{CD} \quad 2(AX) = \frac{1}{2}(CD) = \]
\[ AX + BX = CD - ___ = YD \quad \frac{1}{2}(BC + AD) = \]
\[ 2(____) = BC + AD \quad m\angle BAX + _________ = 180^\circ \]

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, \( \overline{AB} \parallel \overline{CD} \), \( \angle A \equiv \angle B \), 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?

III. Please answer the following questions as Always, Sometimes, or Never true

4. If a quadrilateral is a trapezoid then it is an isosceles trapezoid.

5. If a quadrilateral is an isosceles trapezoid then it is a trapezoid.

6. 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.

7. Trapezoids are quadrilaterals with exactly one pair of parallel sides.

8. Isosceles trapezoids are trapezoid with congruent diagonals.

9. Isosceles trapezoids are trapezoids with congruent legs.

10. Isosceles trapezoids are trapezoids with two pairs of congruent bases.
11. In the diagram below, \( \text{LATE} \) is an isosceles trapezoid with \( \overline{LE} = \overline{AT} \). 
\( \text{LA} = 24 \), \( \text{ET} = 40 \), and \( \text{AT} = 10 \). Altitudes \( \overline{LF} \) and \( \overline{AG} \) are drawn.

What is the length of \( \overline{LF} \)?

(1) 6
(2) 8
(3) 3
(4) 4

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

What is the length of an altitude of the trapezoid?

(1) 7
(2) 14
(3) 19
(4) 24

12. In the diagram below, \( \overline{EF} \) is the median of trapezoid \( \text{ABCD} \).

If \( \text{AB} = 5x - 9 \), \( \text{DC} = x + 3 \), and \( \text{EF} = 2x + 2 \), what is the value of \( x \)?

(1) 5
(2) 2
(3) 7
(4) 8

14. (-4, -1), (-4, 6), (2, 6), (2, -4)  
15. (-4, -3), (0, 3), (4, 3), (8, -3)  
16. (-2, -2), (1, 7), (4, 4), (1, -5)

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

17. Book Assignment: pg. 433 (#19 -23, 30, 32, 34-36, 47)
Kites

Ex. 1 Find KL

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

Ex. 3

Alicia is using a pattern to make a kite. She has made the frame of the kite by placing wooden sticks along the diagonals. She also has cut four triangular pieces of fabric and has attached them to the frame. To finish the kite, Alicia must cover the outer edges with a cloth binding. There are 2 yards of binding in one package. What is the total amount of binding needed to cover the edges of the kite? How many packages of binding must Alicia buy?

Kites Assignment

I. For each shape finish the statements.

$QR \equiv \underline{\quad}$ $PS \equiv \underline{\quad}$ $PT \equiv \underline{\quad}$ $\triangle QRT \equiv \underline{\quad}$

$\triangle PTS \equiv \underline{\quad}$ $QT + TS = \underline{\quad}$ $2(TR) = \underline{\quad}$

$m\angle PQT = \underline{\quad}$ $m\angle STP + m\angle RTQ = \underline{\quad}$

II. Answer the following questions.

1. 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

2. If the diagonals of a quadrilateral are perpendicular then it is a kite.

3. 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.

4. Kites are quadrilaterals with perpendicular diagonals.

5. Kites are quadrilaterals with exactly one pair of congruent opposite angles.

6. Kites are quadrilaterals with exactly two pairs of congruent consecutive sides.

7. Find AD, AB, and the perimeter of the kite.

8. In kite $KLMN$, find the measure of $\angle M$.

9. Give the best name for the quadrilateral with the given vertices. Justify using slopes and/or distance. (-5, 2), (-5, 6), (-1, 6), (2, -1)