


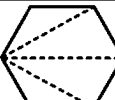


Name:

Date:

Topic:

Class:

| Main Ideas/Questions | Notes/Examples | | | |
|---|---|--|-----------------------|--|
| POLYGON | A polygon is a <u>closed</u> figure formed by three or more <u>line segments</u> , called <u>sides</u> . | | | |
| <i>Sum of the</i> INTERIOR ANGLE <i>Measures</i> | The sum of the measures of the interior angles in any polygon can be determined by the number of triangles that can be drawn within the polygon. Complete the table below and look for a pattern to find the sum of the degrees in any polygon. | | | |
| Polygon | Picture | # of Sides | # of Triangles | Sum of Interior \angle's |
| Triangle |  | 3 | 1 | 180° |
| Quadrilateral |  | 4 | 2 | 360° |
| Pentagon |  | 5 | 3 | 540° |
| Hexagon |  | 6 | 4 | 720° |
| Heptagon | X | 7 | 5 | 900° |
| Octagon | X | 8 | 6 | 1080° |
| Nonagon | X | 9 | 7 | 1260° |
| Decagon | X | 10 | 8 | 1440° |
| INTERIOR <i>Angle Sum</i> FORMULA | If n represents the number of sides of a polygon, then the sum of the interior angle, S , can be found using the formula: $S = (n - 2) \cdot 180$ | | | |
| Find the sum of the measures of the interior angles in each polygon. | | | | |
| 1. 15-gon $S = (15 - 2) \cdot 180 = \boxed{2340^\circ}$ | | 2. 21-gon $S = (21 - 2) \cdot 180 = \boxed{3420^\circ}$ | | |
| 3. 48-gon $S = (48 - 2) \cdot 180 = \boxed{8280^\circ}$ | | 4. 36-gon $S = (36 - 2) \cdot 180 = \boxed{6120^\circ}$ | | |

REGULAR POLYGON

A polygon in which all side measures are congruent, therefore all angle measures are congruent.
 The measure of a single interior angle in a regular polygon can be found by dividing the sum of the interior angle measures, S , by the number of sides, n .

Find the measure of each interior angle in the following polygons.

5. regular pentagon

$$S = \frac{(5-2) \cdot 180}{5} = \frac{540}{5} = \boxed{108^\circ}$$

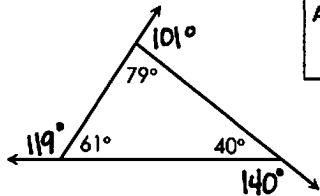
6. regular 18-gon

$$S = \frac{(18-2) \cdot 180}{18} = \frac{2880}{18} = \boxed{160^\circ}$$

Sum of the EXTERIOR ANGLE Measures

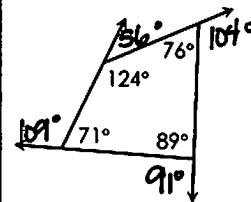
Exterior angles are supplementary to their adjacent interior angle. Find the measure of each exterior angle on the polygons below, then give the sum of all exterior angle measures.

Triangle:



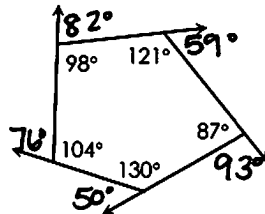
Sum of Exterior Angles Measures: $\boxed{360^\circ}$

Quadrilateral:



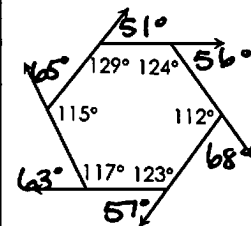
Sum of Exterior Angles Measures: $\boxed{360^\circ}$

Pentagon:



Sum of Exterior Angles Measures: $\boxed{360^\circ}$

Hexagon:



Sum of Exterior Angles Measures: $\boxed{360^\circ}$

What can you conclude about the sum of the exterior angles measures of a polygon?

The sum of the exterior angles of any polygon is 360° .

MORE EXAMPLES

7. What is the measure of each exterior angle of a regular hexagon?

$$\frac{360}{6} = \boxed{60^\circ}$$

8. What is the measure of each exterior angle of a regular 24-gon?

$$\frac{360}{24} = \boxed{15^\circ}$$

9. If the exterior angle of a regular polygon measures 12° , how many sides does the polygon have?

$$\frac{360}{x} = 12 \quad 12x = 360 \quad \boxed{x = 30}$$

10. If the exterior angle of a regular polygon measures 40° , how many sides does the polygon have?

$$\frac{360}{x} = 40 \quad 40x = 360 \quad \boxed{x = 9}$$

more practice with

INTERIOR & EXTERIOR ANGLE MEASURES

INTERIOR & EXTERIOR OF ANY POLYGON REFERENCE:

Sum of the INTERIOR Angle Measures:

$$S = (n-2) \cdot 180$$

Sum of the EXTERIOR Angle Measure:

$$360^\circ$$

INTERIOR & EXTERIOR ANGLES OF REGULAR POLYGONS REFERENCE:

Interior Angle Measure
of a Regular Polygon:

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

Exterior Angle Measure
of a Regular Polygon:

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

The Number of Sides
of a Regular Polygon:

$$\frac{360}{\text{ext } \angle}$$

PRACTICE QUESTIONS

1. What is the sum of the measures of the interior angles of a pentagon?

$$S = (5-2) \cdot 180 = \boxed{540^\circ}$$

2. What is the sum of the measures of the interior angles of a 27-gon?

$$S = (27-2) \cdot 180 = \boxed{4500^\circ}$$

3. What is the measure of each interior angle of a regular octagon?

$$S = (8-2) \cdot 180 = 1080$$
$$1080 / 8 = \boxed{135^\circ}$$

4. What is the measure of each interior angle of a regular 20-gon?

$$S = (20-2) \cdot 180 = 3240$$
$$3240 / 20 = \boxed{162^\circ}$$

5. Five angles of a hexagon measure 119° , 129° , 104° , 139° , and 95° . What is the measure of the sixth angle?

$$S = (6-2) \cdot 180$$
$$= 720^\circ$$

$$720 - 586$$
$$= \boxed{134^\circ}$$

6. The sum of the interior angles of a polygon is 1620° . How many sides does the polygon have?

$$(n-2) \cdot 180 = 1620$$
$$n-2 = 9$$

$$n = \boxed{11 \text{ sides}}$$

7. The sum of the interior angles of a polygon is 3960° . How many sides does the polygon have?

$$(n-2) \cdot 180 = 3960$$

$$n-2 = 22$$

$$n = \boxed{24 \text{ sides}}$$

8. What is the sum of the measures of the exterior angles of a nonagon?

$$\boxed{360^\circ}$$

9. What is the measure of each exterior angle of a regular 20-gon?

$$\frac{360}{20} = \boxed{18^\circ}$$

10. If the exterior angle of a regular polygon measures 9° , how many sides does the polygon have?

$$\frac{360}{n} = 9$$

$$9n = 360$$

$$n = \boxed{40 \text{ sides}}$$

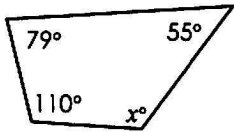
11. If the interior angle of a regular polygon measures 108° , how many sides does the polygon have? ext = 72°

$$\frac{360}{n} = 72$$

$$360 = 72n$$

$$n = \boxed{5 \text{ sides}}$$

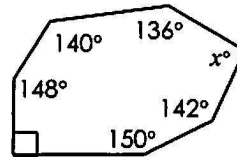
12. Find the value of x .



$$360 - 244$$

$$= \boxed{116^\circ}$$

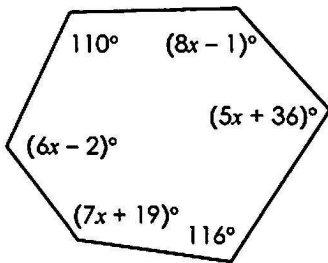
13. Find the value of x .



$$900 - 806$$

$$= \boxed{94^\circ}$$

14. Solve for x .



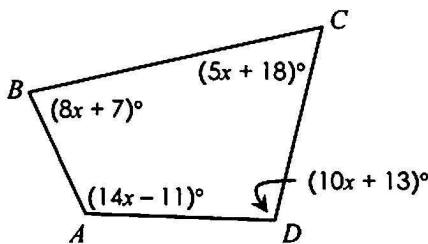
$$110 + 8x - 1 + 5x + 36 + 116 + 7x + 19 + 6x - 2 = 720$$

$$26x + 278 = 720$$

$$26x = 442$$

$$x = \boxed{17}$$

15. Find $m\angle B$.



$$8x + 7 + 5x + 18 + 10x + 13 + 14x - 11 = 360$$

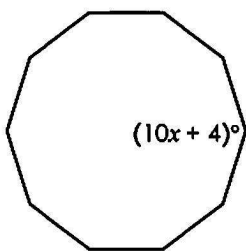
$$37x + 27 = 360$$

$$37x = 333$$

$$x = 9$$

$$m\angle B: 8(9) + 7 = \boxed{79^\circ}$$

16. If the figure below is a regular polygon, find the value of x .



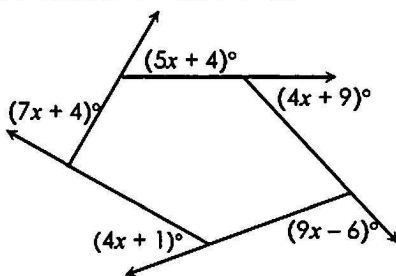
$$10(10x + 4) = 1440$$

$$100x + 40 = 1440$$

$$100x = 1400$$

$$x = \boxed{14}$$

17. Find the value of x .



$$5x + 4 + 4x + 9 + 9x - 6 + 4x + 1 + 7x + 4 = 360$$

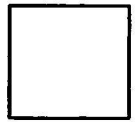
$$29x + 12 = 360$$

$$29x = 348$$

$$x = \boxed{12}$$

Name: _____

Unit 8: Polygons & Quadrilaterals



Date: _____ Per: _____

Homework 1: Angles of Polygons

**** This is a 2-page document! ****

1. What is the sum of the measures of the interior angles of an octagon? 1080°
2. What is the sum of the measures of the interior angles of a 25-gon? 4140°
3. What is the measure of each interior angle of a regular hexagon? 120°
4. What is the measure of each interior angle of a regular 16-gon? 157.5°
5. What is the sum of the measures of the exterior angles of a decagon? 360°
6. What is the measure of each exterior angle of a regular 30-gon? 12°
7. An exterior angle of a regular polygon measures 22.5°. How many sides does it have? 16
8. An interior angle of a regular polygon measures 170°. How many sides does it have? 36

↳ ext = 10°

9. If the sum of the measures of the interior angles of a polygon is 1980°, how many sides does the polygon have?

$$(n-2) \cdot 180 = 1980$$

$$n-2 = 11$$

$$n = 13$$

10. If the sum of the measures of the interior angles of a polygon is 5400°, how many sides does the polygon have?

$$(n-2) \cdot 180 = 5400$$

$$n-2 = 30$$

$$n = 32$$

11. The measure of the seven angles in a nonagon measure 138°, 154°, 145°, 132°, 128°, 147°, and 130°. If the two remaining angles are equal in measure, what is the measure of each angle?

$$S = (9-2) \cdot 180 = 1260$$

$$x + x + 974 = 1260$$

$$2x + 974 = 1260$$

$$2x = 286$$

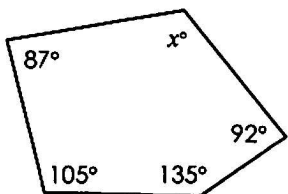
$$x = 143°$$

12. Find the value of x.

$$S = (5-2) \cdot 180 = 540$$

$$540 - 419$$

$$= 121°$$

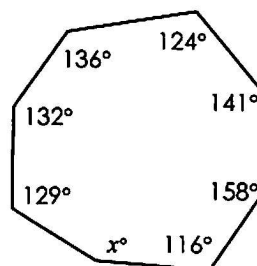


13. Find the value of x.

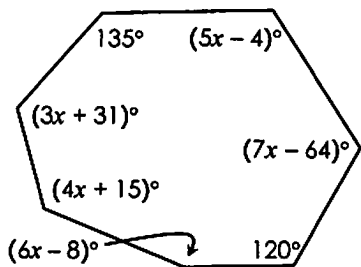
$$S = (8-2) \cdot 180 = 1080$$

$$1080 - 936$$

$$= 144°$$



14. Find the value of x .



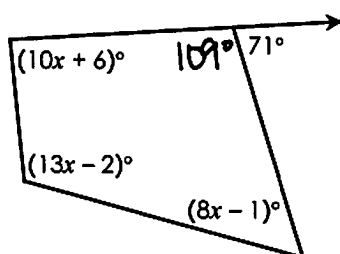
$$S = (7-2) \cdot 180 \\ = 900$$

$$25x + 225 = 900$$

$$25x = 675$$

$$\boxed{x = 27}$$

15. Find the value of x .



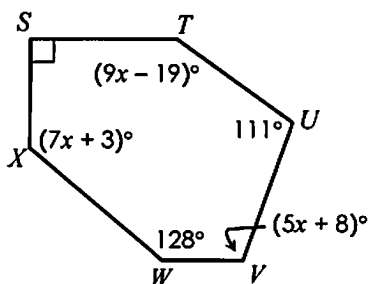
$$S = (4-2) \cdot 180 \\ = 360$$

$$31x + 112 = 360$$

$$31x = 248$$

$$\boxed{x = 8}$$

16. Find $m\angle V$.



$$S = (6-2) \cdot 180 \\ = 720$$

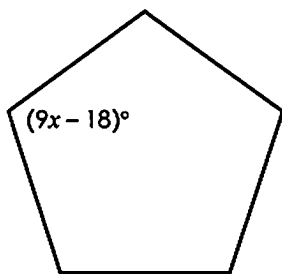
$$21x + 321 = 720$$

$$21x = 399$$

$$x = 19$$

$$m\angle V: 5(19) + 8 = \boxed{103^\circ}$$

17. If the figure below is a regular polygon, find the value of x .



$$S = (5-2) \cdot 180 \\ = 540$$

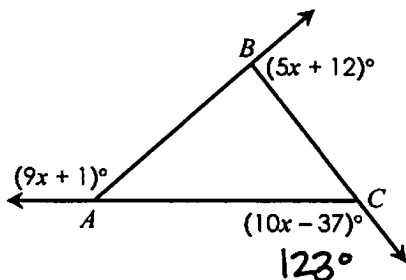
$$9x - 18 = 108$$

$$9x = 126$$

$$\boxed{x = 14}$$

$$\frac{540}{5} = 108$$

18. Find $m\angle BCA$.



$$24x - 24 = 360$$

$$24x = 384$$

$$x = 16$$

$$m\angle BCA = 180 - 123$$

$$= \boxed{57^\circ}$$

Name:

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Main Ideas/Questions

Notes/Examples

Properties of
PARALLELOGRAMS

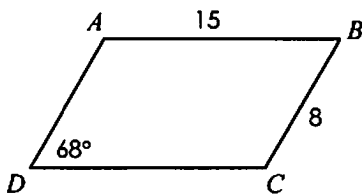
Definition of a Parallelogram:

A quadrilateral in which both pairs of opposite sides
Other important properties of parallelograms: are parallel.

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

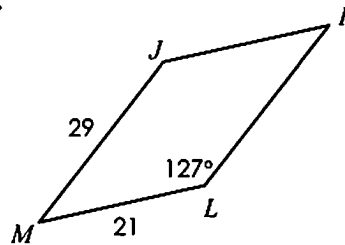
Directions: Each quadrilateral below is a parallelogram. Find the missing measures.

1.



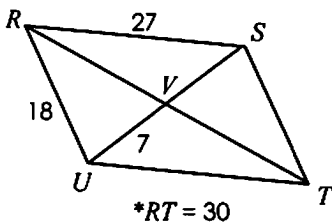
$$\begin{aligned} AD &= \underline{8} \\ DC &= \underline{15} \\ m\angle A &= \underline{112^\circ} \\ m\angle B &= \underline{68^\circ} \\ m\angle C &= \underline{112^\circ} \end{aligned}$$

2.



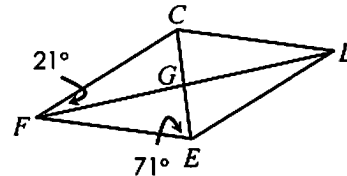
$$\begin{aligned} JK &= \underline{21} \\ KL &= \underline{29} \\ m\angle J &= \underline{127^\circ} \\ m\angle K &= \underline{53^\circ} \\ m\angle M &= \underline{53^\circ} \end{aligned}$$

3.



$$\begin{aligned} UT &= \underline{27} \\ ST &= \underline{18} \\ VS &= \underline{7} \\ VT &= \underline{15} \end{aligned}$$

4.

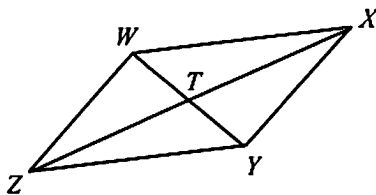


$$\begin{aligned} m\angle DEC &= \underline{63^\circ} \\ m\angle CDE &= \underline{46^\circ} \\ m\angle ECD &= \underline{71^\circ} \\ m\angle DFE &= \underline{25^\circ} \end{aligned}$$

$$*m\angle FED = 134^\circ$$

***Alt. Int. \angle 's**

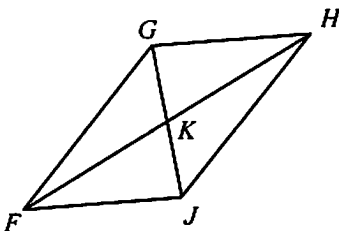
5. Given $XY = 15$, $WX = 22$, $ZX = 32$, $WT = 10$, $m\angle WZY = 62^\circ$, $m\angle WXT = 27^\circ$, and $m\angle ZWT = 77^\circ$.



$$\begin{aligned} ZW &= \underline{15} & m\angle TZY &= \underline{27^\circ} \\ ZY &= \underline{22} & m\angle XYZ &= \underline{118^\circ} \\ TX &= \underline{16} & m\angle XWT &= \underline{41^\circ} \\ WY &= \underline{20} & m\angle XYT &= \underline{77^\circ} \end{aligned}$$

*** Alt. Int. \angle 's**

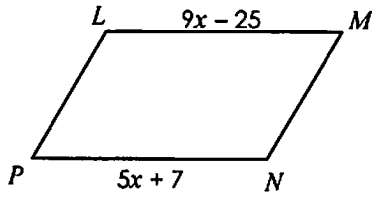
6. Given $m\angle GHF = 34^\circ$, $m\angle HJF = 124^\circ$, and $m\angle FKJ = 79^\circ$.



$$\begin{aligned} m\angle GFJ &= \underline{56^\circ} & m\angle JGH &= \underline{67^\circ} \\ m\angle FGH &= \underline{124^\circ} & m\angle FGJ &= \underline{57^\circ} \\ m\angle HFJ &= \underline{34^\circ} & m\angle FHJ &= \underline{22^\circ} \\ m\angle HKJ &= \underline{101^\circ} & m\angle GJF &= \underline{67^\circ} \end{aligned}$$

*** Alt. Int. \angle 's**

7. Solve for x.

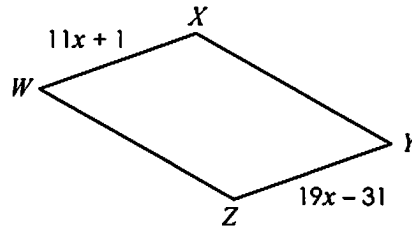


$$9x - 25 = 5x + 7$$

$$4x = 32$$

$$x = 8$$

8. Find YZ.



$$11x + 1 = 19x - 31$$

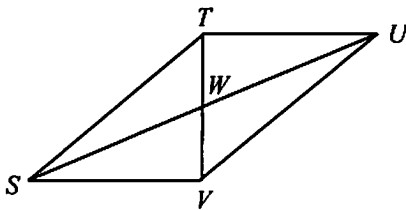
$$32 = 8x$$

$$x = 4$$

$$YZ = 19(4) - 31$$

$$= 45$$

9. If $TV = 74$ and $WV = 4x + 1$, solve for x.



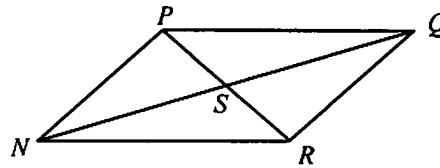
$$2(4x + 1) = 74$$

$$8x + 2 = 74$$

$$8x = 72$$

$$x = 9$$

10. If $NS = 2x + 7$ and $SQ = 5x - 23$, find NQ.



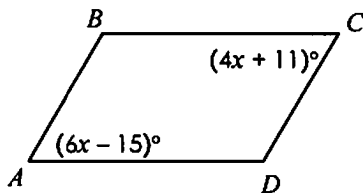
$$5x - 23 = 2x + 7$$

$$3x = 30$$

$$x = 10$$

$$NS = 2(10) + 7 = 27 ; NQ = 54$$

11. Find $m\angle B$.



$$6x - 15 = 4x + 11$$

$$2x = 26$$

$$x = 13$$

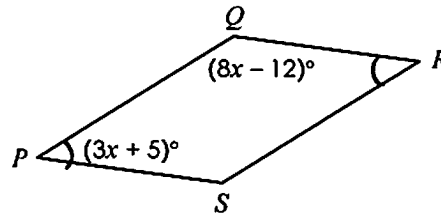
$$m\angle C = 4(13) + 11$$

$$= 63$$

$$m\angle B = 180 - 63$$

$$= 117^\circ$$

12. Find $m\angle R$.



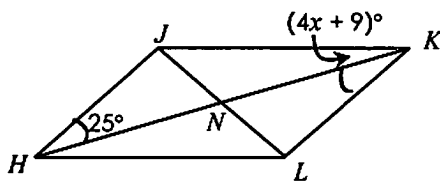
$$8x - 12 + 3x + 5 = 180$$

$$11x = 187$$

$$x = 17$$

$$m\angle R = 3(17) + 5 = 56^\circ$$

13. If $m\angle KLH = 134^\circ$, solve for x.

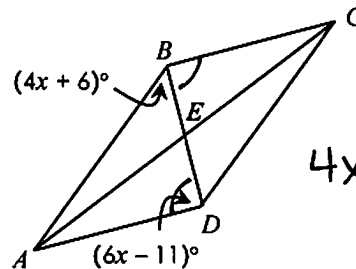


$$4x + 9 + 25 + 134 = 180$$

$$4x = 12$$

$$x = 3$$

14. If $m\angle ABC = 115^\circ$, find $m\angle ADB$.



$$4x + 6 + 6x - 11 = 115$$

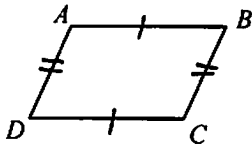
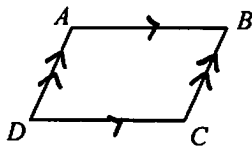
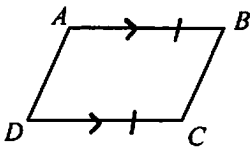
$$10x = 120$$

$$x = 12$$

$$m\angle ADB = 6(12) - 11$$

$$= 61^\circ$$

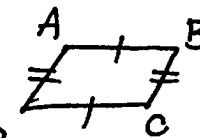
PROVING PARALLELOGRAMS in the Coordinate Plane

| | | |
|----------|---|--|
| METHOD 1 | <p>Prove both pairs of opposite sides are congruent.</p>  <p>If $\overline{AB} \cong \overline{CD}$ and $\overline{DA} \cong \overline{BC}$, then $ABCD$ is a parallelogram.</p> | Use.... distance formula |
| METHOD 2 | <p>Prove both pairs of opposite sides are parallel.</p>  <p>If $\overline{AB} \parallel \overline{CD}$ and $\overline{AD} \parallel \overline{BC}$, then $ABCD$ is a parallelogram.</p> | Use.... slope formula |
| METHOD 3 | <p>Prove one pair of opposite sides are congruent and parallel.</p>  <p>If $\overline{AB} \cong \overline{CD}$ and $\overline{AB} \parallel \overline{CD}$, then $ABCD$ is a parallelogram.</p> | Use.... distance + slope formulas |

SET I: Use the distance formula to determine if the figure is a parallelogram.

1. $A(-7, 4), B(1, 2), C(9, -8), D(1, -6)$

$$\begin{aligned}
 AB &= \sqrt{(1+7)^2 + (2-4)^2} = \sqrt{64+4} = \sqrt{68} = 2\sqrt{17} \\
 BC &= \sqrt{(9-1)^2 + (-8-2)^2} = \sqrt{64+100} = \sqrt{164} = 2\sqrt{41} \\
 CD &= \sqrt{(1-9)^2 + (-6+8)^2} = \sqrt{64+4} = \sqrt{68} = 2\sqrt{17} \\
 DA &= \sqrt{(1+7)^2 + (-6-4)^2} = \sqrt{64+100} = \sqrt{164} = 2\sqrt{41}
 \end{aligned}$$



$$\begin{aligned}
 \overline{AB} &\cong \overline{CD} \\
 \overline{BC} &\cong \overline{DA}
 \end{aligned}$$

Yes! $ABCD$ is
a parallelogram.

2. $P(-4, 2), Q(6, 4), R(11, -2), S(2, -3)$

$$PQ = \sqrt{(6+4)^2 + (4-2)^2} = \sqrt{100+4} = \sqrt{104} = 2\sqrt{26}$$

$$QR = \sqrt{(11-6)^2 + (-2-4)^2} = \sqrt{25+36} = \sqrt{61}$$

$$RS = \sqrt{(2-11)^2 + (-3+2)^2} = \sqrt{81+1} = \sqrt{82}$$

$$SP = \sqrt{(2+4)^2 + (-3-2)^2} = \sqrt{36+25} = \sqrt{61}$$

$$\overline{PQ} \neq \overline{RS}$$

No! $PQRS$ is not
a parallelogram.

SET 2: Use the slope formula to determine if the figure is a parallelogram.

3. $W(-7, -4), X(1, -6), Y(5, -13), Z(1, -12)$

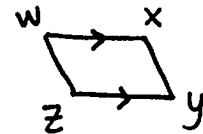
$$m \overline{WX} : \frac{-6+4}{1+7} = \frac{-2}{8} = -\frac{1}{4}$$

$$m \overline{XY} : \frac{-13+6}{5-1} = \frac{-7}{4}$$

$$m \overline{YZ} : \frac{-12+13}{1-5} = -\frac{1}{4}$$

$$m \overline{ZW} : \frac{-12+4}{1+7} = \frac{-8}{8} = -1$$

$$\overline{WX} \parallel \overline{YZ}$$



No! $WXYZ$ is not a parallelogram.

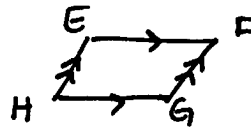
4. $E(0, 8), F(6, 10), G(2, 0), H(-4, -2)$

$$m \overline{EF} : \frac{10-8}{6-0} = \frac{2}{6} = \frac{1}{3}$$

$$m \overline{FG} : \frac{0-10}{2-6} = \frac{-10}{-4} = \frac{5}{2}$$

$$m \overline{GH} : \frac{-2-0}{-4-2} = \frac{-2}{-6} = \frac{1}{3}$$

$$m \overline{HE} : \frac{-2-8}{-4-0} = \frac{-10}{-4} = \frac{5}{2}$$



$$\overline{EF} \parallel \overline{GH}$$

$$\overline{FG} \parallel \overline{HE}$$

Yes! $EFGH$ is a parallelogram.

SET 3: Use the distance formula AND slope formula to determine if the figure is a parallelogram.

5. $J(-9, -2), K(-5, 1), L(1, -4), M(-3, -7)$

$$JK: d = \sqrt{(-5+9)^2 + (1+2)^2} = \sqrt{16+9} = \sqrt{25} = 5$$

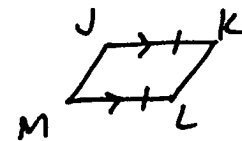
$$LM: d = \sqrt{(-3-1)^2 + (-7+4)^2} = \sqrt{16+9} = \sqrt{25} = 5$$

$$m \overline{JK} : \frac{1+2}{-5+9} = \frac{3}{4}$$

$$\overline{JK} \cong \overline{LM}$$

$$\overline{JK} \parallel \overline{LM}$$

$$m \overline{LM} : \frac{-7+4}{-3-1} = \frac{-3}{-4} = \frac{3}{4}$$



Yes! $JKLM$ is a parallelogram.

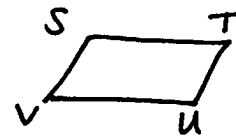
6. $S(1, 5), T(10, 7), U(-3, -1), V(-3, -1)$

$$ST: d = \sqrt{(10-1)^2 + (7-5)^2} = \sqrt{81+4} = \sqrt{85}$$

$$UV: d = \sqrt{(-3-14)^2 + (-1-1)^2} = \sqrt{289+4} = \sqrt{293}$$

$$m \overline{ST} : \frac{7-5}{10-1} = \frac{2}{9}$$

$$m \overline{UV} : \frac{-1-1}{-3-14} = \frac{-2}{-17} = \frac{2}{17}$$



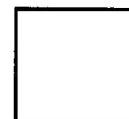
No! $STUV$ is not a parallelogram.

Name: _____

Unit 8: Polygons & Quadrilaterals

Date: _____ Per: _____

Homework 2: Parallelograms



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Directions: If each quadrilateral below is a parallelogram, find the missing measures.

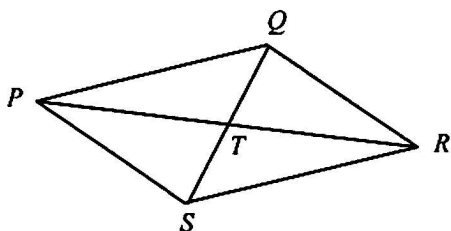
1.

$MN = \underline{31}$
 $KN = \underline{45}$
 $m\angle K = \underline{61^\circ}$
 $m\angle L = \underline{119^\circ}$
 $m\angle M = \underline{61^\circ}$

2.

$CF = \underline{10}$
 $FE = \underline{15}$
 $CE = \underline{14}$
 $GD = \underline{11}$

3. Given $PQ = 24$, $PS = 19$, $PR = 42$, $TQ = 10$, $m\angle PQR = 106^\circ$, $m\angle QSR = 49^\circ$, and $m\angle PRS = 35^\circ$.



| | |
|-----------------------|--------------------------------------|
| $QR = \underline{19}$ | $m\angle QRS = \underline{74^\circ}$ |
| $SR = \underline{24}$ | $m\angle PQS = \underline{49^\circ}$ |
| $PT = \underline{21}$ | $m\angle RPS = \underline{39^\circ}$ |
| $SQ = \underline{20}$ | $m\angle PSQ = \underline{57^\circ}$ |

4. Find KL .

$12x - 22 = 7x - 2$
 $5x = 20$
 $x = 4$

 $KL = 7(4) - 2$
 $= \underline{26}$

5. If $AC = 8x - 14$ and $EC = 2x + 11$, solve for x .

$2(2x + 11) = 8x - 14$
 $4x + 22 = 8x - 14$
 $36 = 4x$
 $\underline{x = 9}$

6. Solve for x .

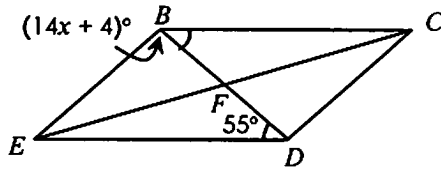
$3x + 5 + 9x - 17 = 180$
 $12x - 12 = 180$
 $12x = 192$
 $\underline{x = 16}$

7. Find $m\angle V$.

$10x - 27 = 2x + 29$
 $8x = 56$
 $x = 7$

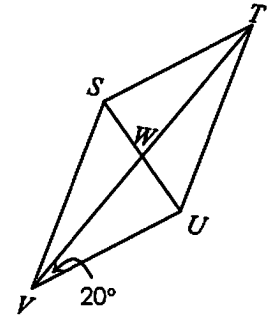
 $m\angle Y = 10(7) - 27 = 43^\circ$
 $\underline{m\angle V = 137^\circ}$

8. If $m\angle BCD = 51^\circ$, solve for x .



$$\begin{aligned} 14x + 4 + 51 + 55 &= 180 \\ 14x + 110 &= 180 \\ 14x &= 70 \\ \boxed{x = 5} \end{aligned}$$

9. If $m\angle VST = (5x + 23)^\circ$ and $m\angle VUT = (8x - 49)^\circ$, find $m\angle SVT$.



$$\begin{aligned} 8x - 49 &= 5x + 23 \\ 3x &= 72 \\ x &= 24 \\ m\angle VST &= 5(24) + 23 \\ &= 143^\circ \\ m\angle SVT &= \boxed{17^\circ} \end{aligned}$$

Directions: Determine whether the quadrilateral is a parallelogram using the indicated method.

10. $Q(-10, -2), R(1, -1), S(1, -7), T(-11, -8)$ (Distance Formula)

$$\begin{aligned} QR: d &= \sqrt{(-10-1)^2 + (-2+1)^2} = \sqrt{121+1} = \sqrt{122} \\ ST: d &= \sqrt{(1+11)^2 + (-7+8)^2} = \sqrt{144+1} = \sqrt{145} \end{aligned}$$

No! QRST is not a parallelogram.

11. $K(2, 7), L(6, 12), M(13, 13), N(9, 8)$ (Slope Formula)

$$\begin{aligned} m_{\overline{KL}}: \frac{12-7}{6-2} &= \frac{5}{4} & m_{\overline{MN}}: \frac{8-13}{9-13} &= \frac{-5}{-4} = \frac{5}{4} \\ m_{\overline{LM}}: \frac{13-12}{13-6} &= \frac{1}{7} & m_{\overline{KN}}: \frac{8-7}{9-2} &= \frac{1}{7} \end{aligned}$$

Yes! KLMN is a parallelogram.

12. $D(-5, -6), E(5, 2), F(4, -4), G(-6, -12)$ (Distance & Slope Formulas)

$$\begin{aligned} DE: d &= \sqrt{(-5-5)^2 + (-6-2)^2} = \sqrt{100+64} = \sqrt{164} = 2\sqrt{41} \\ FG: d &= \sqrt{(4+6)^2 + (-4+12)^2} = \sqrt{100+64} = \sqrt{164} = 2\sqrt{41} \end{aligned}$$

$$m_{\overline{DE}}: \frac{2+6}{5+5} = \frac{8}{10} = \frac{4}{5}$$

$$m_{\overline{FG}}: \frac{-12+4}{-6-4} = \frac{-8}{-10} = \frac{4}{5}$$

Yes! DEFG is a parallelogram.

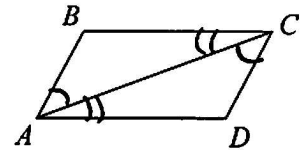
PARALLELOGRAM *Proofs*

Recall: What is the definition of a parallelogram?

A quadrilateral in which both pairs of opposite sides are parallel.

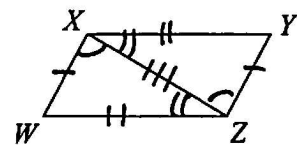
Use the definition of a parallelogram to complete each proof.

- 1 Given: $\angle BAC \cong \angle DCA$; $\angle BCA \cong \angle DAC$
 Prove: $ABCD$ is a parallelogram



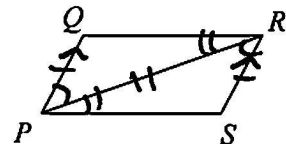
| Statements | Reasons |
|--|----------------------------------|
| 1. $\angle BAC \cong \angle DCA$; $\angle BCA \cong \angle DAC$ | 1. given |
| 2. $\overline{BA} \parallel \overline{DC}$; $\overline{BC} \parallel \overline{DA}$ | 2. Alt. Interior Angles Converse |
| 3. $ABCD$ is a parallelogram | 3. Def. of parallelogram |

- 2 Given: $\overline{WX} \cong \overline{YZ}$; $\overline{WZ} \cong \overline{YX}$
 Prove: $WXYZ$ is a parallelogram



| Statements | Reasons |
|--|----------------------------------|
| 1. $\overline{WX} \cong \overline{YZ}$; $\overline{WZ} \cong \overline{YX}$ | 1. given |
| 2. $\overline{XZ} \cong \overline{ZX}$ | 2. reflexive property |
| 3. $\triangle WZX \cong \triangle YXZ$ | 3. SSSA Congruence |
| 4. $\angle WXZ \cong \angle YZX$; $\angle WZX \cong \angle YXZ$ | 4. CPCTC |
| 5. $\overline{WX} \parallel \overline{YZ}$; $\overline{WZ} \parallel \overline{YX}$ | 5. Alt. Interior Angles Converse |
| 6. $WXYZ$ is a parallelogram | 6. Def of parallelogram |

- 3 Given: $\overline{PQ} \cong \overline{RS}$; $\overline{PQ} \parallel \overline{RS}$
 Prove: $PQRS$ is a parallelogram



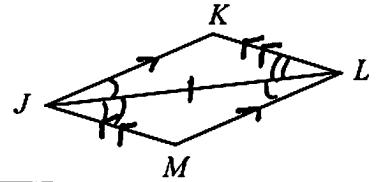
| Statements | Reasons |
|--|----------------------------------|
| 1. $\overline{PQ} \cong \overline{RS}$; $\overline{PQ} \parallel \overline{RS}$ | 1. given |
| 2. $\angle QPR \cong \angle SRP$ | 2. Alt. Interior Angles |
| 3. $\overline{PR} \cong \overline{RP}$ | 3. Reflexive Property |
| 4. $\triangle QPR \cong \triangle SRP$ | 4. SAS Congruence |
| 5. $\angle QRP \cong \angle SPR$ | 5. CPCTC |
| 6. $\overline{QR} \parallel \overline{SP}$ | 6. Alt. Interior Angles Converse |
| 7. $PQRS$ is a parallelogram | 7. Def of parallelogram |

Other properties of parallelograms:

- Opposite sides are congruent.
- Opposite angles are congruent.
- Diagonals bisect each other.
- Adjacent angles are supplementary.

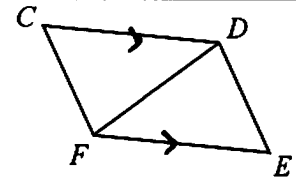
Complete each proof.

4 Given: $JKLM$ is a parallelogram
 Prove: $\overline{JK} \cong \overline{LM}$ and $\overline{JM} \cong \overline{LK}$



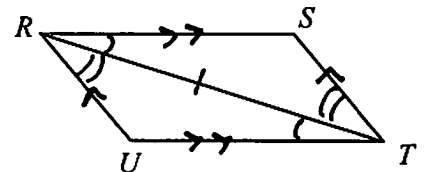
| Statements | Reasons |
|--|-------------------------------|
| 1. $JKLM$ is a parallelogram | 1. given |
| 2. $\overline{JK} \parallel \overline{LM}$; $\overline{JM} \parallel \overline{LK}$ | 2. Def. of parallelogram |
| 3. $\angle KJL \cong \angle MLJ$; $\angle MJL \cong \angle LKJ$ | 3. Alt. Interior Angles |
| 4. $\overline{JM} \cong \overline{JM}$ | 4. Reflexive Property |
| 5. $\triangle JKL \cong \triangle LMJ$ | 5. ASA \triangle Congruence |
| 6. $\overline{JK} \cong \overline{LM}$ and $\overline{JM} \cong \overline{LK}$ | 6. CPCTC |

5 Given: $CDEF$ is a parallelogram
 Prove: $\angle DCF$ and $\angle CFE$ are supplementary



| Statements | Reasons |
|--|----------------------------|
| 1. $CDEF$ is a parallelogram | 1. given |
| 2. $\overline{CD} \parallel \overline{FE}$ | 2. Def of Parallelogram |
| 3. $\angle DCF$ and $\angle CFE$ are supplementary | 3. Consec. Interior Angles |

6 Given: $RSTU$ is a parallelogram
 Prove: $\angle U \cong \angle S$



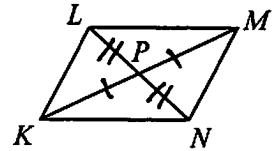
| Statements | Reasons |
|--|-------------------------------|
| 1. $RSTU$ is a parallelogram | 1. given |
| 2. $\overline{RU} \parallel \overline{TS}$; $\overline{RS} \parallel \overline{TU}$ | 2. Def of parallelogram |
| 3. $\angle SRT \cong \angle UTR$; $\angle URT \cong \angle STR$ | 3. Alt. Interior Angles |
| 4. $\overline{RT} \cong \overline{TR}$ | 4. Reflexive Property |
| 5. $\triangle RUT \cong \triangle TRS$ | 5. ASA \triangle congruence |
| 6. $\angle U \cong \angle S$ | 6. CPCTC |

Properties of parallelogram are sufficient to prove a quadrilateral is a parallelogram.
The list below summarizes ways to prove a quadrilateral is a parallelogram.

- Show that both pairs of opposite sides are parallel. (Definition of a Parallelogram)
- Show that both pairs of opposite sides are congruent.
- Show that both pairs of opposite angles are congruent.
- Show that the diagonals bisect each other.
- Show that one angle is supplementary to both adjacent angles.
- Show that one pair of opposite sides are congruent and parallel.

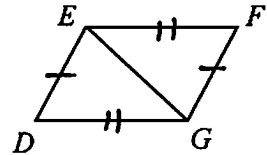
Complete each proof.

- 7 Given: P is the midpoint of \overline{LN} and \overline{KM}
Prove: $KLMN$ is a parallelogram



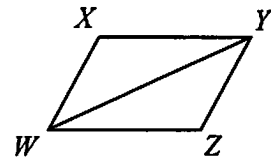
| Statements | Reasons |
|--|--------------------------------------|
| 1. P is the midpoint of \overline{LN} + \overline{KM} | 1. given |
| 2. $\overline{KP} \cong \overline{MP}$; $\overline{LP} \cong \overline{NP}$ | 2. Def of midpoint |
| 3. $KLMN$ is a parallelogram | 3. Diag. of p'gram bisect each other |

- 8 Given: $\triangle EDG \cong \triangle GFE$
Prove: $DEFG$ is a parallelogram



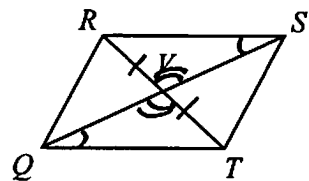
| Statements | Reasons |
|--|---------------------------------------|
| 1. $\triangle EDG \cong \triangle GFE$ | 1. given |
| 2. $\overline{DG} \cong \overline{FE}$; $\overline{DE} \cong \overline{FG}$ | 2. CPCTC |
| 3. $DEFG$ is a parallelogram | 3. Opp. sides of p'gram are congruent |

- 9 Given: $\angle XWZ \cong \angle ZYX$; $\triangle WXY \cong \triangle YZW$
Prove: $WXYZ$ is a parallelogram



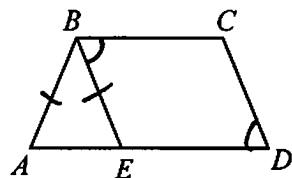
| Statements | Reasons |
|--|---|
| 1. $\angle XWZ \cong \angle ZYX$ | 1. given |
| 2. $\triangle WXY \cong \triangle YZW$ | 2. given |
| 3. $\angle WXZ \cong \angle YZW$ | 3. CPCTC |
| 4. $WXYZ$ is a parallelogram | 4. Opp. angles of p'gram are congruent. |

- 10 Given: \overline{QS} bisects \overline{RT} ; $\angle RSQ \cong \angle TQS$
 Prove: $QRST$ is a parallelogram



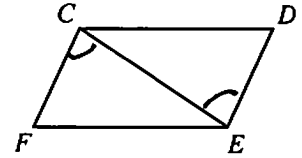
| Statements | Reasons |
|--|---|
| 1. \overline{QS} bisects \overline{RT} ; $\angle RSQ \cong \angle TQS$ | 1. given |
| 2. $\overline{RV} \cong \overline{TV}$ | 2. Def of bisector |
| 3. $\angle RVS \cong \angle TVQ$ | 3. Vertical angles |
| 4. $\triangle RVS \cong \triangle TVQ$ | 4. AAS \triangle Congruence |
| 5. $\overline{RS} \cong \overline{QT}$ | 5. CPCTC |
| 6. $\overline{RS} \parallel \overline{QT}$ | 6. Alt. Interior Angles Converse |
| 7. $QRST$ is a parallelogram | 7. One pair of opp sides are congruent + parallel |

- 11 Given: $\overline{BA} \cong \overline{BE}$, $\angle CBE \cong \angle EDC$,
 $\angle A$ and $\angle C$ are supplementary
 Prove: $BCDE$ is a parallelogram



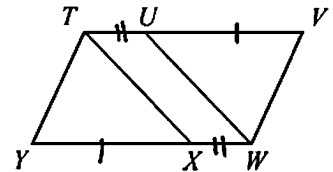
| Statements | Reasons |
|--|--|
| 1. $\overline{BA} \cong \overline{BE}$; $\angle CBE \cong \angle EDC$ | 1. given |
| 2. $\triangle ABE$ is an isosceles \triangle | 2. Def of isosceles triangle |
| 3. $\angle A \cong \angle BEA$ | 3. Base \angle 's of isosc \triangle are congruent |
| 4. $m\angle A = m\angle BEA$ | 4. Def of congruence |
| 5. $\angle A + \angle C$ are supplementary | 5. given |
| 6. $\angle BEA + \angle BED$ are supplementary | 6. Linear Pair (Supplement Thm) |
| 7. $m\angle A + m\angle C = 180^\circ$ | 7. Def of supplementary angles |
| 8. $m\angle BEA + m\angle BED = 180^\circ$ | 8. Def of supplementary angles |
| 9. $m\angle BEA + m\angle BED = m\angle A + m\angle C$ | 9. Substitution Property |
| 10. $m\angle A + m\angle BED = m\angle A + m\angle C$ | 10. Substitution Property |
| 11. $m\angle BED = m\angle C$ | 11. Subtraction Property |
| 12. $\angle BED \cong \angle C$ | 12. Def of congruence |
| 13. $BCDE$ is a parallelogram | 13. Opp. angles of a p'gram are congruent. |

- 12 Given: $\angle FCE \cong \angle DEC$, $\angle FCD \cong \angle DEF$
 Prove: $CDEF$ is a parallelogram



| Statements | Reasons |
|--|-----------------------------------|
| 1. $\angle FCE \cong \angle DEC$ | 1. given |
| 2. $\overline{FC} \parallel \overline{DE}$ | 2. Alt. Interior Angles Converse |
| 3. $\angle FCD \cong \angle DEF$ | 3. given |
| 4. $m\angle FCE + m\angle DCE = m\angle FCD$ | 4. Angle Addition Postulate |
| 5. $m\angle FEC + m\angle DEC = m\angle FED$ | 5. Angle Addition Postulate |
| 6. $m\angle FCE = m\angle DEC$ | 6. Def of Congruence |
| 7. $m\angle FCD = m\angle DEF$ | 7. Def of Congruence |
| 8. $m\angle DEC + m\angle DCE = m\angle DEF$ | 8. Substitution Property |
| 9. $m\angle FEC + m\angle DEC = m\angle DEC + m\angle DCE$ | 9. Substitution Property |
| 10. $m\angle FEC = m\angle DCE$ | 10. Subtraction Property |
| 11. $\overline{CD} \parallel \overline{FE}$ | 11. Alt. Interior Angles Converse |
| 12. $CDEF$ is a parallelogram | 12. Def of parallelogram |

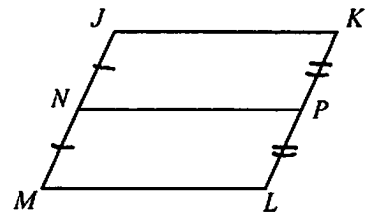
- 13 Given: $TUWX$ is a parallelogram,
 $\overline{YX} \cong \overline{UV}$
 Prove: $TVWY$ is a parallelogram



| Statements | Reasons |
|--|--|
| 1. $TUWX$ is a parallelogram | 1. given |
| 2. $\overline{TU} \parallel \overline{WX}$ | 2. Def of a parallelogram |
| 3. $\overline{TU} \cong \overline{XW}$ | 3. Opp sides of a p'gram are congruent. |
| 4. $\overline{YX} \cong \overline{UV}$ | 4. given |
| 5. $UV + TU = TV$ | 5. Segment Addition Postulate |
| 6. $YX + XW = YW$ | 6. Segment Addition Postulate |
| 7. $TU = XW$; $YX = UV$ | 7. Def of congruence |
| 8. $UV + TU = YW$ | 8. Substitution Property |
| 9. $TV = YW$ | 9. Substitution Property |
| 10. $\overline{TV} \cong \overline{YW}$ | 10. Def of congruence |
| 11. $TVWY$ is a parallelogram | 11. One pair of opp. sides are parallel & congruent. |

- 14 Given: $JKLM$ is a parallelogram,
 N is the midpoint of \overline{MJ} ,
 P is the midpoint of \overline{KL}

Prove: $JKPN$ is a parallelogram



| Statements | Reasons |
|--|--|
| 1. $JKLM$ is a parallelogram | 1. given |
| 2. N is the midpoint of \overline{MJ} | 2. given |
| 3. P is the midpoint of \overline{KL} | 3. given |
| 4. $\overline{JN} \parallel \overline{KP}$ | 4. Def of parallelogram |
| 5. $\overline{MJ} \cong \overline{KL}$ | 5. Opp. sides of a p'gram are congruent |
| 6. $JN = MN$; $KP = LP$ | 6. Def of midpoint |
| 7. $JN + MN = MJ$ | 7. Seg Addition Postulate |
| 8. $KP + LP = KL$ | 8. Seg Addition Postulate |
| 9. $MJ = KL$ | 9. Def of Congruence |
| 10. $JN + JN = MJ$ | 10. Substitution Property |
| 11. $KP + KP = KL$ | 11. Substitution Property |
| 12. $2JN = MJ$; $2KP = KL$ | 12. Simplify |
| 13. $2KP = MJ$ | 13. Substitution Property |
| 14. $2JN = 2KP$ | 14. Substitution Property |
| 15. $JN = KP$ | 15. Division Property |
| 16. $\overline{JN} \cong \overline{KP}$ | 16. Def of Congruence |
| 17. $JKPN$ is a parallelogram | 17. One pair of opp. sides are parallel & congruent. |
| | |
| | |
| | |

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Unit 8: Polygons & Quadrilaterals



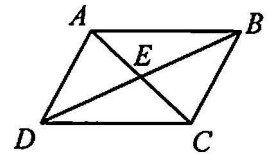
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Homework 3: Parallelogram Proofs

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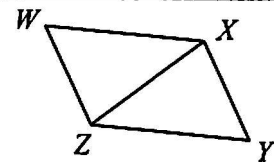
Directions: Complete each proof.

1. Given: $\overline{AD} \parallel \overline{BC}$; $\angle ABD \cong \angle CDB$
 Prove: $ABCD$ is a parallelogram



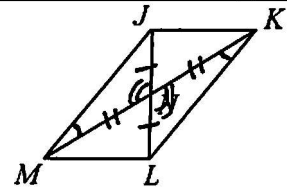
| Statements | Reasons |
|--|----------------------------------|
| 1. $\overline{AD} \parallel \overline{BC}$ | 1. given |
| 2. $\angle ABD \cong \angle CDB$ | 2. given |
| 3. $\overline{AB} \parallel \overline{CD}$ | 3. Alt. Interior Angles Converse |
| 4. $ABCD$ is a parallelogram | 4. Def of parallelogram |

2. Given: $\overline{WX} \cong \overline{YZ}$; $\angle WXZ \cong \angle YZX$
 Prove: $WXYZ$ is a parallelogram



| Statements | Reasons |
|--|---------------------------------------|
| 1. $\overline{WX} \cong \overline{YZ}$; $\angle WXZ \cong \angle YZX$ | 1. given |
| 2. $\overline{XZ} \cong \overline{ZX}$ | 2. Reflexive Property |
| 3. $\triangle WXZ \cong \triangle YZX$ | 3. SAS \triangle Congruence |
| 4. $\overline{WZ} \cong \overline{YX}$ | 4. CPCTC |
| 5. $WXYZ$ is a parallelogram | 5. Opp sides of p'gram are congruent. |

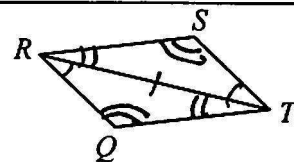
3. Given: $\overline{JN} \cong \overline{NL}$; $\angle JMK \cong \angle LKM$
 Prove: $JKLM$ is a parallelogram



| Statements | Reasons |
|--|--|
| 1. $\overline{JN} \cong \overline{NL}$; $\angle JMK \cong \angle LKM$ | 1. given |
| 2. $\angle JNM \cong \angle LNK$ | 2. Vertical Angles |
| 3. $\triangle JNM \cong \triangle LNK$ | 3. AAS \triangle Congruence |
| 4. $\overline{NM} \cong \overline{NK}$ | 4. CPCTC |
| 5. $JKLM$ is a parallelogram | 5. Diagonals of a p'gram bisect each other |

4. Given: $\angle QRT \cong \angle STR$; $\angle S \cong \angle Q$

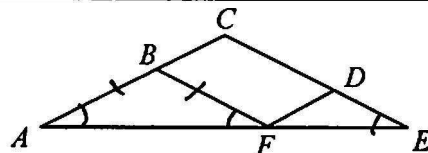
Prove: $QRST$ is a parallelogram



| Statements | Reasons |
|--|----------------------------------|
| 1. $\angle QRT \cong \angle STR$; $\angle S \cong \angle Q$ | 1. given |
| 2. $\overline{RT} \cong \overline{TR}$ | 2. Reflexive property |
| 3. $\triangle RQT \cong \triangle TSR$ | 3. AAS \triangle congruence |
| 4. $\angle SRT \cong \angle QTR$ | 4. CPCTC |
| 5. $\overline{RQ} \parallel \overline{TS}$; $\overline{RS} \parallel \overline{TQ}$ | 5. Alt. Interior Angles Converse |
| 6. $QRST$ is a parallelogram | 6. Def of parallelogram |

5. Given: $BCDF$ is a parallelogram; $\overline{AB} \cong \overline{BF}$

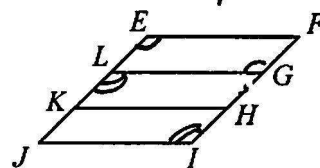
Prove: $\angle A \cong \angle E$



| Statements | Reasons |
|--|---|
| 1. $BCDF$ is a parallelogram | 1. given |
| 2. $\overline{CD} \parallel \overline{BF}$ | 2. Def of parallelogram |
| 3. $\angle BFA \cong \angle E$ | 3. Corresponding angles |
| 4. $\overline{AB} \cong \overline{BF}$ | 4. given |
| 5. $\triangle ABF$ is isosceles | 5. Def of isosceles triangle |
| 6. $\angle A \cong \angle BFA$ | 6. Base \angle 's of isos \triangle are congruent |
| 7. $\angle A \cong \angle E$ | 7. Transitive Property |

6. Given: $EFGL$ and $LGIJ$ are parallelograms

Prove: $\angle E \cong \angle I$



| Statements | Reasons |
|--|---|
| 1. $EFGL$ + $LGIJ$ are parallelograms | 1. given |
| 2. $\angle E \cong \angle LGF$; $\angle JLG \cong \angle I$ | 2. Opp. angles of a pgram are congruent |
| 3. $\overline{EF} \parallel \overline{LG}$ | 3. Def of parallelogram |
| 4. $\angle E \cong \angle JLG$ | 4. corresponding angles |
| 5. $\angle E \cong \angle I$ | 5. Transitive Property |

Name: _____

Geometry

Date: _____ Per: _____

Unit 8: Polygons & Quadrilaterals

Quiz 8-1: Angles of Polygons & Parallelograms

Part I: Angles of Polygons

1. What is the sum of the degrees of the interior angles of a 19-gon?

$$S = (19 - 2) \cdot 180$$

1. 3060°

2. If the sum of the interior angles of a polygon is 1800°, how many sides does it have?

$$(n - 2) \cdot 180 = 1800$$
$$n - 2 = 10$$

2. 12 sides

3. What is the measure of an interior angle of a regular nonagon?

$$\frac{(9 - 2) \cdot 180}{9} = \frac{1260}{9}$$

3. 140°

4. What is the sum of the exterior angles of a 25-gon?

4. 360°

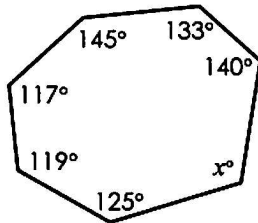
5. What is the measure of each exterior angle of a regular decagon?

$$\frac{360}{10}$$

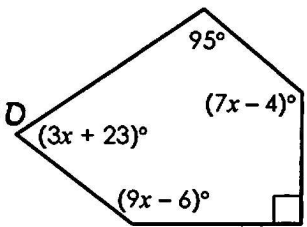
5. 36°

Find the value of x.

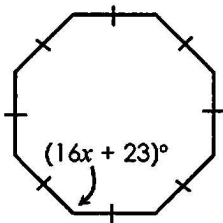
6. $x = \underline{121^\circ}$
 $(7 - 2) \cdot 180 = 900$



7. $x = \underline{18}$
 $19x + 198 = 540$
 $19x = 342$
 $x = 18$

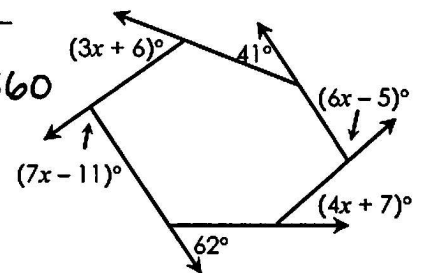


8. $x = \underline{7}$
 $\frac{(8 - 2) \cdot 180}{8} = 135$



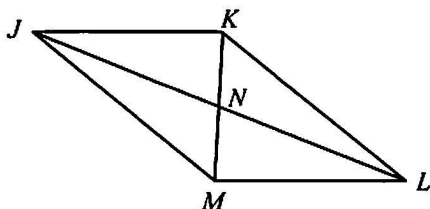
$16x + 23 = 135$
 $16x = 112$
 $x = 7$

9. $x = \underline{13}$
 $20x + 100 = 360$
 $20x = 260$
 $x = 13$



Part II: Parallelograms

10. Given $JM = 27$, $ML = 16$, $JL = 46$, $NK = 15$, $m\angle KLM = 48^\circ$, $m\angle JKM = 78^\circ$, and $m\angle MJL = 22^\circ$, find each missing value.



$KL = \underline{27}$

$m\angle JKL = \underline{132^\circ}$

$JK = \underline{16}$

$m\angle KLJ = \underline{22^\circ}$

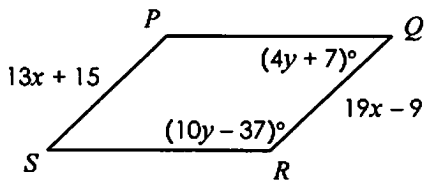
$MK = \underline{30}$

$m\angle KMJ = \underline{54^\circ}$

$NL = \underline{23}$

$m\angle KJL = \underline{26^\circ}$

11. If $PQRS$ is a parallelogram, find the values of x and y .

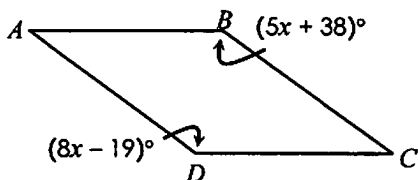


$$\begin{aligned} 19x - 9 &= 13x + 15 \\ 6x &= 24 \\ x &= 4 \end{aligned}$$

$$\begin{aligned} 14y - 30 &= 180 \\ 14y &= 210 \\ y &= 15 \end{aligned}$$

11. $x = \underline{4}$
 $y = \underline{15}$

12. If $ABCD$ is a parallelogram, find $m\angle C$.



$$\begin{aligned} 8x - 19 &= 5x + 38 \\ 3x &= 57 \\ x &= 19 \end{aligned}$$

$$m\angle B = 5(19) + 38 = 133^\circ$$

$$m\angle C = 180 - 133 = 47^\circ$$

12. $m\angle C = \underline{47^\circ}$

Determine whether the quadrilateral is a parallelogram using the indicated method.

13. $D(-8, 1), E(-3, 6), F(7, 4), G(2, -1)$ (Distance Formula)

13. YES / NO

$$\begin{aligned} DE: d &= \sqrt{(-3+8)^2 + (6-1)^2} = \sqrt{25+25} = \sqrt{50} = 5\sqrt{2} \\ FG: d &= \sqrt{(2-7)^2 + (-1-4)^2} = \sqrt{25+25} = \sqrt{50} = 5\sqrt{2} \\ EF: d &= \sqrt{(7+3)^2 + (4-6)^2} = \sqrt{100+4} = \sqrt{104} = 2\sqrt{26} \\ DG: d &= \sqrt{(2+8)^2 + (-1-1)^2} = \sqrt{100+4} = \sqrt{104} = 2\sqrt{26} \end{aligned} \left. \vphantom{\begin{aligned} DE: d \\ FG: d \\ EF: d \\ DG: d \end{aligned}} \right\} \cong$$

14. $L(-1, 6), M(5, 9), N(0, 2), P(-8, -2)$ (Slope Formula)

14. YES / NO

$$\begin{aligned} m_{\overline{LM}} &: \frac{9-6}{5+1} = \frac{3}{6} = \frac{1}{2} \\ m_{\overline{NP}} &: \frac{-2-2}{-8-0} = \frac{-4}{-8} = \frac{1}{2} \end{aligned} \left. \vphantom{\begin{aligned} m_{\overline{LM}} \\ m_{\overline{NP}} \end{aligned}} \right\} \parallel$$

$$\begin{aligned} m_{\overline{MN}} &: \frac{2-9}{0-5} = \frac{-7}{-5} = \frac{7}{5} \\ m_{\overline{LP}} &: \frac{-2-6}{-8+1} = \frac{-8}{-7} = \frac{8}{7} \end{aligned} \left. \vphantom{\begin{aligned} m_{\overline{MN}} \\ m_{\overline{LP}} \end{aligned}} \right\} \text{Not } \parallel$$

15. $B(-2, -9), C(0, -5), D(6, -3), E(4, -7)$ (Distance and Slope Formulas)

15. YES / NO

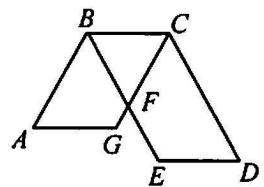
$$\begin{aligned} BC: d &= \sqrt{(0+2)^2 + (-5+9)^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5} \\ DE: d &= \sqrt{(4-6)^2 + (-7+3)^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5} \end{aligned} \left. \vphantom{\begin{aligned} BC: d \\ DE: d \end{aligned}} \right\} \cong$$

$$\begin{aligned} m_{BC} &: \frac{-5+9}{0+2} = \frac{4}{2} = 2 \\ m_{DE} &: \frac{-7+3}{4-6} = \frac{-4}{-2} = 2 \end{aligned} \left. \vphantom{\begin{aligned} m_{BC} \\ m_{DE} \end{aligned}} \right\} \parallel$$

Complete each proof.

16. Given: $ABCG$ and $BCDE$ are parallelograms

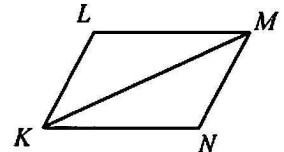
Prove: $\overline{AG} \cong \overline{ED}$



| Statements | Reasons |
|--|-------------------------------------|
| 1. $ABCG$ & $BCDE$ are parallelograms | 1. given |
| 2. $\overline{AG} \cong \overline{BC}$; $\overline{BC} \cong \overline{ED}$ | 2. Opp sides of pgram are Congruent |
| 3. $\overline{AG} \cong \overline{ED}$ | 3. Transitive property |

17. Given: $\overline{KL} \parallel \overline{NM}$; $\angle L \cong \angle N$

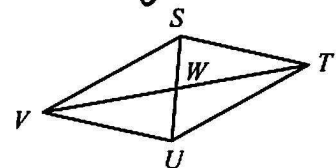
Prove: $KLMN$ is a parallelogram



| Statements | Reasons |
|--|----------------------------------|
| 1. $\overline{KL} \parallel \overline{NM}$ | 1. given |
| 2. $\angle L \cong \angle N$ | 2. given |
| 3. $\angle LKM \cong \angle NKM$ | 3. Alt. Interior Angles |
| 4. $\overline{KM} \cong \overline{MK}$ | 4. Reflexive property |
| 5. $\triangle LKM \cong \triangle NKM$ | 5. AAS \triangle Congruence |
| 6. $\triangle LMK \cong \triangle NKM$ | 6. CPCTC |
| 7. $\overline{LM} \parallel \overline{NK}$ | 7. Alt. Interior Angles Converse |
| 8. $KLMN$ is a parallelogram | 8. Def of parallelogram |

18. Given: W is the midpoint of \overline{SU} ; $\overline{ST} \parallel \overline{VU}$

Prove: $STUV$ is a parallelogram



| Statements | Reasons |
|--|--|
| 1. W is the midpt of \overline{SU} | 1. given |
| 2. $\overline{SW} \cong \overline{UW}$ | 2. Def of midpoint |
| 3. $\overline{ST} \parallel \overline{VU}$ | 3. given |
| 4. $\angle TSU \cong \angle VUS$ | 4. Alt. Interior Angles |
| 5. $\angle SWT \cong \angle UWV$ | 5. Vertical Angles |
| 6. $\triangle SWT \cong \triangle UWV$ | 6. ASA \triangle congruence |
| 7. $\overline{ST} \cong \overline{VU}$ | 7. CPCTC |
| 8. $STUV$ is a parallelogram | 8. One pair of opp sides are \cong and \parallel . |

Name: _____

Date: _____

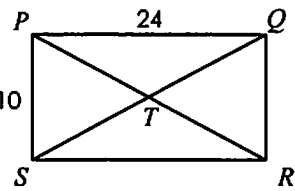
Topic: _____

Class: _____

| Main Ideas/Questions | Notes/Examples |
|---|---|
| <p style="text-align: center;"><i>Properties of</i> RECTANGLES</p> <p style="text-align: center;">PLUS THESE! ►</p> | <p>Rectangles have the same properties of parallelograms:</p> <ul style="list-style-type: none"> • Opposite sides are congruent. • Opposite sides are parallel. • Opposite angles are congruent. • Consecutive angles are supplementary. • Diagonals bisect each other. |
| | <p>① All 4 angles are right angles.</p> |
| | <p>② Diagonals are congruent.</p> |

Directions: Each quadrilateral below is a rectangle. Find the missing measures.

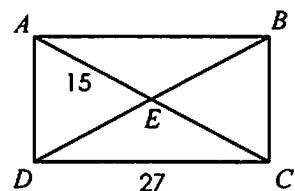
1.



$QR = \underline{10}$
 $SR = \underline{24}$
 $SQ = \underline{26}$
 $PR = \underline{26}$
 $QT = \underline{13}$

$SQ: 10^2 + 24^2 = x^2$
 $676 = x^2$
 $x = 26$

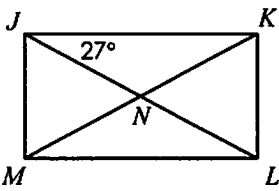
2.



$AC = \underline{36}$
 $BD = \underline{30}$
 $BE = \underline{15}$
 $AB = \underline{27}$
 $BC = \underline{13.1}$

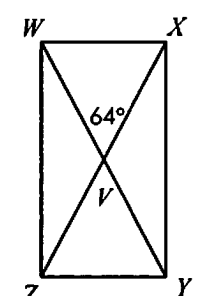
$BC: 27^2 + x^2 = 30^2$
 $x^2 = 171$
 $x = 13.1$

3.



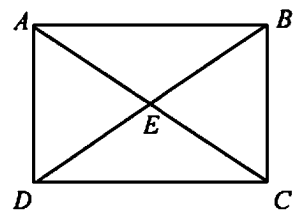
$m\angle MJK = \underline{90^\circ}$
 $m\angle MJL = \underline{63^\circ}$
 $m\angle JLK = \underline{63^\circ}$
 $m\angle KML = \underline{27^\circ}$
 $m\angle MNL = \underline{126^\circ}$

4.



$m\angle XWY = \underline{58^\circ}$
 $m\angle YXZ = \underline{32^\circ}$
 $m\angle WVZ = \underline{116^\circ}$
 $m\angle XWZ = \underline{90^\circ}$
 $m\angle XZY = \underline{58^\circ}$

5. Given $DB = 42$, $AD = 26$, and $m\angle DAE = 52^\circ$.

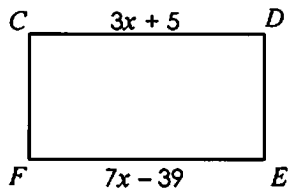


$x^2 + 26^2 = 42^2$
 $x^2 = 1088$
 $x = 33$

$AC = \underline{42}$
 $EB = \underline{21}$
 $BC = \underline{26}$
 $AB = \underline{33}$
 $m\angle ADC = \underline{90^\circ}$
 $m\angle ABD = \underline{38^\circ}$
 $m\angle BCA = \underline{52^\circ}$
 $m\angle DEC = \underline{104^\circ}$

6. Find EF .

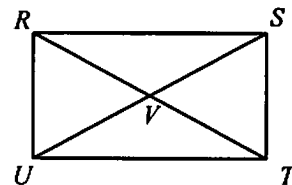
$$\begin{aligned} 7x - 39 &= 3x + 5 \\ 4x &= 44 \\ x &= 11 \end{aligned}$$



$$EF : 7(11) - 39 = \boxed{38}$$

7. If $RT = 5x - 14$ and $US = 2x + 10$, find VT .

$$\begin{aligned} 5x - 14 &= 2x + 10 \\ 3x &= 24 \\ x &= 8 \end{aligned}$$

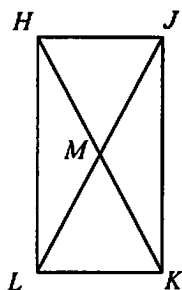


$$RT : 5(8) - 14 = 26$$

$$\boxed{VT = 13}$$

8. If $JM = x + 17$ and $MK = 5x - 23$, find JL .

$$\begin{aligned} x + 17 &= 5x - 23 \\ 40 &= 4x \\ x &= 10 \end{aligned}$$

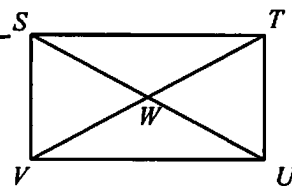


$$JM : 10 + 17 = 27$$

$$\boxed{JL = 54}$$

9. If $VW = 9x - 11$ and $SU = 16x - 12$, find WT .

$$\begin{aligned} 2(9x - 11) &= 16x - 12 \\ 18x - 22 &= 16x - 12 \\ 2x &= 10 \\ x &= 5 \end{aligned}$$

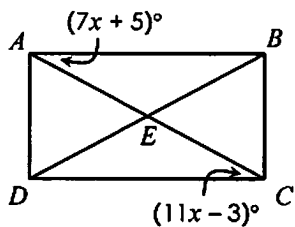


$$VW : 9(5) - 11 = 34$$

$$\boxed{WT = 34}$$

10. Find $m\angle BCE$.

$$\begin{aligned} 11x - 3 &= 7x + 5 \\ 4x &= 8 \\ x &= 2 \end{aligned}$$

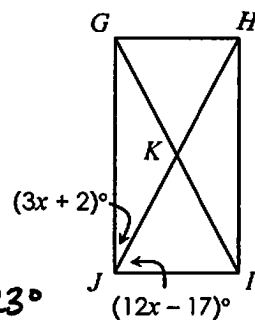


$$m\angle DCE = 11(2) - 3 = 19^\circ$$

$$\boxed{m\angle BCE = 71^\circ}$$

11. Find $m\angle JHI$.

$$\begin{aligned} 3x + 2 + 12x - 17 &= 90 \\ 15x - 15 &= 90 \\ 15x &= 105 \\ x &= 7 \end{aligned}$$

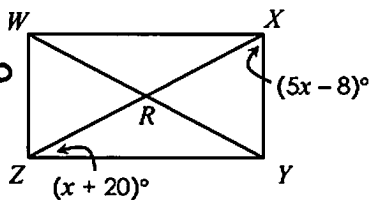


$$m\angle GJK = 3(7) + 2 = 23^\circ$$

$$\boxed{m\angle JHI = 23^\circ}$$

12. Find $m\angle XZW$.

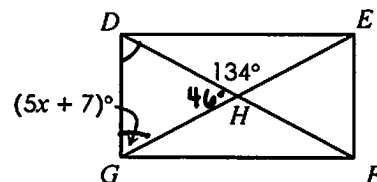
$$\begin{aligned} 5x - 8 + x + 20 &= 90 \\ 6x + 12 &= 90 \\ 6x &= 78 \\ x &= 13 \end{aligned}$$



$$m\angle YXZ = 5(13) - 8 = 57^\circ$$

$$\boxed{m\angle XZW = 57^\circ}$$

13. Solve for x .



$$\begin{aligned} 2(5x + 7) + 46 &= 180 \\ 10x + 14 + 46 &= 180 \\ 10x &= 120 \end{aligned}$$

$$\boxed{x = 12}$$

Name: _____

Unit 8: Polygons & Quadrilaterals

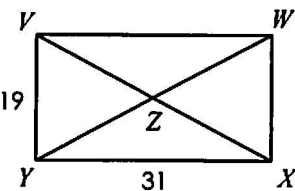
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Homework 4: Rectangles



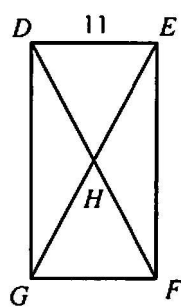
**** This is a 2-page document! ****

Directions: If each quadrilateral below is a rectangle, find the missing measures.

1. 

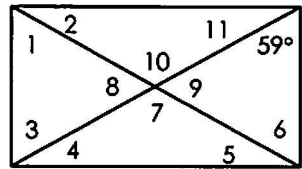
$VW = \underline{31}$
 $WX = \underline{19}$
 $YW = \underline{36.4}$
 $ZX = \underline{18.2}$
 $VX = \underline{36.4}$

WY: $31^2 + 19^2 = X^2$
 $1322 = X^2$
 $X = 36.4$

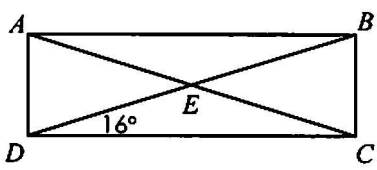
2. 

$GF = \underline{11}$
 $GE = \underline{28}$
 $DF = \underline{28}$
 $HF = \underline{14}$
 $DG = \underline{25.7}$

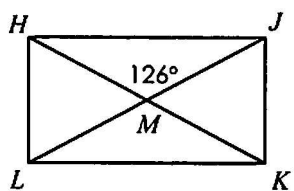
*GH = 14
 DG: $X^2 + 11^2 = 28^2$
 $X^2 = 663$
 $X = 25.7$

3. 

$m\angle 1 = \underline{59^\circ}$ $m\angle 5 = \underline{31^\circ}$ $m\angle 9 = \underline{62^\circ}$
 $m\angle 2 = \underline{31^\circ}$ $m\angle 6 = \underline{59^\circ}$ $m\angle 10 = \underline{118^\circ}$
 $m\angle 3 = \underline{59^\circ}$ $m\angle 7 = \underline{118^\circ}$ $m\angle 11 = \underline{31^\circ}$
 $m\angle 4 = \underline{31^\circ}$ $m\angle 8 = \underline{62^\circ}$

4. 

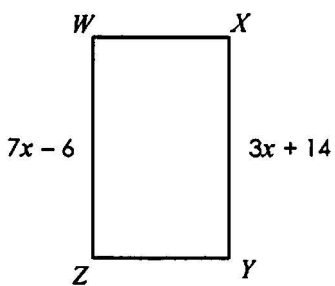
$m\angle BCD = \underline{90^\circ}$ $m\angle ADE = \underline{74^\circ}$
 $m\angle ABD = \underline{16^\circ}$ $m\angle AEB = \underline{148^\circ}$
 $m\angle CBE = \underline{74^\circ}$ $m\angle DEA = \underline{32^\circ}$

5. 

$m\angle JMK = \underline{54^\circ}$ $m\angle HJL = \underline{27^\circ}$
 $m\angle JKH = \underline{63^\circ}$ $m\angle LHK = \underline{63^\circ}$
 $m\angle HLK = \underline{90^\circ}$ $m\angle JLK = \underline{27^\circ}$

6. Find WZ.

$7x - 6 = 3x + 14$
 $4x = 20$
 $x = 5$

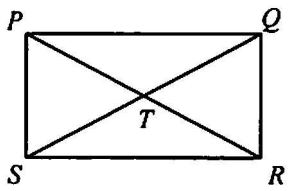


WZ: $7(5) - 6$
 $\underline{= 29}$

7. If $SQ = 11x - 26$ and $PR = 5x + 28$, find PR.

$11x - 26 = 5x + 28$
 $6x = 54$
 $x = 9$

$PR = 5(9) + 28$
 $\underline{= 73}$

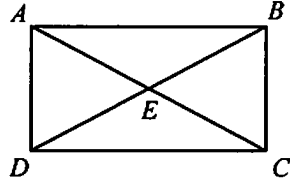


8. If $AE = 6x - 55$ and $EC = 3x - 16$, find DB .

$$6x - 55 = 3x - 16$$

$$3x = 39$$

$$x = 13$$



$$EC: 3(13) - 16 = 23$$

$$AC: 2(23) = 46$$

$$DB = 46$$

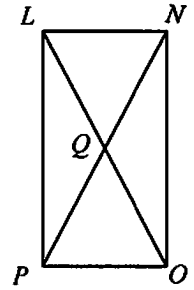
9. If $LO = 15x + 19$ and $QN = 10x + 2$, find PN .

$$2(10x + 2) = 15x + 19$$

$$20x + 4 = 15x + 19$$

$$5x = 15$$

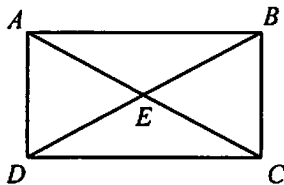
$$x = 3$$



$$LO: 15(3) + 19 = 64$$

$$PN = 64$$

10. If $DE = 4x + 1$, $EB = 12x - 31$, and $CD = 28$, find AD .



$$12x - 31 = 4x + 1$$

$$8x = 32$$

$$x = 4$$

$$DE: 4(4) + 1 = 17$$

$$DB = AC = 34$$

$$x^2 + 28^2 = 34^2$$

$$x^2 = 312$$

$$x = 19.3$$

$$AD = 19.3$$

11. Find $m\angle GJK$.

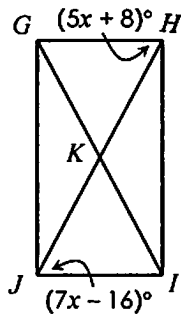
$$7x - 16 = 5x + 8$$

$$2x = 24$$

$$x = 12$$

$$m\angle HJI = 7(12) - 16 = 68^\circ$$

$$m\angle GJK = 22^\circ$$



12. Find $m\angle ADE$.

$$4x + 15 + 13x + 7 = 90$$

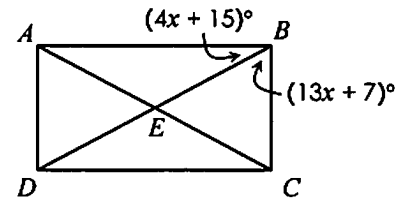
$$17x + 22 = 90$$

$$17x = 68$$

$$x = 4$$

$$m\angle CBD = 13(4) + 7 = 59^\circ$$

$$m\angle ADE = 59^\circ$$



13. Find $m\angle VWZ$.

$$5x - 12 + 2x - 3 = 90$$

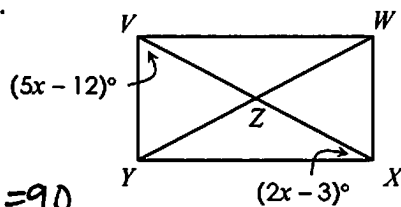
$$7x - 15 = 90$$

$$7x = 105$$

$$x = 15$$

$$m\angle ZXY = 2(15) - 3 = 27^\circ$$

$$m\angle VWZ = 27^\circ$$



14. Find $m\angle DHG$.

$$14x - 27 = 9x + 3$$

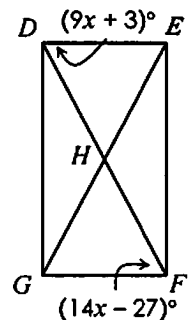
$$5x = 30$$

$$x = 6$$

$$m\angle EDH = 9(6) + 3 = 57^\circ$$

$$m\angle EHD = 180 - 2(57) = 66^\circ$$

$$m\angle DHG = 114^\circ$$



Name: _____

Date: _____

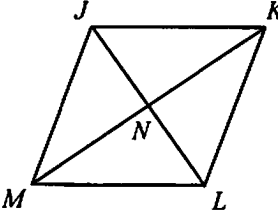
Topic: _____

Class: _____

| Main Ideas/Questions | Notes/Examples |
|---|---|
| <p>Properties of RHOMBI</p> <p>Plus these! ►</p> | <p>Rhombi have the same properties of parallelograms:</p> <ul style="list-style-type: none"> • Opposite sides are congruent. • Opposite sides are parallel. • Opposite angles are congruent. • Consecutive angles are supplementary. • Diagonals bisect each other. |
| | <p>① All 4 sides are congruent.</p> |
| | <p>② Diagonals are perpendicular.</p> |
| | <p>③ Diagonals bisect opposite angles.</p> |

Directions: Each quadrilateral below is a rhombus. Find the missing measures.

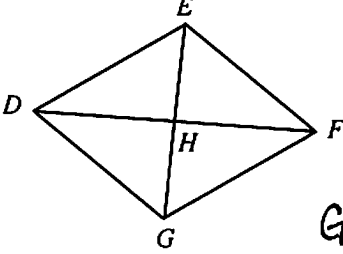
1. $JK = 12$ and $JN = 7$



$JM = \underline{12}$
 $JL = \underline{14}$
 $MN = \underline{9.7}$
 $MK = \underline{19.4}$

$MN: x^2 + 7^2 = 12^2$
 $x^2 = 95$
 $x = 9.7$

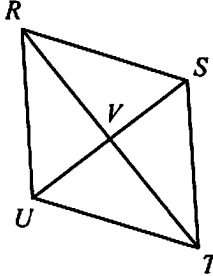
2. $EF = 23$ and $DF = 40$



$GF = \underline{23}$
 $HF = \underline{20}$
 $GH = \underline{11.4}$
 $GE = \underline{22.8}$

$GH: x^2 + 20^2 = 23^2$
 $x^2 = 129$
 $x = 11.4$

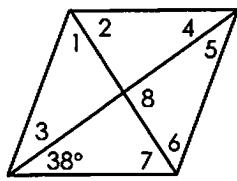
3. $RT = 22$ and $US = 18$



$VT = \underline{11}$
 $UV = \underline{9}$
 $RS = \underline{14.2}$
 $ST = \underline{14.2}$

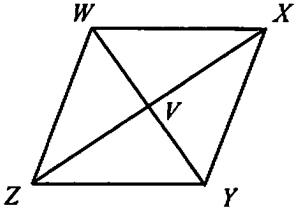
$RS: 9^2 + 11^2 = x^2$
 $20^2 = x^2$
 $14.2 = x$

4.



$m\angle 1 = \underline{52^\circ}$ $m\angle 5 = \underline{38^\circ}$
 $m\angle 2 = \underline{52^\circ}$ $m\angle 6 = \underline{52^\circ}$
 $m\angle 3 = \underline{38^\circ}$ $m\angle 7 = \underline{52^\circ}$
 $m\angle 4 = \underline{38^\circ}$ $m\angle 8 = \underline{90^\circ}$

5. $ZY = 34$, $WY = 38$, and $m\angle ZXY = 34^\circ$.



$ZV: x^2 + 19^2 = 34^2$
 $x^2 = 795$
 $x = 28.2$

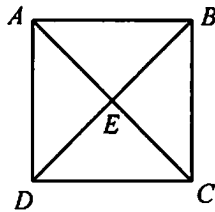
$WZ = \underline{34}$ $m\angle WXZ = \underline{34^\circ}$
 $VY = \underline{19}$ $m\angle WVZ = \underline{90^\circ}$
 $ZV = \underline{28.2}$ $m\angle ZYW = \underline{56^\circ}$
 $ZX = \underline{56.4}$ $m\angle XYW = \underline{56^\circ}$

Properties of SQUARES

A square has ALL the properties of a parallelogram, rectangle, and rhombus!

- Opposite sides are congruent.
- Opposite sides are parallel.
- Opposite angles are congruent.
- Consecutive angles are supplementary.
- Diagonals bisect each other.
- Four right angles.
- Diagonals are congruent.
- Four congruent sides.
- Diagonals are perpendicular.
- Diagonals bisect opposite angles.

6. If $ABCD$ is a square and $AD = 11$, find each missing value.



$$AC: 11^2 + 11^2 = x^2$$

$$242 = x^2$$

$$x = 15.6$$

$$BC = \underline{11}$$

$$AC = \underline{15.6}$$

$$BD = \underline{15.6}$$

$$EC = \underline{7.8}$$

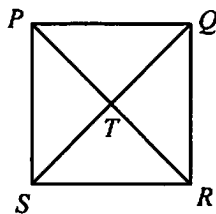
$$m\angle DAB = \underline{90^\circ}$$

$$m\angle AEB = \underline{90^\circ}$$

$$m\angle CBD = \underline{45^\circ}$$

$$m\angle BAC = \underline{45^\circ}$$

7. If $PQRS$ is a square and $TR = 17$, find each missing value.



$$PQ: 17^2 + 17^2 = x^2$$

$$578 = x^2$$

$$x = 24$$

$$PR = \underline{34}$$

$$QS = \underline{34}$$

$$QT = \underline{17}$$

$$PQ = \underline{24}$$

$$m\angle PRS = \underline{45^\circ}$$

$$m\angle STR = \underline{90^\circ}$$

$$m\angle PSR = \underline{90^\circ}$$

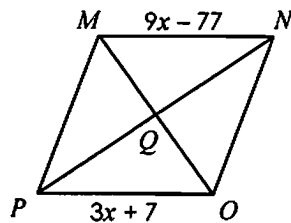
$$m\angle QPR = \underline{45^\circ}$$

8. If $MNOP$ is a rhombus, find MP .

$$9x - 77 = 3x + 7$$

$$6x = 84$$

$$x = 14$$



$$PO: 3(14) + 7 = 49$$

$$\boxed{MP = 49}$$

9. If $CDEF$ is a rhombus, find $m\angle FED$.

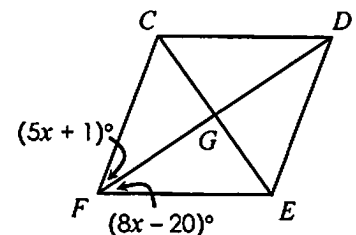
$$5x + 1 = 8x - 20$$

$$3x = 21$$

$$x = 7$$

$$m\angle CFG = 5(7) + 1 = 36^\circ$$

$$m\angle CFE = 72^\circ$$



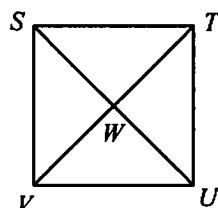
$$\boxed{m\angle FED = 108^\circ}$$

10. If $STUV$ is a square with $SW = 2x + 13$ and $WU = 8x - 41$, find VT .

$$8x - 41 = 2x + 13$$

$$6x = 54$$

$$x = 9$$



$$SW = 2(9) + 13 = 31$$

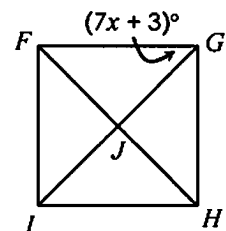
$$VT = 2(31) = \boxed{62}$$

11. If $FGHI$ is a square, solve for x .

$$7x + 3 = 46$$

$$7x = 43$$

$$\boxed{x = 6}$$

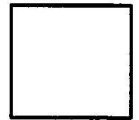


Name: _____

Unit 8: Polygons & Quadrilaterals

Date: _____ Per: _____

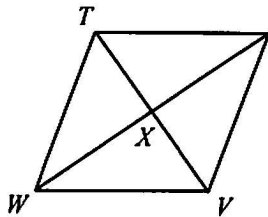
Homework 5: Rhombi and Squares



** This is a 2-page document! **

Directions: If each quadrilateral below is a rhombus, find the missing measures.

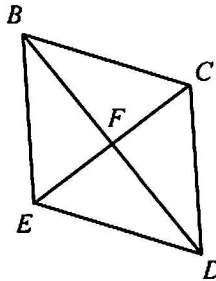
1. $UV = 8$ and $WX = 5$



$$\begin{aligned} TU &= \underline{8} \\ WU &= \underline{10} \\ TX &= \underline{6.2} \\ TV &= \underline{12.4} \end{aligned}$$

$$\begin{aligned} TX: X^2 + 5^2 &= 8^2 \\ X^2 &= 39 \\ X &= 6.2 \end{aligned}$$

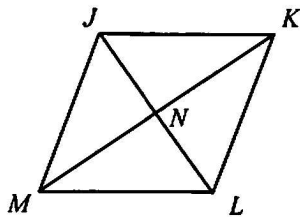
2. $BC = 28$ and $BD = 32$



$$\begin{aligned} CD &= \underline{28} \\ FD &= \underline{16} \\ EF &= \underline{23} \\ EC &= \underline{46} \end{aligned}$$

$$\begin{aligned} EF: X^2 + 16^2 &= 28^2 \\ X^2 &= 528 \\ X &= 23 \end{aligned}$$

3. $MK = 24$, $JL = 20$, and $m\angle MJL = 50^\circ$



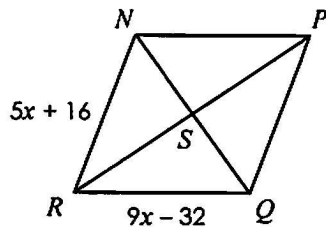
$$\begin{aligned} ML: 10^2 + 12^2 &= X^2 \\ 244 &= X^2 \\ X &= 15.6 \end{aligned}$$

$$\begin{aligned} NK &= \underline{12} \\ NL &= \underline{10} \\ ML &= \underline{15.6} \\ JM &= \underline{15.6} \end{aligned}$$

$$\begin{aligned} m\angle KNL &= \underline{90^\circ} \\ m\angle KJL &= \underline{50^\circ} \\ m\angle MLK &= \underline{100^\circ} \\ m\angle JKM &= \underline{40^\circ} \\ m\angle JML &= \underline{80^\circ} \end{aligned}$$

4. Find PQ .

$$\begin{aligned} 9x - 32 &= 5x + 16 \\ 4x &= 48 \\ x &= 12 \end{aligned}$$

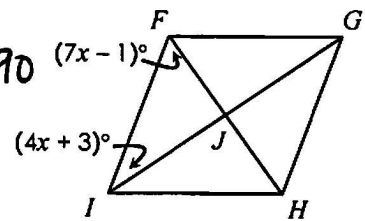


$$NR: 5(12) + 16 = 76$$

$$\boxed{PQ = 76}$$

5. Find $m\angle HGI$.

$$\begin{aligned} 7x - 1 + 4x + 3 &= 90 \\ 11x &= 88 \\ x &= 8 \end{aligned}$$

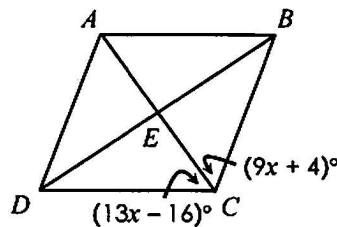


$$m\angle FIJ: 4(8) + 3 = 35^\circ$$

$$\boxed{m\angle HGI = 35^\circ}$$

6. Find $m\angle ADB$.

$$\begin{aligned} 13x - 16 &= 9x + 4 \\ 4x &= 20 \\ x &= 5 \end{aligned}$$



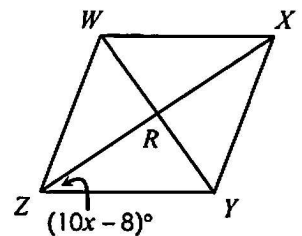
$$m\angle BCE: 9(5) + 4 = 49^\circ$$

$$\boxed{m\angle ADB = 41^\circ}$$

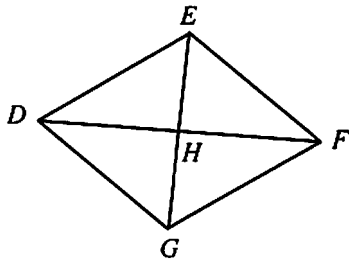
7. If $m\angle XYZ = 136^\circ$, solve for x .

$$m\angle YZW = 44^\circ$$

$$\begin{aligned} 10x - 8 &= 22 \\ 10x &= 30 \\ x &= 3 \end{aligned}$$



8. If $DE = 16x - 3$, $EF = 9x + 11$, and $DF = 52$, find HG .



$$16x - 3 = 9x + 11$$

$$7x = 14$$

$$x = 2$$

$$DE: 16(2) - 3 = 29$$

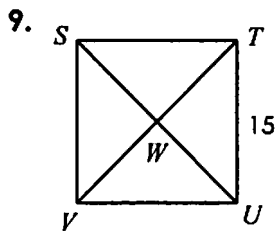
$$x^2 + 26^2 = 29^2$$

$$x^2 = 165$$

$$x = 12.8$$

$$HG = 12.8$$

Directions: If each quadrilateral below is a square, find the missing measures.



$$VU = \underline{15}$$

$$SU = \underline{21.2}$$

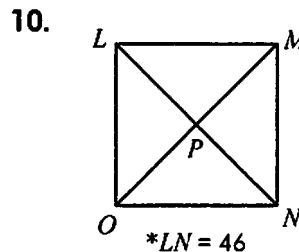
$$TV = \underline{21.2}$$

$$SW = \underline{10.6}$$

$$15^2 + 15^2 = x^2$$

$$450 = x^2$$

$$x = 21.2$$



$$OM = \underline{46}$$

$$PN = \underline{23}$$

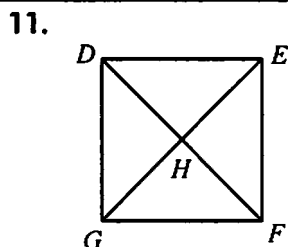
$$ON = \underline{32.5}$$

$$MN = \underline{32.5}$$

$$23^2 + 23^2 = x^2$$

$$1068 = x^2$$

$$x = 32.5$$



$$m\angle EFG = \underline{90^\circ}$$

$$m\angle GDH = \underline{45^\circ}$$

$$m\angle FEG = \underline{45^\circ}$$

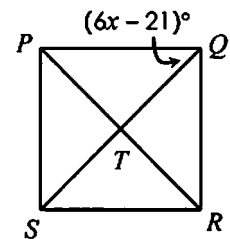
$$m\angle DHG = \underline{90^\circ}$$

12. Solve for x .

$$6x - 21 = 45$$

$$6x = 66$$

$$x = \underline{11}$$



13. Which quadrilaterals always have diagonals that are congruent?

- Parallelograms
- Rectangles
- Rhombi
- Squares

14. Which quadrilaterals always have consecutive angles that are supplementary?

- Parallelograms
- Rectangles
- Rhombi
- Squares

15. Which quadrilaterals always have diagonals that are perpendicular?

- Parallelograms
- Rectangles
- Rhombi
- Squares

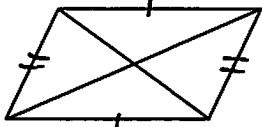
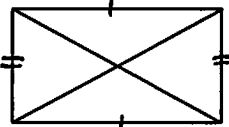
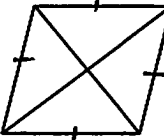
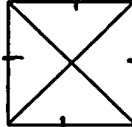
16. Which quadrilaterals always have diagonals that bisect each other?

- Parallelograms
- Rectangles
- Rhombi
- Squares

COORDINATE GEOMETRY: Name that Quadrilateral!

To classify a quadrilateral as a parallelogram, rectangle, rhombus, or square:

- > Step 1: Check congruency of sides.
- > Step 2: Check congruency of diagonals.

| | | |
|----------------------------------|---|--|
| CASE 1 (Parallelogram) | Opposite sides are congruent and diagonals are NOT congruent. |  |
| CASE 2 (Rectangle) | Opposite sides are congruent and diagonals are congruent. |  |
| CASE 3 (Rhombus) | All four sides are congruent and diagonals are NOT congruent. |  |
| CASE 4 (Square) | All four sides are congruent and diagonals are congruent. |  |

Directions: Given the vertices, determine the quadrilaterals most specific classification.

① $A(9, -4), B(8, -2), C(2, -5), D(3, -7)$

$$AB = \sqrt{(8-9)^2 + (-2+4)^2} = \sqrt{1+4} = \sqrt{5}$$

$$BC = \sqrt{(2-8)^2 + (-5+2)^2} = \sqrt{36+9} = \sqrt{45} = 3\sqrt{5}$$

$$CD = \sqrt{(3-2)^2 + (-7+5)^2} = \sqrt{1+4} = \sqrt{5}$$

$$AD = \sqrt{(3-9)^2 + (-7+4)^2} = \sqrt{36+9} = \sqrt{45} = 3\sqrt{5}$$

Parallelogram
or
Rectangle

$$AC = \sqrt{(2-9)^2 + (-5+4)^2} = \sqrt{49+1} = \sqrt{50} = 5\sqrt{2}$$

$$BD = \sqrt{(3-8)^2 + (-7+2)^2} = \sqrt{25+25} = \sqrt{50} = 5\sqrt{2}$$

$ABCD$ is a Rectangle.

② $Q(-2, -7), R(1, -5), S(4, -7), T(1, -9)$

$$QR = \sqrt{(1+2)^2 + (-5+7)^2} = \sqrt{9+4} = \sqrt{13}$$

$$RS = \sqrt{(4-1)^2 + (-7+5)^2} = \sqrt{9+4} = \sqrt{13}$$

$$ST = \sqrt{(1-4)^2 + (-9+7)^2} = \sqrt{9+4} = \sqrt{13}$$

$$QT = \sqrt{(1+2)^2 + (-9+7)^2} = \sqrt{9+4} = \sqrt{13}$$

} Rhombus
or
Square

$$QS = \sqrt{(4+2)^2 + (-7+7)^2} = \sqrt{36} = 6$$

$$RT = \sqrt{(1-1)^2 + (-9+5)^2} = \sqrt{16} = 4$$

$QRST$ is a Rhombus.

③ $J(5, -1), K(8, 2), L(11, 10), M(8, 7)$

$$JK = \sqrt{(8-5)^2 + (2+1)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$$

$$KL = \sqrt{(11-8)^2 + (10-2)^2} = \sqrt{9+64} = \sqrt{73}$$

$$LM = \sqrt{(8-11)^2 + (7-10)^2} = \sqrt{9+9} = \sqrt{18} = 3\sqrt{2}$$

$$JM = \sqrt{(8-5)^2 + (7+1)^2} = \sqrt{9+64} = \sqrt{73}$$

} Parallelogram
or
Rectangle

$$JL = \sqrt{(11-5)^2 + (10+1)^2} = \sqrt{36+121} = \sqrt{157}$$

$$KM = \sqrt{(8-8)^2 + (7-2)^2} = \sqrt{25} = 5$$

$JKLM$ is a Parallelogram.

④ $W(-4, -3), X(1, -2), Y(2, -7), Z(-3, -8)$

$$WX = \sqrt{(1+4)^2 + (-2+3)^2} = \sqrt{25+1} = \sqrt{26}$$

$$XY = \sqrt{(2-1)^2 + (-7+2)^2} = \sqrt{1+25} = \sqrt{26}$$

$$YZ = \sqrt{(-3-2)^2 + (-8+7)^2} = \sqrt{25+1} = \sqrt{26}$$

$$WZ = \sqrt{(-3+4)^2 + (-8+3)^2} = \sqrt{1+25} = \sqrt{26}$$

} Square
or
Rhombus

$$WY = \sqrt{(2+4)^2 + (-7+3)^2} = \sqrt{36+16} = \sqrt{52} = 2\sqrt{13}$$

$$XZ = \sqrt{(-3-1)^2 + (-8+2)^2} = \sqrt{16+36} = \sqrt{52} = 2\sqrt{13}$$

WXYZ is a Square.

⑤ $D(-5, 9), E(-3, 6), F(-6, -2), G(-8, 1)$

$$DE = \sqrt{(-3+5)^2 + (6-9)^2} = \sqrt{4+9} = \sqrt{13}$$

$$EF = \sqrt{(-6+3)^2 + (-2-6)^2} = \sqrt{9+64} = \sqrt{73}$$

$$FG = \sqrt{(-8+6)^2 + (1+2)^2} = \sqrt{4+9} = \sqrt{13}$$

$$DG = \sqrt{(-8+5)^2 + (1-9)^2} = \sqrt{9+64} = \sqrt{73}$$

} Parallelogram
or
Rectangle

$$DF = \sqrt{(-6+5)^2 + (-2-9)^2} = \sqrt{1+121} = \sqrt{122}$$

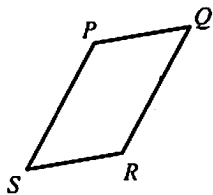
$$EG = \sqrt{(-8+3)^2 + (1-6)^2} = \sqrt{25+25} = \sqrt{50} = 5\sqrt{2}$$

DEFG is a Parallelogram.

QUADRILATERALS *in the* COORDINATE PLANE

Directions: Use your knowledge of slope, distance, midpoint, and the properties of quadrilaterals to answer the following questions.

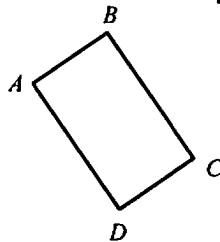
1. On parallelogram $PQRS$ below, if P is located at $(-1, 6)$ and S is located at $(-7, -3)$, what is the slope of \overline{QR} ?



$$m_{\overline{PS}} = \frac{-3-6}{-7+1} = \frac{-9}{-6} = \frac{3}{2}$$

$$m_{\overline{QR}} = \frac{3}{2}$$

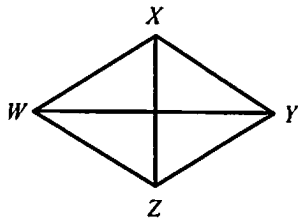
2. On rectangle $ABCD$ below, if A is located at $(3, 4)$ and B is located at $(7, 6)$, what is the slope of \overline{BC} ?



$$m_{\overline{AB}} = \frac{6-4}{7-3} = \frac{2}{4} = \frac{1}{2}$$

$$m_{\overline{BC}} = -2$$

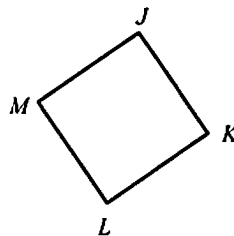
3. On rhombus $WXYZ$, if W is located at $(-5, -2)$ and Y is located at $(3, -2)$, what is the slope of \overline{XZ} ?



$$m_{\overline{WY}} = \frac{-2+2}{3+5} = \frac{0}{8} = 0$$

$$m_{\overline{XZ}} = \text{undefined}$$

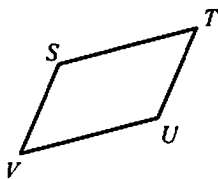
4. On square $JKLM$ below, if J is located at $(-2, 5)$ and K is located at $(2, 2)$, what is the slope of \overline{LK} ?



$$m_{\overline{JK}} = \frac{2-5}{2+2} = \frac{-3}{4}$$

$$m_{\overline{LK}} = \frac{4}{3}$$

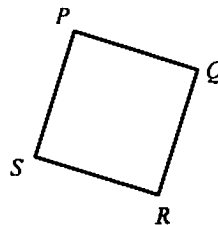
5. On parallelogram $STUV$ below, if S is located at $(-4, 1)$ and T is located at $(5, 3)$, what is the length of \overline{VU} ?



$$\begin{aligned} ST &= \sqrt{(-4-5)^2 + (1-3)^2} \\ &= \sqrt{81 + 4} \\ &= \sqrt{85} \end{aligned}$$

$$VU = \sqrt{85}$$

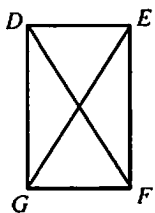
6. On square $PQRS$ below, if Q is located at $(7, 0)$ and R is located at $(5, -8)$, what is the length of \overline{SR} ?



$$\begin{aligned} QR &= \sqrt{(7-5)^2 + (0+8)^2} \\ &= \sqrt{4+64} \\ &= \sqrt{68} \\ &= 2\sqrt{17} \end{aligned}$$

$$SR = 2\sqrt{17}$$

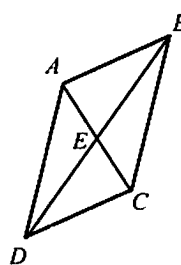
7. On rectangle $DEFG$ below, if D is located at $(-1, -1)$ and F is located at $(4, -8)$, what is the length of \overline{GE} ?



$$\begin{aligned} DF &= \sqrt{(-1-4)^2 + (-1+8)^2} \\ &= \sqrt{25 + 49} \\ &= \sqrt{74} \end{aligned}$$

$$GE = \sqrt{74}$$

8. On parallelogram $ABCD$ below, if $A(1, 1)$, $B(8, 5)$, $C(5, -5)$ and $D(-2, -9)$, what are the coordinates of point E ?



$$E = \left(\frac{-2+8}{2}, \frac{-9+5}{2} \right)$$

$$= (3, -2)$$

Name: _____

Unit 8: Polygons & Quadrilaterals



Date: _____ Per: _____

Homework 6: Classifying Quadrilaterals
in the Coordinate Plane

**** This is a 2-page document! ****

Directions: Given the vertices, determine the quadrilaterals most specific classification: Parallelogram, Rectangle, Rhombus, or Square. Justify your answer using the distance formula.

1. $S(-9, 14), T(1, 10), U(-3, 0), V(-13, 4)$

$$\begin{aligned} ST &= \sqrt{(1+9)^2 + (10-14)^2} = \sqrt{100+16} = \sqrt{116} = 2\sqrt{29} \\ TU &= \sqrt{(-3-1)^2 + (0-10)^2} = \sqrt{16+100} = \sqrt{116} = 2\sqrt{29} \\ UV &= \sqrt{(-13+3)^2 + (4-0)^2} = \sqrt{100+16} = \sqrt{116} = 2\sqrt{29} \\ SV &= \sqrt{(-13+9)^2 + (4-14)^2} = \sqrt{16+100} = \sqrt{116} = 2\sqrt{29} \end{aligned} \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \begin{array}{l} \text{Rhombus} \\ \text{or} \\ \text{Square} \end{array}$$

$$SU = \sqrt{(-3+9)^2 + (0-14)^2} = \sqrt{36+196} = \sqrt{232} = 2\sqrt{58}$$

$$TV = \sqrt{(-13-1)^2 + (4-10)^2} = \sqrt{196+36} = \sqrt{232} = 2\sqrt{58}$$

$STUV$ is a Square.

2. $E(-7, -4), F(2, -3), G(0, -7), H(-9, -8)$

$$\begin{aligned} EF &= \sqrt{(2+7)^2 + (-3+4)^2} = \sqrt{81+1} = \sqrt{82} \\ FG &= \sqrt{(0-2)^2 + (-7+3)^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5} \\ GH &= \sqrt{(-9-0)^2 + (-8+7)^2} = \sqrt{81+1} = \sqrt{82} \\ EH &= \sqrt{(-9+7)^2 + (-8+4)^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5} \end{aligned} \left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \begin{array}{l} \text{Parallelogram} \\ \text{or} \\ \text{Rectangle} \end{array}$$

$$EG = \sqrt{(0+7)^2 + (-7+4)^2} = \sqrt{49+9} = \sqrt{58}$$

$$FH = \sqrt{(-9-2)^2 + (-8+3)^2} = \sqrt{121+25} = \sqrt{146}$$

$EFGH$ is a Parallelogram.

3. $A(-5, 8)$, $B(-2, 14)$, $C(12, 7)$, $D(9, 1)$

$$AB = \sqrt{(-2+5)^2 + (14-8)^2} = \sqrt{9+36} = \sqrt{45} = 3\sqrt{5}$$

$$BC = \sqrt{(12+2)^2 + (7-14)^2} = \sqrt{196+49} = \sqrt{245} = 7\sqrt{5}$$

$$CD = \sqrt{(9-12)^2 + (1-7)^2} = \sqrt{9+36} = \sqrt{45} = 3\sqrt{5}$$

$$AD = \sqrt{(9+5)^2 + (1-8)^2} = \sqrt{196+49} = \sqrt{245} = 7\sqrt{5}$$

} Rectangle
or
Parallelogram

$$AC = \sqrt{(12+5)^2 + (7-8)^2} = \sqrt{289+1} = \sqrt{290}$$

$$BD = \sqrt{(9+2)^2 + (1-14)^2} = \sqrt{121+169} = \sqrt{290}$$

$ABCD$ is a Rectangle.

4. $K(5, -3)$, $L(7, 1)$, $M(9, -3)$, $N(7, -7)$

$$KL = \sqrt{(7-5)^2 + (1+3)^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$$

$$LM = \sqrt{(9-7)^2 + (-3-1)^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$$

$$MN = \sqrt{(7-9)^2 + (-7+3)^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$$

$$KN = \sqrt{(7-5)^2 + (-7+3)^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$$

} Rhombus
or
Square

$$KM = \sqrt{(9-5)^2 + (-3+3)^2} = \sqrt{16} = 4$$

$$LN = \sqrt{(7-7)^2 + (-7-1)^2} = \sqrt{64} = 8$$

$KLMN$ is a Rhombus.

Name: _____

Geometry

Date: _____ Per: _____

Unit 8: Polygons & Quadrilaterals

Quiz 8-2: Parallelograms, Rectangles, Rhombi, & Squares

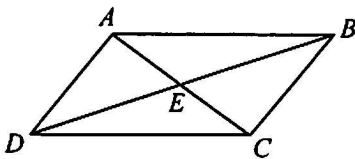
1. Which quadrilaterals always have opposite angles that are congruent?

- Parallelograms
- Rectangles
- Rhombi
- Squares

2. Which quadrilaterals always have diagonals that bisect opposite angles?

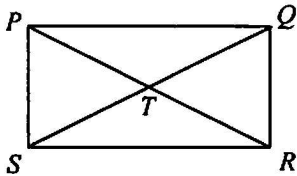
- Parallelograms
- Rectangles
- Rhombi
- Squares

3. If $ABCD$ is a parallelogram, $AD = 14$, $EC = 11$, $m\angle ABC = 64^\circ$, $m\angle DAC = 71^\circ$, and $m\angle BDC = 25^\circ$, find each measure.



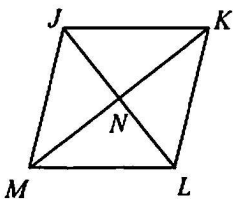
- a) $BC = \underline{14}$
- b) $AC = \underline{22}$
- c) $m\angle DAB = \underline{116^\circ}$
- d) $m\angle ABD = \underline{25^\circ}$
- e) $m\angle ACD = \underline{45^\circ}$
- f) $m\angle ADB = \underline{39^\circ}$

4. If $PQRS$ is a rectangle, $ST = 12$, and $m\angle PRS = 23^\circ$, find each measure.



- a) $SQ = \underline{24}$
- b) $PR = \underline{24}$
- c) $m\angle QPR = \underline{23^\circ}$
- d) $m\angle PSR = \underline{90^\circ}$
- e) $m\angle SQR = \underline{67^\circ}$
- f) $m\angle PTQ = \underline{134^\circ}$

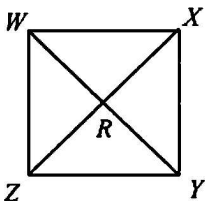
5. If $JKLM$ is a rhombus, $MK = 30$, $NL = 13$, and $m\angle MKL = 41^\circ$, find each measure.



$$\begin{aligned}
 \text{KL: } 13^2 + 15^2 &= x^2 \\
 394 &= x^2 \\
 x &= 19.8
 \end{aligned}$$

- a) $NK = \underline{15}$
- b) $JL = \underline{26}$
- c) $KL = \underline{19.8}$
- d) $m\angle JKM = \underline{41^\circ}$
- e) $m\angle JML = \underline{82^\circ}$
- f) $m\angle MLK = \underline{98^\circ}$
- g) $m\angle MNL = \underline{90^\circ}$
- h) $m\angle KJL = \underline{49^\circ}$

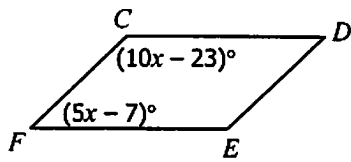
6. If $WXYZ$ is a square with $WZ = 27$, find each measure.



$$\begin{aligned}
 27^2 + 27^2 &= x^2 \\
 1458 &= x^2 \\
 x &= 38.2
 \end{aligned}$$

- a) $ZY = \underline{27}$
- b) $WY = \underline{38.2}$
- c) $RX = \underline{19.1}$
- d) $m\angle WRZ = \underline{90^\circ}$
- e) $m\angle XYZ = \underline{90^\circ}$
- f) $m\angle ZWY = \underline{45^\circ}$

7. If $CDEF$ is a parallelogram, find $m\angle FCD$.

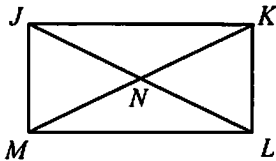


$$\begin{aligned} 10x - 23 + 5x - 7 &= 180 \\ 15x - 30 &= 180 \\ 15x &= 210 \\ x &= 14 \end{aligned}$$

7. 117°

$$\begin{aligned} m\angle FCD &= 10(14) - 23 \\ &= 117^\circ \end{aligned}$$

8. If $JKLM$ is a rectangle, $JL = 2x + 5$, and $MK = 7x - 40$, find MK .

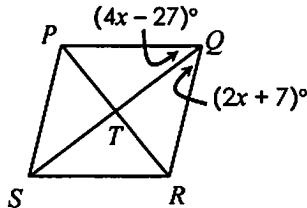


$$\begin{aligned} 7x - 40 &= 2x + 5 \\ 5x &= 45 \\ x &= 9 \end{aligned}$$

8. 23

$$\begin{aligned} MK &= 7(9) - 40 \\ &= 23 \end{aligned}$$

9. If $PQRS$ is a rhombus, find $m\angle PQR$.



$$\begin{aligned} 4x - 27 &= 2x + 7 \\ 2x &= 34 \\ x &= 17 \end{aligned}$$

9. 82°

$$\begin{aligned} m\angle RQS &= 2(17) + 7 = 41^\circ \\ m\angle PQR &= 2(41) = 82^\circ \end{aligned}$$

10. Quadrilateral $BCDE$ has vertices $B(-1, -1)$, $C(6, -2)$, $D(5, -9)$, and $E(-2, -8)$. Determine the most precise classification of $BCDE$: a parallelogram, rectangle, rhombus, or square. Use the distance formula to justify your answer.

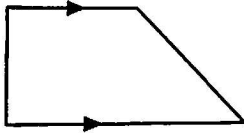
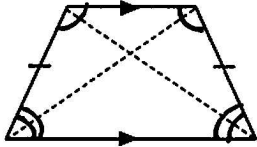
$$\begin{aligned} BC &= \sqrt{(6+1)^2 + (-2+1)^2} = \sqrt{49+1} = \sqrt{50} = 5\sqrt{2} \\ CD &= \sqrt{(5-6)^2 + (-9+2)^2} = \sqrt{1+49} = \sqrt{50} = 5\sqrt{2} \\ DE &= \sqrt{(-2-5)^2 + (-8+9)^2} = \sqrt{49+1} = \sqrt{50} = 5\sqrt{2} \\ BE &= \sqrt{(-2+1)^2 + (-8+1)^2} = \sqrt{1+49} = \sqrt{50} = 5\sqrt{2} \end{aligned} \left. \vphantom{\begin{aligned} BC \\ CD \\ DE \\ BE \end{aligned}} \right\} \begin{array}{l} \text{Rhombus} \\ \text{or} \\ \text{Square} \end{array}$$

$$BD = \sqrt{(5+1)^2 + (-9+1)^2} = \sqrt{36+64} = \sqrt{100} = 10$$

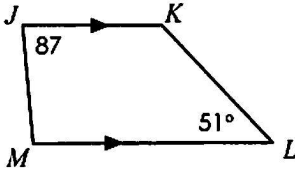
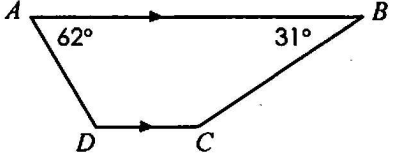
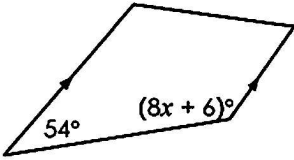
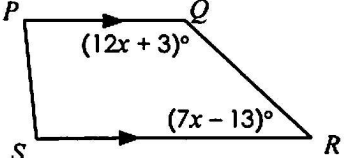
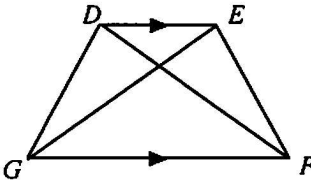
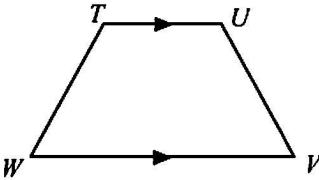
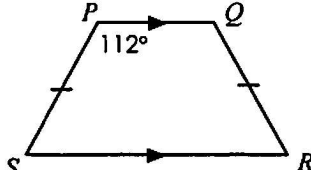
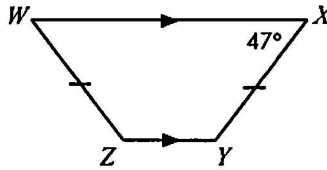
$$CE = \sqrt{(-2-6)^2 + (-8+2)^2} = \sqrt{64+36} = \sqrt{100} = 10$$

10. $BCDE$ is a Square

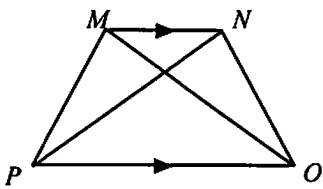
| | |
|--------|--------|
| Name: | Date: |
| Topic: | Class: |

| Main Ideas/Questions | Notes/Examples |
|---|---|
| <p>NON-ISOSCELES <i>Trapezoids</i></p> |  <p>Properties of Non-Isosceles Trapezoids:</p> <ul style="list-style-type: none"> • Only ONE pair of opposite sides parallel. • Consecutive angles between parallel lines are supplementary. |
| <p>ISOSCELES <i>Trapezoids</i></p> | <p style="text-align: center;">Isosceles trapezoids have the same properties as non-isosceles trapezoids, plus these:</p>  <ul style="list-style-type: none"> • Non-parallel sides (legs) are congruent. • Diagonals are congruent. • Base angles are congruent. • Opposite angles are supplementary. |

Directions: Find each missing value on the trapezoids below.

| | |
|--|--|
| <p>1. </p> $m\angle K = \underline{129^\circ}$ $m\angle M = \underline{93^\circ}$ | <p>2. </p> $m\angle C = \underline{149^\circ}$ $m\angle D = \underline{118^\circ}$ |
| <p>3. Solve for x.</p> $8x + 60 = 180$ $8x = 120$ $\boxed{x = 15}$  | <p>4. Find $m\angle R$.</p> $19x - 10 = 180$ $19x = 190$ $x = 10$ $m\angle R = 7(10) - 13$ $\boxed{= 57^\circ}$  |
| <p>5. $DEFG$ is an isosceles trapezoid.</p>  $\overline{DG} \cong \overline{EF}$ $\overline{DF} \cong \overline{GE}$ | <p>6. $TUVW$ is an isosceles trapezoid.</p>  $\angle T \cong \angle U$ $\angle V \cong \angle W$ |
| <p>7. </p> $m\angle Q = \underline{112^\circ}$ $m\angle R = \underline{68^\circ}$ $m\angle S = \underline{68^\circ}$ | <p>8. </p> $m\angle W = \underline{47^\circ}$ $m\angle Y = \underline{133^\circ}$ $m\angle Z = \underline{133^\circ}$ |

9. If $MNOP$ is an isosceles trapezoid, $MP = 16x - 13$, $NO = 9x + 8$, $PN = 5y + 19$, and $MO = 12y - 37$, solve for x and y .



$$16x - 13 = 9x + 8$$

$$7x = 21$$

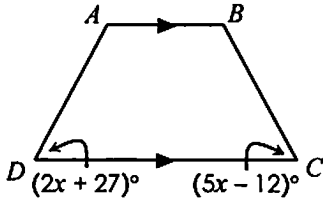
$$x = 3$$

$$5y + 19 = 12y - 37$$

$$56 = 7y$$

$$y = 8$$

10. If $ABCD$ is an isosceles trapezoid, find each missing angle.



$$5x - 12 = 2x + 27$$

$$3x = 39$$

$$x = 13$$

$$m\angle A = \underline{127^\circ}$$

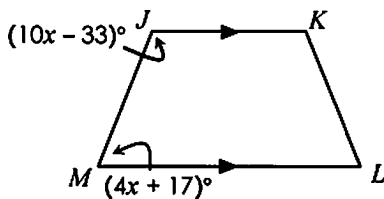
$$m\angle B = \underline{127^\circ}$$

$$m\angle C = \underline{53^\circ}$$

$$m\angle D = \underline{53^\circ}$$

$$m\angle D = 2(13) + 27 = 53^\circ$$

11. If $JKLM$ is an isosceles trapezoid, find each missing angle.



$$14x - 16 = 180$$

$$14x = 196$$

$$x = 14$$

$$m\angle J = \underline{107^\circ}$$

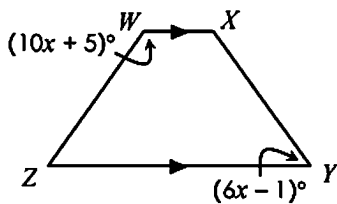
$$m\angle K = \underline{107^\circ}$$

$$m\angle L = \underline{73^\circ}$$

$$m\angle M = \underline{73^\circ}$$

$$m\angle M = 4(14) + 17 = 73^\circ$$

12. If $WXYZ$ is an isosceles trapezoid, find each missing angle.



$$16x + 4 = 180$$

$$16x = 176$$

$$x = 11$$

$$m\angle W = \underline{115^\circ}$$

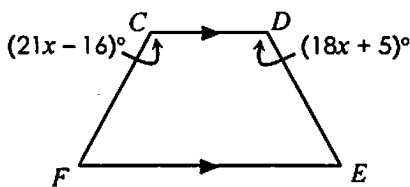
$$m\angle X = \underline{115^\circ}$$

$$m\angle Y = \underline{65^\circ}$$

$$m\angle Z = \underline{65^\circ}$$

$$m\angle Y = 6(11) - 1 = 65^\circ$$

13. If $CDEF$ is an isosceles trapezoid, find each missing angle.



$$21x - 16 = 18x + 5$$

$$3x = 21$$

$$x = 7$$

$$m\angle C = \underline{131^\circ}$$

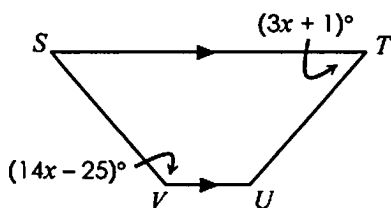
$$m\angle D = \underline{131^\circ}$$

$$m\angle E = \underline{49^\circ}$$

$$m\angle F = \underline{49^\circ}$$

$$m\angle D = 18(7) + 5 = 131^\circ$$

14. If $STUV$ is an isosceles trapezoid, find each missing angle.



$$17x - 24 = 180$$

$$17x = 204$$

$$x = 12$$

$$m\angle S = \underline{37^\circ}$$

$$m\angle T = \underline{37^\circ}$$

$$m\angle U = \underline{143^\circ}$$

$$m\angle V = \underline{143^\circ}$$

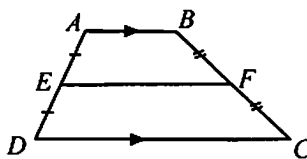
$$m\angle T = 3(12) + 1 = 37^\circ$$

Name: _____

Date: _____

Topic: _____

Class: _____

| Main Ideas/Questions | Notes/Examples |
|--|---|
| <p>MIDSEGMENT of a TRAPEZOID</p> | <p>The midsegment of a trapezoid connects the midpoints of the legs:</p>  <p>If \overline{EF} is the midsegment of trapezoid $ABCD$, then:</p> <ul style="list-style-type: none"> $\overline{AB} \parallel \overline{CD} \parallel \overline{EF}$ $EF = \frac{AB + CD}{2}$ |

Directions: Use the trapezoid above for questions 1-4.

1. If $AB = 14$ and $DC = 26$, find EF .

$$EF = \frac{14 + 26}{2} = \frac{40}{2} = \boxed{20}$$

2. If $AB = 7$ and $DC = 31$, find EF .

$$EF = \frac{7 + 31}{2} = \frac{38}{2} = \boxed{19}$$

3. If $EF = 22$ and $DC = 38$, find AB .

$$22 = \frac{AB + 38}{2} \quad 44 = AB + 38$$

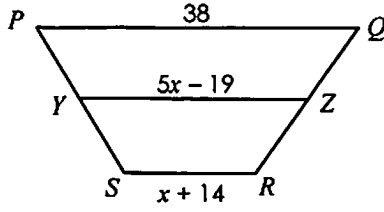
$$\boxed{6 = AB}$$

4. If $AB = 41$ and $EF = 47$, find DC .

$$47 = \frac{41 + CD}{2} \quad 94 = 41 + CD$$

$$\boxed{53 = CD}$$

5. For trapezoid $PQRS$, Y and Z are midpoints of the legs. Find YZ .



$$\frac{38 + x + 14}{2} = 5x - 19$$

$$x + 52 = 10x - 38$$

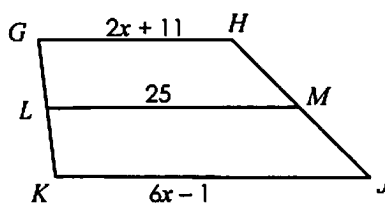
$$90 = 9x$$

$$10 = x$$

$$YZ = 5(10) - 19$$

$$\boxed{= 31}$$

6. For trapezoid $GHJK$, L and M are midpoints of the legs. Find KJ .



$$\frac{2x + 11 + 6x - 1}{2} = 25$$

$$8x + 10 = 50$$

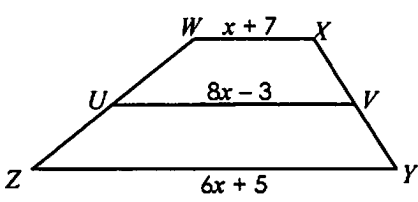
$$8x = 40$$

$$x = 5$$

$$KJ = 6(5) - 1$$

$$\boxed{= 29}$$

7. For trapezoid $WXYZ$, U and V are midpoints of the legs. Find UV .



$$\frac{x + 7 + 6x + 5}{2} = 8x - 3$$

$$7x + 12 = 16x - 6$$

$$18 = 9x$$

$$2 = x$$

$$UV = 8(2) - 3$$

$$\boxed{= 13}$$

Name: _____

Unit 8: Polygons & Quadrilaterals

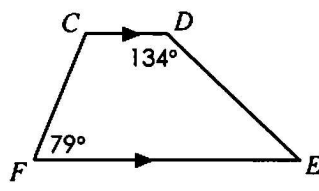
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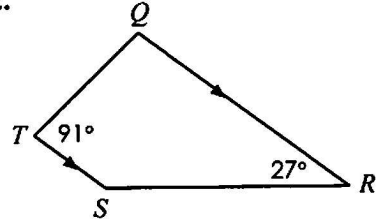
Homework 7: Trapezoids

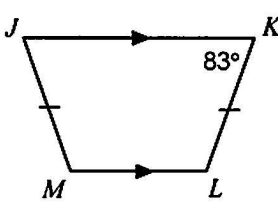


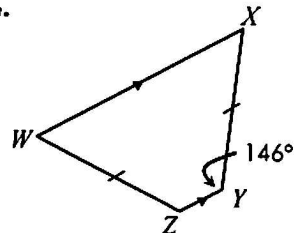
** This is a 2-page document! **

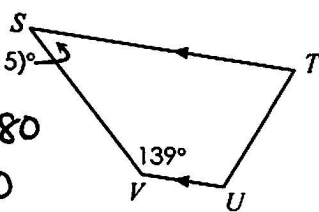
Directions: If each quadrilateral below is a trapezoid, find the missing measures.

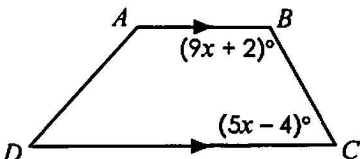
1.  $m\angle C = \underline{101^\circ}$
 $m\angle E = \underline{46^\circ}$

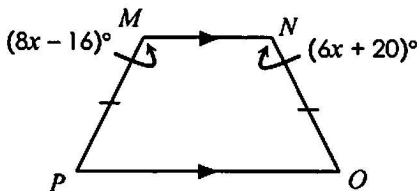
2.  $m\angle Q = \underline{89^\circ}$
 $m\angle S = \underline{153^\circ}$

3.  $m\angle J = \underline{83^\circ}$
 $m\angle L = \underline{97^\circ}$
 $m\angle M = \underline{97^\circ}$

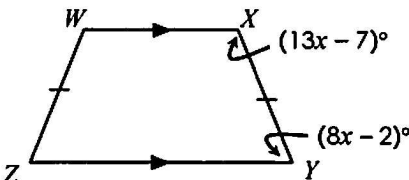
4.  $m\angle W = \underline{34^\circ}$
 $m\angle X = \underline{34^\circ}$
 $m\angle Z = \underline{146^\circ}$

5. Solve for x.  $(14x - 15)^\circ$
 $14x - 15 + 139 = 180$
 $14x + 124 = 180$
 $14x = 56$
 $x = 4$

6. Find $m\angle B$.  $(9x + 2)^\circ$
 $(5x - 4)^\circ$
 $14x - 2 = 180$
 $14x = 182$
 $x = 13$
 $m\angle B = 9(13) + 2 = \underline{119^\circ}$

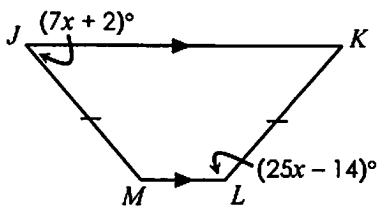
7.  $(8x - 16)^\circ$
 $(6x + 20)^\circ$
 $8x - 16 = 6x + 20$
 $2x = 36$
 $x = 18$
 $m\angle M = 8(18) - 16 = 128^\circ$

$m\angle M = \underline{128^\circ}$
 $m\angle N = \underline{128^\circ}$
 $m\angle O = \underline{52^\circ}$
 $m\angle P = \underline{52^\circ}$

8.  $(13x - 7)^\circ$
 $(8x - 2)^\circ$
 $21x - 9 = 180$
 $21x = 189$
 $x = 9$
 $m\angle Y = 8(9) - 2 = 70^\circ$

$m\angle W = \underline{110^\circ}$
 $m\angle X = \underline{110^\circ}$
 $m\angle Y = \underline{70^\circ}$
 $m\angle Z = \underline{70^\circ}$

9.



$$32x - 12 = 180$$

$$32x = 192$$

$$x = 6$$

$$m\angle J = \underline{44^\circ}$$

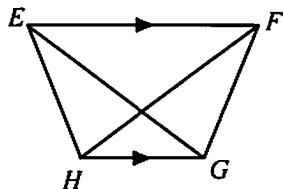
$$m\angle K = \underline{44^\circ}$$

$$m\angle L = \underline{136^\circ}$$

$$m\angle M = \underline{136^\circ}$$

$$m\angle J = 7(6) + 2 = 44^\circ$$

10. If $EFGH$ is an isosceles trapezoid, $EH = 4x - 27$, $FG = x + 9$, $EG = 3y + 19$, and $FH = 11y - 21$, solve for x and y .



$$4x - 27 = x + 9$$

$$3x = 36$$

$$\boxed{x = 12}$$

$$3y + 19 = 11y - 21$$

$$40 = 8y$$

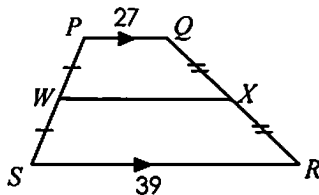
$$\boxed{5 = y}$$

11. Find WX .

$$\frac{27 + 39}{2} = WX$$

$$\frac{66}{2} = WX$$

$$\boxed{WX = 33}$$

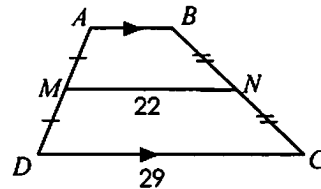


12. Find AB .

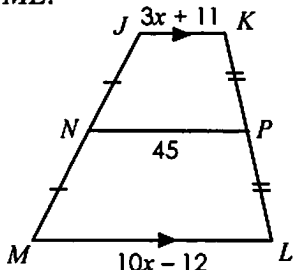
$$\frac{AB + 29}{2} = 22$$

$$AB + 29 = 44$$

$$\boxed{AB = 15}$$



13. Find ML .



$$\frac{3x + 11 + 10x - 12}{2} = 45$$

$$13x - 1 = 90$$

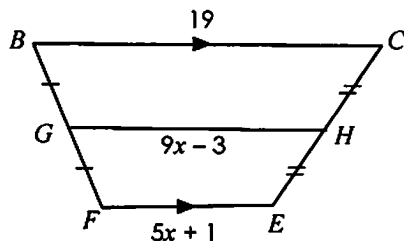
$$13x = 91$$

$$x = 7$$

$$ML = 10(7) - 12$$

$$\boxed{= 58}$$

14. Find GH .



$$\frac{19 + 5x + 1}{2} = 9x - 3$$

$$5x + 20 = 18x - 6$$

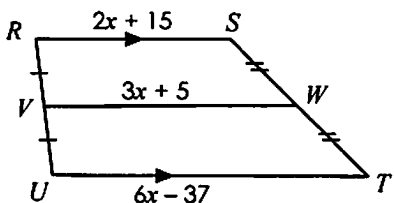
$$26 = 13x$$

$$x = 2$$

$$GH = 9(2) - 3$$

$$\boxed{= 15}$$

15. Find RS .



$$\frac{2x + 15 + 6x - 37}{2} = 3x + 5$$

$$8x - 22 = 6x + 10$$

$$2x = 32$$

$$x = 16$$

$$RS = 2(16) + 15$$

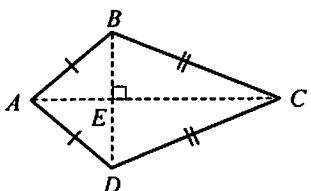
$$\boxed{= 47}$$

Name: _____

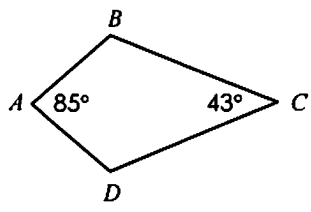
Date: _____

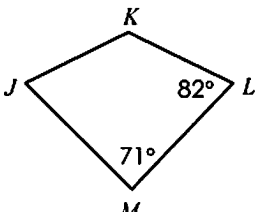
Topic: _____

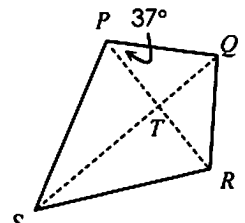
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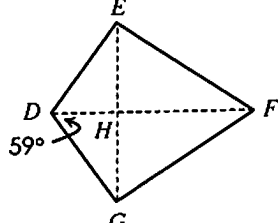
| Main Ideas/Questions | Notes/Examples |
|---------------------------------------|---|
| <p>Properties of KITES</p> | <p style="text-align: center;">A kite is a quadrilateral with the following properties:</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <ul style="list-style-type: none"> • Exactly two pairs of consecutive congruent sides. ($\overline{AB} \cong \overline{AD}$ and $\overline{BC} \cong \overline{DC}$) • One pair of opposite angles are congruent. ($\angle ABC \cong \angle ADC$) • Diagonals are perpendicular. ($\overline{AC} \perp \overline{BD}$) </div> </div> |

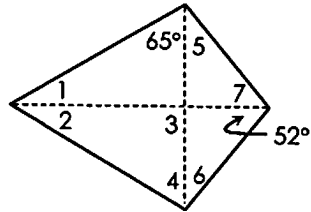
Directions: If each quadrilateral below is a kite, find the missing values.

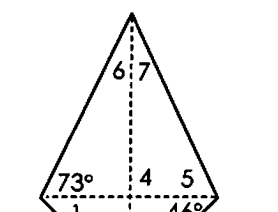
1.  $m\angle B = \underline{116^\circ}$
 $m\angle D = \underline{116^\circ}$

2.  $m\angle J = \underline{82^\circ}$
 $m\angle K = \underline{125^\circ}$

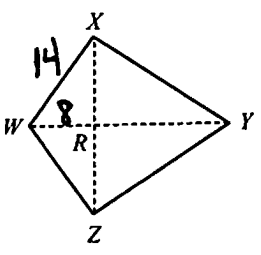
3.  $m\angle PTQ = \underline{90^\circ}$
 $m\angle PQT = \underline{53^\circ}$
 $m\angle QRT = \underline{37^\circ}$

4.  $m\angle GDE = \underline{118^\circ}$
 $m\angle DEH = \underline{31^\circ}$
 $m\angle DGH = \underline{31^\circ}$

5.  $m\angle 1 = \underline{25^\circ}$
 $m\angle 2 = \underline{25^\circ}$
 $m\angle 3 = \underline{90^\circ}$
 $m\angle 4 = \underline{65^\circ}$
 $m\angle 5 = \underline{38^\circ}$
 $m\angle 6 = \underline{38^\circ}$
 $m\angle 7 = \underline{52^\circ}$

6.  $m\angle 1 = \underline{46^\circ}$
 $m\angle 2 = \underline{44^\circ}$
 $m\angle 3 = \underline{44^\circ}$
 $m\angle 4 = \underline{90^\circ}$
 $m\angle 5 = \underline{73^\circ}$
 $m\angle 6 = \underline{17^\circ}$
 $m\angle 7 = \underline{17^\circ}$

7. If $WX = 14$ and $WR = 8$, find RZ .



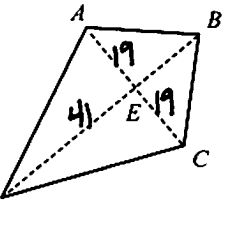
$$X^2 + 8^2 = 14^2$$

$$X^2 = 132$$

$$X = 11.5$$

$RZ = 11.5$

8. If $AC = 38$ and $ED = 41$, find CD .



$$19^2 + 41^2 = X^2$$

$$2042 = X^2$$

$$X = 45.2$$

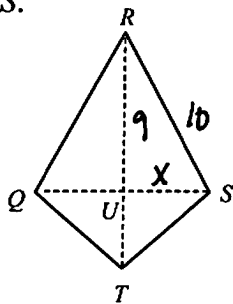
$CD = 45.2$

9. If $RS = 10$ and $RU = 9$, find QS .

$$9^2 + x^2 = 10^2$$

$$x^2 = 19$$

$$x = 4.4$$



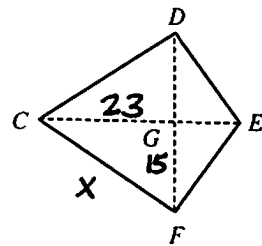
$$QS = 2(4.4) = \boxed{8.8}$$

10. If $GF = 15$ and $CG = 23$, find CD .

$$15^2 + 23^2 = x^2$$

$$754 = x^2$$

$$27.5 = x$$



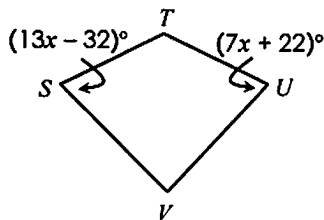
$$\boxed{CD = 27.5}$$

11. Solve for x .

$$13x - 32 = 7x + 22$$

$$6x = 54$$

$$\boxed{x = 9}$$



12. Find $m\angle L$.

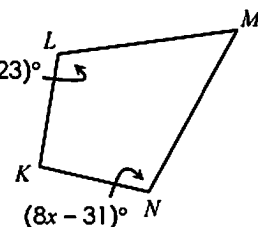
$$5x + 23 = 8x - 31$$

$$54 = 3x$$

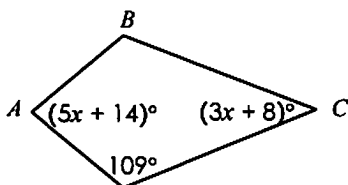
$$18 = x$$

$$m\angle L = 5(18) + 23$$

$$\boxed{= 113^\circ}$$



13. Solve for x .



$$5x + 14 + 3x + 8 + 2(109) = 360$$

$$8x + 240 = 360$$

$$8x = 120$$

$$\boxed{x = 15}$$

14. Find $m\angle STV$.

$$9x + 1 + 23x - 7 = 90$$

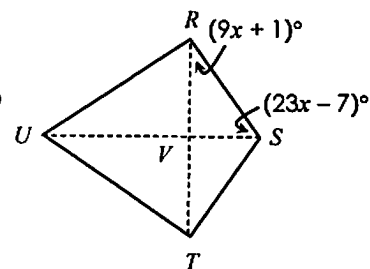
$$32x - 6 = 90$$

$$32x = 96$$

$$x = 3$$

$$m\angle SRV = 9(3) + 1 = 28^\circ$$

$$\boxed{m\angle STV = 28^\circ}$$

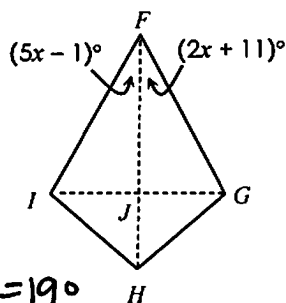


15. Find $m\angle FGJ$.

$$5x - 1 = 2x + 11$$

$$3x = 12$$

$$x = 4$$



$$m\angle JFG = 2(4) + 11 = 19^\circ$$

$$m\angle FGJ = 90 - 19 = \boxed{71^\circ}$$

16. Find $m\angle NQP$.

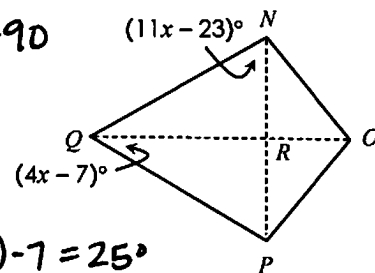
$$11x - 23 + 4x - 7 = 90$$

$$15x = 120$$

$$x = 8$$

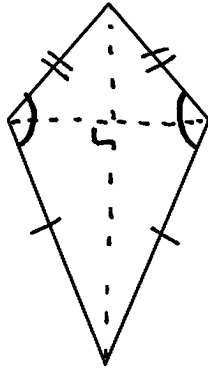
$$m\angle PQR = 4(8) - 7 = 25^\circ$$

$$m\angle NQP = \boxed{50^\circ}$$



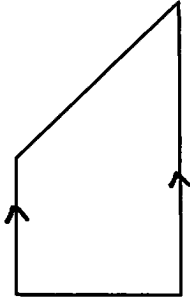
QUADRILATERALS

KITE



- Exactly two pairs of consecutive congruent sides.
- One pair of opposite angles are congruent.
- Diagonals are perpendicular.

TRAPEZOID

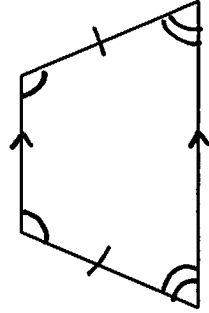


- Only ONE pair of opposite sides parallel (called bases).
- Consecutive angles are supplementary.

Midsegment of a Trapezoid:

A midsegment of a trapezoid connects the midpoints of the legs. This segment is equal to the average of the two bases.

ISOSCELES TRAPEZOID



- Non-parallel sides (legs) are congruent.
- Diagonals are congruent.
- Base angles are congruent.
- Opposite angles are supplementary.

PARALLELOGRAM



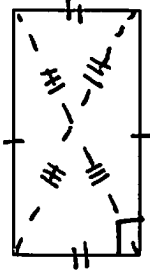
- Opposite sides parallel.
- Opposite sides congruent.
- Opposite angles supplementary.
- Consecutive angles supplementary.
- Diagonals bisect each other.

RHOMBUS



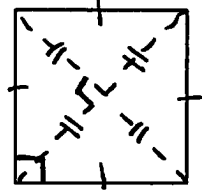
- Four congruent sides.
- Diagonals are perpendicular.
- Diagonals bisect opposite angles.

RECTANGLE



- Four right angles.
- Diagonals are congruent.

SQUARE



Squares have ALL the properties of parallelograms, rectangles, and rhombi!

Name: _____

Unit 8: Polygons & Quadrilaterals

Date: _____ Per: _____

Homework 8: Kites



** This is a 2-page document! **

Directions: If each quadrilateral below is a kite, find the missing measures.

1. $m\angle F = \underline{121^\circ}$
 $m\angle H = \underline{121^\circ}$

2. $m\angle U = \underline{65^\circ}$
 $m\angle V = \underline{139^\circ}$

3. $m\angle 1 = \underline{72^\circ}$ $m\angle 5 = \underline{18^\circ}$
 $m\angle 2 = \underline{72^\circ}$ $m\angle 6 = \underline{47^\circ}$
 $m\angle 3 = \underline{47^\circ}$ $m\angle 7 = \underline{43^\circ}$
 $m\angle 4 = \underline{90^\circ}$

4. Given: $m\angle ABC = 70^\circ$ and $m\angle ADC = 46^\circ$.
 $m\angle 1 = \underline{55^\circ}$
 $m\angle 2 = \underline{35^\circ}$
 $m\angle 3 = \underline{35^\circ}$
 $m\angle 4 = \underline{90^\circ}$
 $m\angle 5 = \underline{55^\circ}$
 $m\angle 6 = \underline{67^\circ}$
 $m\angle 7 = \underline{67^\circ}$
 $m\angle 8 = \underline{23^\circ}$
 $m\angle 9 = \underline{23^\circ}$

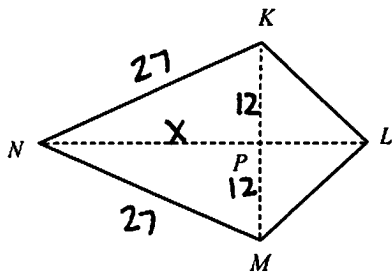
5. If $QR = 13$ and $PT = 8$, find QT .
 $X^2 + 8^2 = 13^2$
 $X^2 = 105$
 $X = 10.2$
QT = 10.2

6. If $KM = 52$ and $NL = 33$, find LM .
 $26^2 + 33^2 = X^2$
 $1765 = X^2$
 $X = 42$
LM = 42

7. If $XZ = 46$ and $WR = 21$, find WX .
 $21^2 + 23^2 = X^2$
 $970 = X^2$
 $31.1 = X$
WX = 31.1

8. If $DE = 15$ and $EH = 11$, find DF .
 $X^2 + 11^2 = 15^2$
 $X^2 = 104$
 $X = 10.2$
 $DF = 2(10.2)$
= 20.4

9. If $NK = 7x - 1$, $NM = 10x - 13$, and $KM = 24$, find NP .



$$7x - 1 = 10x - 13$$

$$12 = 3x$$

$$4 = x$$

$$x^2 + 12^2 = 27^2$$

$$x^2 = 585$$

$$x = 24.2$$

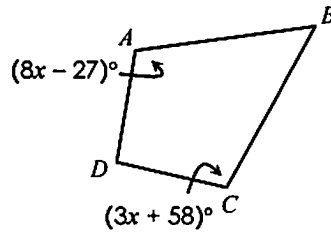
$$\boxed{NP = 24.2}$$

10. Solve for x .

$$8x - 27 = 3x + 58$$

$$5x = 85$$

$$\boxed{x = 17}$$

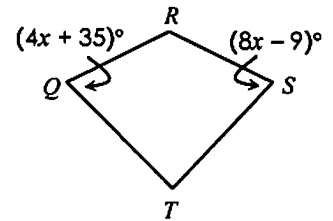


11. Find $m\angle S$.

$$8x - 9 = 4x + 35$$

$$4x = 44$$

$$x = 11$$



$$m\angle S = 8(11) - 9$$

$$\boxed{= 79^\circ}$$

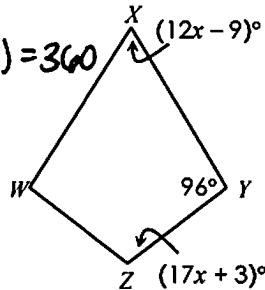
12. Solve for x .

$$12x - 9 + 17x + 3 + 2(96) = 360$$

$$29x + 186 = 360$$

$$29x = 174$$

$$\boxed{x = 6}$$

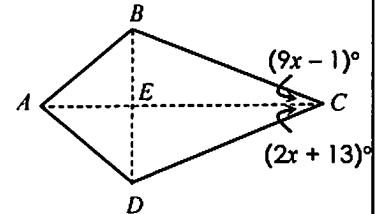


13. Find $m\angle EDC$.

$$9x - 1 = 2x + 13$$

$$7x = 14$$

$$x = 2$$



$$m\angle ECD = 2(2) + 13 = 17^\circ$$

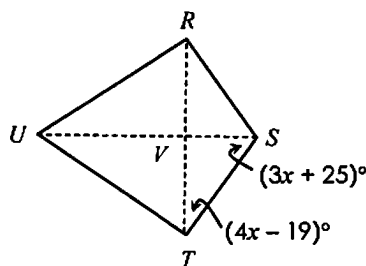
$$\boxed{m\angle EDC = 73^\circ}$$

14. Find $m\angle RST$.

$$7x + 6 = 90$$

$$7x = 84$$

$$x = 12$$



$$m\angle TSV = 3(12) + 25 = 61^\circ$$

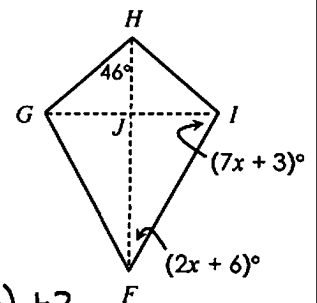
$$m\angle RST = 2(61) = \boxed{122^\circ}$$

15. Find $m\angle HIF$.

$$9x + 9 = 90$$

$$9x = 81$$

$$x = 9$$



$$m\angle HIF = 44 + 7(6) + 3$$

$$\boxed{= 110^\circ}$$

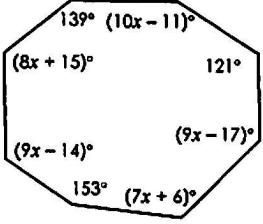
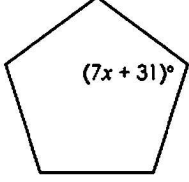
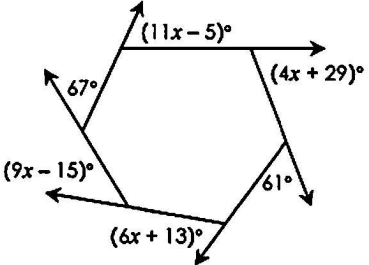
Unit 8 Test Study Guide

(Polygons & Quadrilaterals)

Name: _____

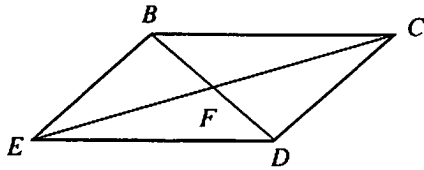
Date: _____ Per: _____

Topic 1: Angles of Polygons

| | |
|--|--|
| <p>1. What is the formula for the sum of the interior angle measures of a polygon?</p> $S = (n-2) \cdot 180$ | <p>2. What is the formula to find the measure of each interior angle of a regular polygon?</p> $\frac{(n-2) \cdot 180}{n}$ |
| <p>3. Find the sum of the interior angle measures of a 35-gon.</p> $(35-2) \cdot 180 = \boxed{5940^\circ}$ | <p>4. Six angles of a heptagon measure 107°, 139°, 131°, 110°, 145°, and 128°. What is the measure of the seventh angle?</p> $(7-2) \cdot 180 = 900$ $900 - 760 = \boxed{140^\circ}$ |
| <p>5. If the sum of the interior angles of a polygon is 3780°, how many sides does it have?</p> $3780 = (n-2) \cdot 180$ $21 = n-2$ $\boxed{n=23}$ | <p>6. What is the measure of each interior angle of a regular 18-gon?</p> $(18-2) \cdot 180 = 2880$ $\frac{2880}{18} = \boxed{160^\circ}$ |
| <p>7. What is the sum of the exterior angles measures of any polygon?</p> $\boxed{360^\circ}$ | <p>8. What is the measure of each exterior angle of a regular 30-gon?</p> $\frac{360}{30} = \boxed{12^\circ}$ |
| <p>9. If the exterior angle of a regular polygon measures 24°, how many sides does it have?</p> $\frac{360}{24} = \boxed{15 \text{ sides}}$ | <p>10. If the interior angle of a regular polygon is 162°, how many sides does it have?</p> $\text{ext} = 18^\circ$ $\frac{360}{18} = \boxed{20 \text{ sides}}$ |
| <p>11. Solve for x.</p> $(8-2) \cdot 180 = 1080$ $43x + 392 = 1080$ $43x = 688$ $\boxed{x=16}$  | <p>12. If the figure is a regular polygon, solve for x.</p> $\frac{(5-2) \cdot 180}{5} = 108$ $7x + 31 = 108$ $7x = 77$ $\boxed{x=11}$  |
| <p>13. Solve for x.</p>  $30x + 150 = 360$ $30x = 210$ $\boxed{x=7}$ | |

Topic 2: Parallelograms

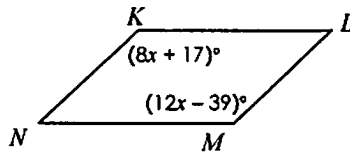
14. If $EBCD$ is a parallelogram, $EB = 16$, $ED = 25$, $BF = 11$, $EC = 34$, $m\angle BED = 55^\circ$, $m\angle CDB = 67^\circ$, and $m\angle BCE = 24^\circ$, find each missing measure.



$$\begin{array}{ll} BC = \underline{25} & m\angle EDC = \underline{125^\circ} \\ BD = \underline{22} & m\angle EBD = \underline{67^\circ} \\ FC = \underline{17} & m\angle BEC = \underline{31^\circ} \\ CD = \underline{16} & m\angle DBC = \underline{58^\circ} \end{array}$$

15. Find $m\angle N$.

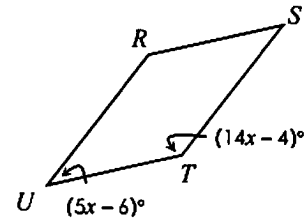
$$\begin{aligned} 12x - 39 &= 8x + 17 \\ 4x &= 56 \\ x &= 14 \end{aligned}$$



$$\begin{aligned} m\angle K &: 8(14) + 17 = 129^\circ \\ m\angle N &= 180 - 129 = \boxed{51^\circ} \end{aligned}$$

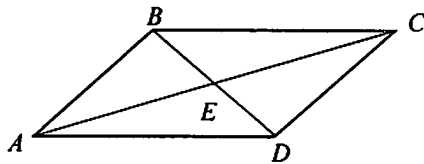
16. Find $m\angle R$.

$$\begin{aligned} 19x - 10 &= 180 \\ 19x &= 190 \\ x &= 10 \end{aligned}$$



$$\begin{aligned} m\angle T &= 14(10) - 4 = 136^\circ \\ m\angle R &= \boxed{136^\circ} \end{aligned}$$

17. In parallelogram $ABCD$, if $ED = 7x - 13$ and $BD = 16x - 38$, find BD .

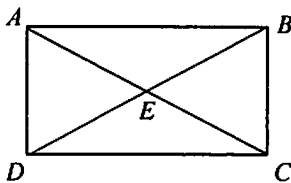


$$\begin{aligned} 2(7x - 13) &= 16x - 38 \\ 14x - 26 &= 16x - 38 \\ 12 &= 2x \\ x &= 6 \end{aligned}$$

$$\begin{aligned} BD &= 16(6) - 38 \\ &= \boxed{58} \end{aligned}$$

Topic 3: Rectangles

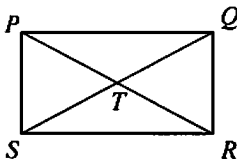
18. If $ABCD$ is a rectangle, $AD = 9$, $AC = 22$, and $m\angle BCA = 66^\circ$, find each missing measure.



$$\begin{aligned} AB &: x^2 + 9^2 = 22^2 \\ x^2 &= 403 \\ x &= 20.1 \end{aligned}$$

$$\begin{array}{ll} BC = \underline{9} & m\angle ADC = \underline{90^\circ} \\ AB = \underline{20.1} & m\angle BAC = \underline{24^\circ} \\ BD = \underline{22} & m\angle CDB = \underline{24^\circ} \\ EC = \underline{11} & m\angle AEB = \underline{132^\circ} \end{array}$$

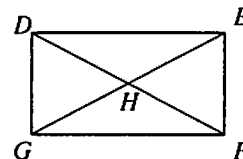
19. If $PQRS$ is a rectangle, $PR = 9x + 1$, and $QS = 13x - 11$, find TR .



$$\begin{aligned} 13x - 11 &= 9x + 1 \\ 4x &= 12 \\ x &= 3 \end{aligned}$$

$$\begin{aligned} PR &= 9(3) + 1 = 28 \\ TR &= \boxed{14} \end{aligned}$$

20. If $DEFG$ is a rectangle, $m\angle DEG = (4x - 5)^\circ$, and $m\angle FGE = (6x - 21)^\circ$, find $m\angle DGE$.

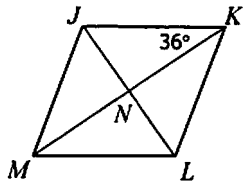


$$\begin{aligned} 6x - 21 &= 4x - 5 \\ 2x &= 16 \\ x &= 8 \end{aligned}$$

$$\begin{aligned} m\angle FGE &= 6(8) - 21 \\ &= 27^\circ \\ m\angle DGE &= \boxed{63^\circ} \end{aligned}$$

Topic 4: Rhombi & Squares

21. If $JKLM$ is a rhombus, find each angle.



$$\begin{aligned} m\angle JKL &= \underline{72^\circ} \\ m\angle MLK &= \underline{108^\circ} \\ m\angle JMK &= \underline{36^\circ} \\ m\angle MJL &= \underline{54^\circ} \\ m\angle KNL &= \underline{90^\circ} \end{aligned}$$

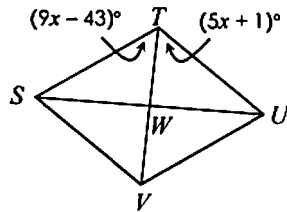
22. Using $JKLM$ from the previous question, if $MN = 20$ and $JL = 26$, find JK .

$$\begin{aligned} 13^2 + 20^2 &= x^2 \\ 569 &= x^2 \\ x &= 23.9 \end{aligned}$$

$JK = 23.9$

23. If $STUV$ is a rhombus, find $m\angle SVU$.

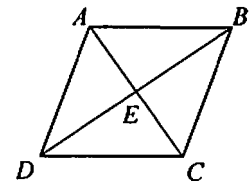
$$\begin{aligned} 9x - 43 &= 5x + 1 \\ 4x &= 44 \\ x &= 11 \end{aligned}$$



$m\angle SVU = 112^\circ$

24. If $ABCD$ is a rhombus, $AD = 4x + 2$, $DC = 7x - 13$, and $BD = 34$, find AE .

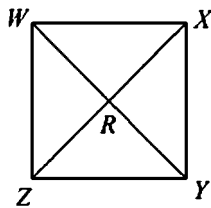
$$\begin{aligned} 7x - 13 &= 4x + 2 \\ 3x &= 15 \\ x &= 5 \end{aligned}$$



$$\begin{aligned} 17^2 + x^2 &= 22^2 \\ x^2 &= 195 \\ x &= 14 \end{aligned}$$

$AE = 14$

25. If $WXYZ$ is a square, find each angle.



$$\begin{aligned} m\angle WXY &= \underline{90^\circ} \\ m\angle XZY &= \underline{45^\circ} \\ m\angle YXZ &= \underline{45^\circ} \\ m\angle WRZ &= \underline{90^\circ} \\ m\angle XWY &= \underline{45^\circ} \end{aligned}$$

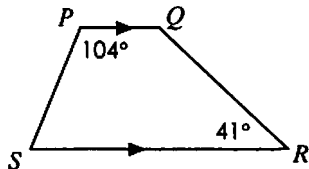
26. Using $WXYZ$ from the previous question, if $WY = 32$, find XY .

$$\begin{aligned} 16^2 + 16^2 &= x^2 \\ 512 &= x^2 \\ x &= 22.6 \end{aligned}$$

$XY = 22.6$

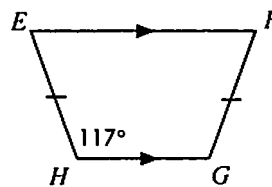
Topic 5: Trapezoids

27. Find each measure.



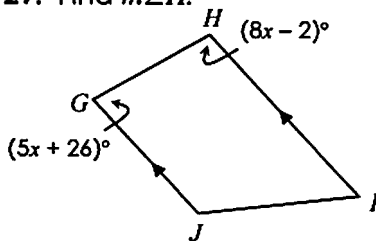
$$\begin{aligned} m\angle Q &= \underline{139^\circ} \\ m\angle S &= \underline{76^\circ} \end{aligned}$$

28. Find each measure.



$$\begin{aligned} m\angle E &= \underline{63^\circ} \\ m\angle F &= \underline{63^\circ} \\ m\angle G &= \underline{117^\circ} \end{aligned}$$

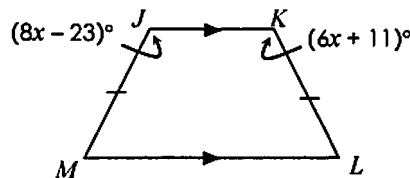
29. Find $m\angle H$.



$$\begin{aligned} 13x + 24 &= 180 \\ 13x &= 156 \\ x &= 12 \end{aligned}$$

$m\angle H = 94^\circ$

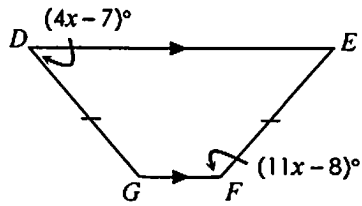
30. Find $m\angle M$.



$$\begin{aligned} 8x - 23 &= 6x + 11 \\ 2x &= 34 \\ x &= 17 \end{aligned}$$

$m\angle J = 113^\circ$
 $m\angle M = 67^\circ$

31. Find $m\angle G$.



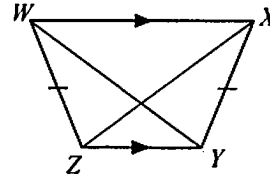
$$4x-7 + 11x-8 = 180$$

$$15x = 195$$

$$x = 13$$

$$m\angle F = 135^\circ ; \boxed{m\angle G = 135^\circ}$$

32. If $WY = 15x - 2$ and $XZ = 9x + 10$, find WY .



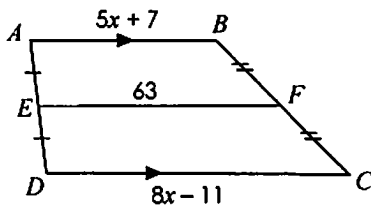
$$15x - 2 = 9x + 10$$

$$6x = 12$$

$$x = 2$$

$$WY = 15(2) - 2 = \boxed{28}$$

33. Find AB .



$$63 = \frac{5x+7 + 8x-11}{2}$$

$$126 = 13x - 4$$

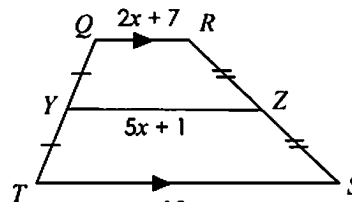
$$130 = 13x$$

$$x = 10$$

$$AB = 5(10) + 7$$

$$= \boxed{57}$$

34. Find YZ .



$$5x+1 = \frac{2x+7 + 19}{2}$$

$$10x+2 = 2x+26$$

$$8x = 24$$

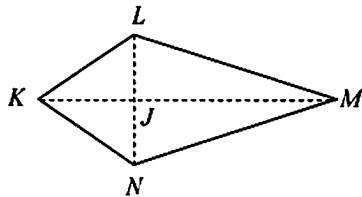
$$x = 3$$

$$YZ = 5(3) + 1$$

$$= \boxed{16}$$

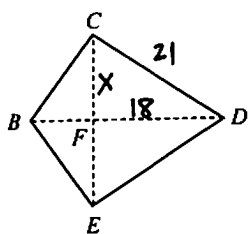
Topic 6: Kites

35. If $KLMN$ is a kite, $m\angle LMN = 36^\circ$ and $m\angle KNJ = 54^\circ$, find each measure.



| | |
|---------------------------------------|---------------------------------------|
| $m\angle KLN = \underline{54^\circ}$ | $m\angle JKN = \underline{36^\circ}$ |
| $m\angle LKN = \underline{72^\circ}$ | $m\angle NMJ = \underline{18^\circ}$ |
| $m\angle KNM = \underline{126^\circ}$ | $m\angle JLM = \underline{72^\circ}$ |
| $m\angle LJM = \underline{90^\circ}$ | $m\angle KLM = \underline{126^\circ}$ |

36. If $BCDE$ is a kite, $CD = 21$ and $DF = 18$, find CE .



$$x^2 + 18^2 = 21^2$$

$$x^2 = 117$$

$$x = 10.8$$

$$CE = 2(10.8)$$

$$= \boxed{21.6}$$

37. If $WXYZ$ is a kite, find $m\angle Z$.

$$8x-23 = 6x+11$$

$$2x = 34$$

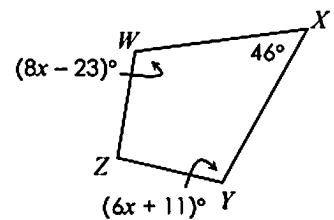
$$x = 17$$

$$m\angle W = 8(17) - 23$$

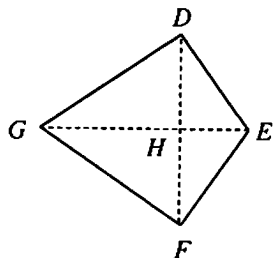
$$= 113^\circ$$

$$m\angle Z = 360 - 272$$

$$= \boxed{88^\circ}$$



38. If DEFG is a kite, $m\angle DEF = (12x - 16)^\circ$, $m\angle EFH = (3x - 1)^\circ$ and $m\angle DGF = 74^\circ$, find $m\angle GFE$.



$$6x - 8 + 3x - 1 + 90 = 180$$

$$9x + 81 = 180$$

$$9x = 99$$

$$x = 11$$

$$m\angle DEF = 12(11) - 16 = 116^\circ$$

$$m\angle GFE = \frac{360 - 190}{2}$$

$$= 85^\circ$$

Topic 7: Quadrilaterals in the Coordinate Plane

Use the distance and slope formulas to justify your answers to questions 39-40.

39. Determine whether WXYZ given $W(0, 8)$, $X(6, 10)$, $Y(-1, -1)$, $Z(-7, -3)$ is a parallelogram.

$$m(\overline{WX}) = \frac{10-8}{6-0} = \frac{2}{6} = \frac{1}{3}$$

$$m(\overline{YZ}) = \frac{-3+1}{-7+1} = \frac{-2}{-6} = \frac{1}{3}$$

$$\left. \begin{array}{l} m(\overline{WX}) = \frac{1}{3} \\ m(\overline{YZ}) = \frac{1}{3} \end{array} \right\} \overline{WX} \parallel \overline{YZ}$$

$$m(\overline{XY}) = \frac{-1-10}{-1-6} = \frac{-11}{-7} = \frac{11}{7}$$

$$m(\overline{WZ}) = \frac{-3-8}{-7-0} = \frac{-11}{-7} = \frac{11}{7}$$

$$\left. \begin{array}{l} m(\overline{XY}) = \frac{11}{7} \\ m(\overline{WZ}) = \frac{11}{7} \end{array} \right\} \overline{XY} \parallel \overline{WZ}$$

Yes; parallelogram!

40. Determine the most precise classification for quadrilateral ABCD (parallelogram, rectangle, rhombus, or square) given $A(3, -4)$, $B(10, -2)$, $C(8, -9)$, $D(1, -11)$.

$$AB: d = \sqrt{(3-10)^2 + (-4+2)^2} = \sqrt{49+4} = \sqrt{53}$$

$$CD: d = \sqrt{(8-1)^2 + (-9+11)^2} = \sqrt{49+4} = \sqrt{53}$$

$$BC: d = \sqrt{(10-8)^2 + (-2+9)^2} = \sqrt{4+49} = \sqrt{53}$$

$$AD: d = \sqrt{(3-1)^2 + (-4+11)^2} = \sqrt{4+49} = \sqrt{53}$$

Sq/Rhm

$$AC: d = \sqrt{(3-8)^2 + (-4+9)^2} = \sqrt{25+25} = \sqrt{50}$$

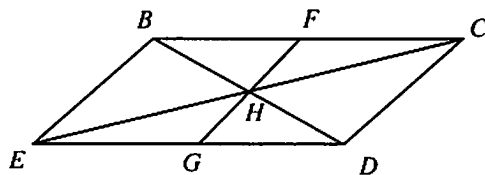
$$BD: d = \sqrt{(10-1)^2 + (-2+11)^2} = \sqrt{81+81} = \sqrt{162}$$

Rhm

Rhombus

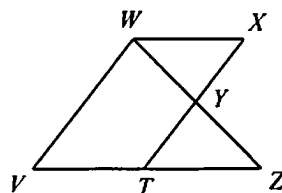
Topic 8: Parallelogram Proofs

41. Given: $BCDE$ is a parallelogram
 Prove: $\overline{EG} \cong \overline{CF}$



| Statements | Reasons |
|--|--|
| 1. $BCDE$ is a parallelogram | 1. given |
| 2. $\overline{BC} \parallel \overline{ED}$ | 2. Def of parallelogram |
| 3. $\angle BCE \cong \angle DEC$ | 3. Alt. Interior Angles |
| 4. $\angle CFG \cong \angle EGF$ | 4. Alt. Interior Angles |
| 5. $\overline{EH} \cong \overline{CH}$ | 5. Diag of a p'gram bisect each other. |
| 6. $\triangle EGH \cong \triangle CFH$ | 6. AAS \triangle Congruence |
| 7. $\overline{EG} \cong \overline{CF}$ | 7. CPCTC |
| | |
| | |

42. Given: $\triangle TYZ \cong \triangle XYW$
 T is the midpoint of \overline{VZ}
 Prove: $VWXT$ is a parallelogram



| Statements | Reasons |
|--|--|
| 1. $\triangle TYZ \cong \triangle XYW$ | 1. given |
| 2. $\overline{ZT} \cong \overline{WX}$ | 2. CPCTC |
| 3. T is the midpoint of \overline{VZ} | 3. given |
| 4. $\overline{VT} \cong \overline{ZT}$ | 4. Def of midpoint |
| 5. $\overline{VT} \cong \overline{WX}$ | 5. Transitive Property |
| 6. $\angle ZTY \cong \angle WXY$ | 6. CPCTC |
| 7. $\overline{VT} \parallel \overline{WX}$ | 7. Alt. Interior Angles |
| 8. $VWXT$ is a parallelogram. | 8. One pair of opp sides are parallel & congruent. |
| | |

Name: _____

Unit 8 Test

Date: _____ Per: _____

Polygons & Quadrilaterals

1. What is the sum of the measures of the interior angles of a 27-gon?
 $(27-2) \cdot 180$

A. 4860° C. 5220°
 B. 4500° D. 166.7°

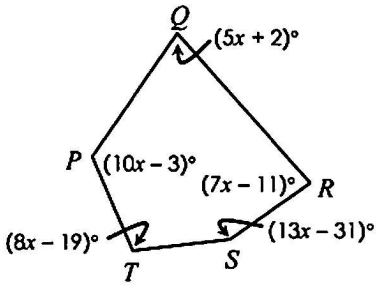
B

2. If the sum of the interior angles of a polygon is 2340°, how many sides does the polygon have?
 $(n-2) \cdot 180 = 2340$
 $n-2 = 13$

A. 11 sides C. 15 sides
 B. 13 sides D. 16 sides

C

3. Find $m\angle S$.




$(5-2) \cdot 180 = 540$
 $43x - 62 = 540$
 $43x = 602$
 $x = 14$

$m\angle S = 13(14) - 31$
 $= 151^\circ$

$m\angle S = 151^\circ$

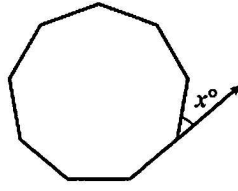
4. A regular hexagon is shown below. Find the value of x .



$11x + 21 = 120$
 $11x = 99$
 $x = 9$

$x = 9$

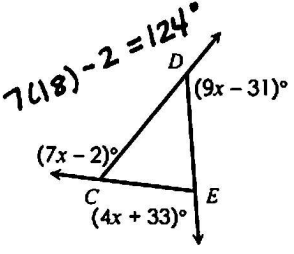
5. If the polygon shown below is a regular nonagon, what is the value of x ?



$\frac{360}{9} = 40$

$x = 40$

6. Find $m\angle DCE$.



$20x = 360$
 $x = 18$

$m\angle DCE = 56^\circ$

7. If each interior angle of a regular polygon measures 168°, how many sides does the polygon have?
 $ext = 12^\circ$

$\frac{360}{12}$

A. 12 sides
 B. 30 sides
 C. 25 sides
 D. 15 sides

B

8. Which of the following properties is always true for a parallelogram?

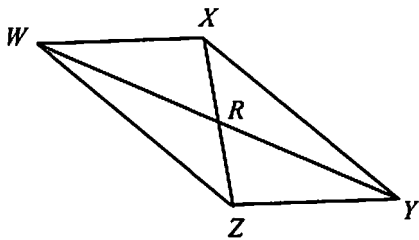
A. Diagonals bisect each other.
 B. Diagonals are perpendicular.
 C. Diagonals are congruent.
 D. Diagonals bisect opposite angles.

A

9. Which of the following quadrilaterals always have diagonals that are congruent? Check all that apply.

- Parallelograms
- Rectangles
- Rhombi
- Squares
- Isosceles Trapezoids

Use parallelogram $WXYZ$ for questions 10 and 11.



10. If $m\angle XYZ = 68^\circ$ and $m\angle WXZ = 71^\circ$, find $m\angle WZX$.

$$m\angle WZX = 41^\circ$$

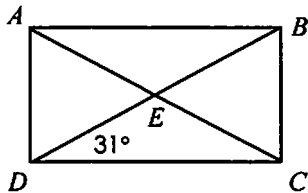
11. If $XZ = 8x - 18$ and $RZ = 2x + 5$, find XR .

$$\begin{aligned} 8x - 18 &= 2(2x + 5) \\ 8x - 18 &= 4x + 10 \\ 4x &= 28 \\ x &= 7 \end{aligned}$$

$$\begin{aligned} RZ &= 2(7) + 5 \\ &= 19 \end{aligned}$$

$$XR = 19$$

Use rectangle $ABCD$ for questions 12-14.



12. If $EC = 13$, find BD .

$$BD = 26$$

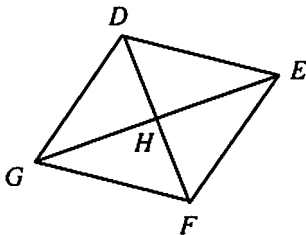
13. Find $m\angle ADB$.

$$m\angle ADB = 59^\circ$$

14. Find $m\angle DEC$.

$$m\angle DEC = 118^\circ$$

Use rhombus $DEFG$ for questions 15 and 16.



15. If $GE = 42$ and $DH = 16$, find GF .

$$\begin{aligned} 21^2 + 16^2 &= x^2 \\ 697 &= x^2 \\ x &= 26.4 \end{aligned}$$

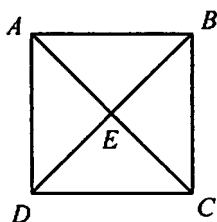
$$GF = 26.4$$

16. If $EF = 13$ and $DF = 18$, find EH .

$$\begin{aligned} x^2 + 9^2 &= 13^2 \\ x^2 &= 88 \\ x &= 9.4 \end{aligned}$$

$$EH = 9.4$$

Use square $ABCD$ for questions 17 and 18.



17. If $AC = 26$, find BC .

$$\begin{aligned} 13^2 + 13^2 &= x^2 \\ 338 &= x^2 \\ x &= 18.4 \end{aligned}$$

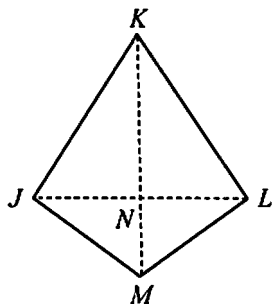
$$BC = 18.4$$

18. If $m\angle ACB = (11x - 32)^\circ$, find the value of x .

$$\begin{aligned} 11x - 32 &= 45 \\ 11x &= 77 \\ x &= 7 \end{aligned}$$

$$x = 7$$

Use kite $JKLM$ for questions 19 and 20.



19. If $m\angle JKN = 28^\circ$ and $m\angle KLM = 103^\circ$, find $m\angle JML$.

$$m\angle JML = 98^\circ$$

20. If $JL = 18$, $NK = 12$, and $ML = 10$, find the perimeter of $JKLM$.

- A. 42
- B. 45
- C. 50
- D. 56

$$9^2 + 12^2 = c^2$$

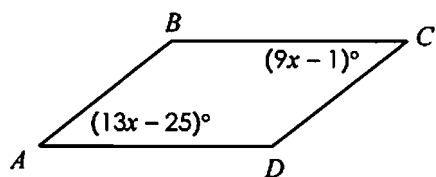
$$225 = c^2$$

$$c = 15$$

$$\text{Perimeter} = 2(15) + 2(10)$$

C

21. If $ABCD$ is a parallelogram, find $m\angle D$.



$$13x - 25 = 9x - 1$$

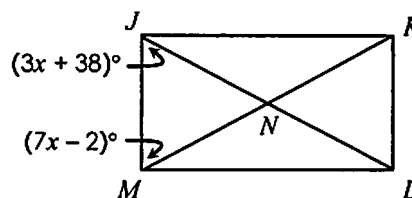
$$4x = 24$$

$$x = 6$$

$$m\angle C = 9(6) - 1 = 53^\circ$$

$$m\angle D = 127^\circ$$

22. If $JKLM$ is a rectangle, find $m\angle NML$.



$$7x - 2 = 3x + 38$$

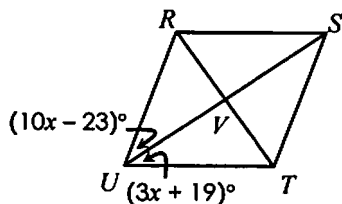
$$4x = 40$$

$$x = 10$$

$$m\angle NML = 7(10) - 2 = 68^\circ$$

$$m\angle NML = 22^\circ$$

23. If $RSTU$ is a rhombus, find $m\angle UTS$.



$$10x - 23 = 3x + 19$$

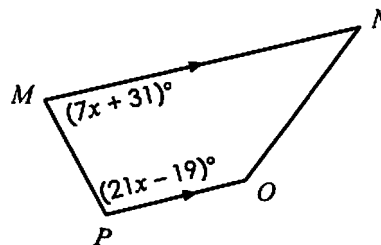
$$7x = 42$$

$$x = 6$$

$$m\angle VUT = 3(6) + 19 = 37^\circ$$

$$m\angle UTS = 106^\circ$$

24. Find $m\angle P$.



$$28x + 12 = 180$$

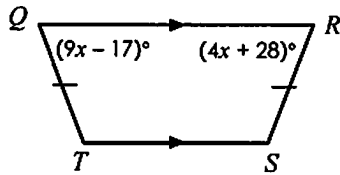
$$28x = 168$$

$$x = 6$$

$$m\angle P = 21(6) - 19 = 107^\circ$$

$$m\angle P = 107^\circ$$

25. Find $m\angle T$.

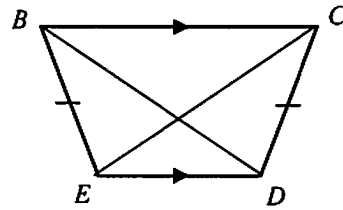


$$\begin{aligned} 9x - 17 &= 4x + 28 \\ 5x &= 45 \\ x &= 9 \end{aligned}$$

$$\begin{aligned} m\angle Q &= 9(9) - 17 \\ &= 64^\circ \end{aligned}$$

$$m\angle T = 116^\circ$$

26. If $BD = 8x - 27$ and $EC = 2x + 33$, find BD .

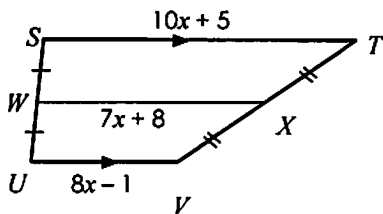


$$\begin{aligned} 8x - 27 &= 2x + 33 \\ 6x &= 60 \\ x &= 10 \end{aligned}$$

$$BD = 8(10) - 27 = 53$$

$$BD = 53$$

27. Find WX .

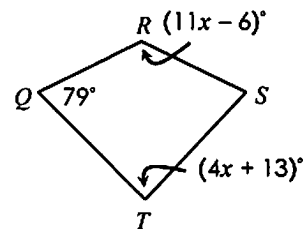


$$\begin{aligned} 7x + 8 &= \frac{10x + 5 + 8x - 1}{2} \\ 14x + 16 &= 18x + 4 \\ 12 &= 4x \\ x &= 3 \end{aligned}$$

$$\begin{aligned} WX &= 7(3) + 8 \\ &= 29 \end{aligned}$$

$$WX = 29$$

28. If $QRST$ is a kite, find $m\angle QRS$.



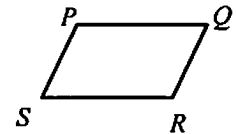
$$\begin{aligned} 11x - 6 + 4x + 13 + 2(79) &= 360 \\ 15x + 165 &= 360 \\ 15x &= 195 \\ x &= 13 \end{aligned}$$

$$\begin{aligned} m\angle QRS &= 11(13) - 6 \\ &= 137^\circ \end{aligned}$$

$$m\angle QRS = 137^\circ$$

29. The vertices of quadrilateral $PQRS$ are given below. Use the distance and/or slope formulas to determine if $PQRS$ is a parallelogram. Use the diagram as a guide.

$$P(-6, 4), Q(-2, 7), R(-1, 0), S(-5, -3)$$



$$m(\overline{PQ}) = \frac{7-4}{-2-(-6)} = \frac{3}{4}$$

$$m(\overline{RS}) = \frac{-3-0}{-5-(-1)} = \frac{-3}{-4} = \frac{3}{4}$$

$$\left. \begin{array}{l} m(\overline{PQ}) = \frac{3}{4} \\ m(\overline{RS}) = \frac{3}{4} \end{array} \right\} \overline{PQ} \parallel \overline{RS}$$

$$m(\overline{QR}) = \frac{0-7}{-1-(-2)} = \frac{-7}{1} = -7$$

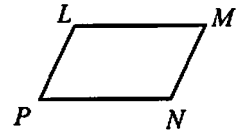
$$m(\overline{PS}) = \frac{-3-4}{-5-(-6)} = \frac{-7}{1} = -7$$

$$\left. \begin{array}{l} m(\overline{QR}) = -7 \\ m(\overline{PS}) = -7 \end{array} \right\} \overline{QR} \parallel \overline{PS}$$

$PQRS$ is a parallelogram

$PQRS$ is not a parallelogram

30. The vertices of quadrilateral $LMNP$ are $L(-1, 7)$, $M(4, 9)$, $N(8, -1)$, and $P(3, -3)$. Using the distance formula, determine the most precise classification of $LMNP$: parallelogram, rectangle, rhombus, or square. Use the diagram as a guide.



$$LM = \sqrt{(4+1)^2 + (9-7)^2} = \sqrt{25+4} = \sqrt{29}$$

$$MN = \sqrt{(8-4)^2 + (-1-9)^2} = \sqrt{16+100} = \sqrt{116} = 2\sqrt{29}$$

$$NP = \sqrt{(3-8)^2 + (-3+1)^2} = \sqrt{25+4} = \sqrt{29}$$

$$LP = \sqrt{(3+1)^2 + (-3-7)^2} = \sqrt{16+100} = \sqrt{116} = 2\sqrt{29}$$

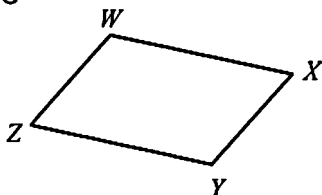
Rect or
P'gram

$$LN = \sqrt{(8+1)^2 + (-1-7)^2} = \sqrt{81+64} = \sqrt{145}$$

$$MP = \sqrt{(3-4)^2 + (-3-9)^2} = \sqrt{1+144} = \sqrt{145}$$

$LMNP$ is a **Rectangle**

31. $WXYZ$ is a quadrilateral with W located at $(-5, 2)$ and X located at $(3, 0)$. What must be the slope of \overline{ZY} in order for $WXYZ$ to be a parallelogram?



A. 4

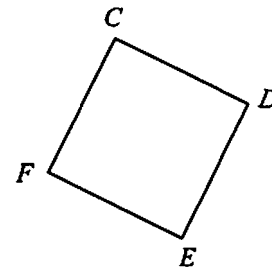
C. $\frac{1}{4}$

B. -4

D. $-\frac{1}{4}$

D

32. Rhombus $CDEF$ is shown below. If the slope of \overline{FC} is $\frac{5}{2}$, what must be the slope of \overline{CD} in order for $CDEF$ to be a square?



A. $\frac{2}{5}$

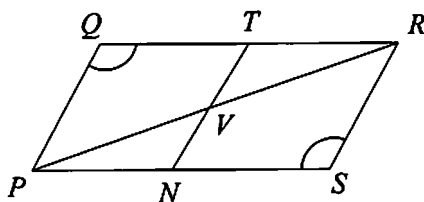
C. $\frac{5}{2}$

B. $-\frac{2}{5}$

D. $-\frac{5}{2}$

B

33. In addition to the information given in the drawing, which statement is sufficient to prove $PQRS$ is a parallelogram?



A. $\overline{QR} \cong \overline{SP}$

B. $\overline{QP} \cong \overline{SR}$

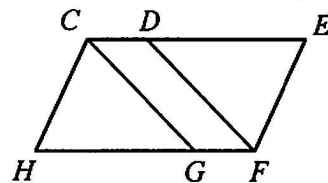
C. V is the midpoint of \overline{PR}

D. $\angle QPR \cong \angle SRP$

D

34. Given: $CEFH$ is a parallelogram, $\triangle CGH \cong \triangle FDE$

Prove: $CDFG$ is a parallelogram

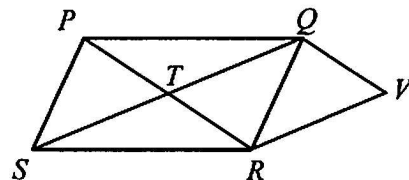


| Statements | Reasons |
|--|----------------------------------|
| 1. $CEFH$ is a parallelogram | 1. given |
| 2. $\overline{CE} \parallel \overline{HF}$ | 2. Def. of parallelogram |
| 3. $\angle GFD \cong \angle EDF$ | 3. Alt. Interior Angles |
| 4. $\triangle CGH \cong \triangle FDE$ | 4. Given |
| 5. $\angle EDF \cong \angle HGC$ | 5. CPCTC |
| 6. $\overline{CG} \cong \overline{FD}$ | 6. CPCTC |
| 7. $\angle GFD \cong \angle HGC$ | 7. Transitive Property |
| 8. $\overline{CG} \parallel \overline{DF}$ | 8. Corresponding Angles Converse |
| 9. $CDFG$ is a parallelogram | 9. Def of Parallelogram |
| | |
| | |

35. Given: $PQRS$ is a parallelogram, $\angle PSQ \cong \angle VRQ$

$\angle RTQ \cong \angle QVR$

Prove: $TQVR$ is a parallelogram



| Statements | Reasons |
|--|-------------------------------|
| 1. $PQRS$ is a parallelogram | 1. given |
| 2. $\overline{PS} \parallel \overline{QR}$ | 2. Def of parallelogram |
| 3. $\angle RQT \cong \angle PSQ$ | 3. Alt. Interior Angles |
| 4. $\angle PSQ \cong \angle VRQ$ | 4. given |
| 5. $\angle RQT \cong \angle VRQ$ | 5. Transitive Property |
| 6. $\angle RTQ \cong \angle QVR$ | 6. Given |
| 7. $\overline{QR} \cong \overline{RQ}$ | 7. Reflexive Property |
| 8. $\triangle RTQ \cong \triangle QVR$ | 8. AAS \triangle Congruence |
| 9. $\overline{TQ} \cong \overline{VR}$; $\overline{TR} \cong \overline{VQ}$ | 9. CPCTC |
| 10. $TQVR$ is a parallelogram. | 10. Opp. sides are congruent |
| | |

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Art with Jenny K



Many thanks to these talented artists!