

Name _____

Geometry

Proving that a Quadrilateral is a Parallelogram

Any of the methods may be used to prove that a quadrilateral is a parallelogram.

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

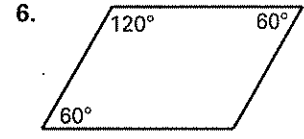
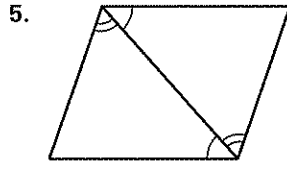
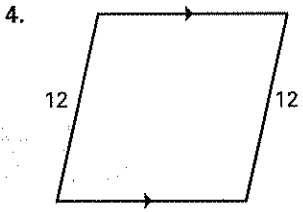
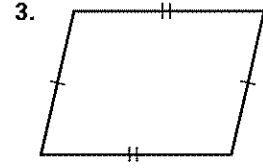
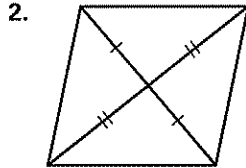
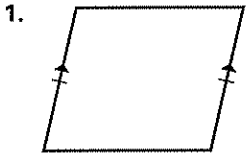
LESSON
6.3

NAME _____ DATE _____

Practice A

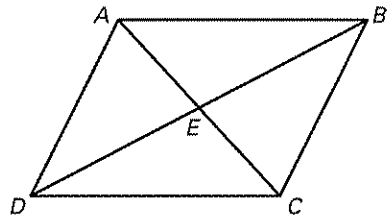
For use with pages 338–346

Are you given enough information to determine whether the quadrilateral is a parallelogram? Explain.

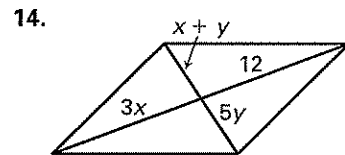
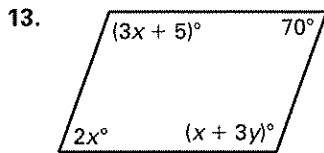
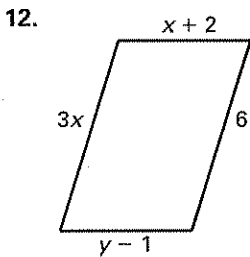


What additional information is needed in order to prove that quadrilateral $ABCD$ is a parallelogram?

- 7. $\overline{AB} \parallel \overline{DC}$
- 8. $\overline{AB} \cong \overline{DC}$
- 9. $\angle DCA \cong \angle BAC$
- 10. $\overline{DE} \cong \overline{EB}$
- 11. $m\angle CDA + m\angle DAB = 180^\circ$

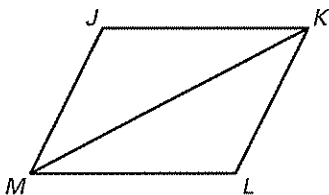


What value of x and y will make the polygon a parallelogram?



Write a two-column or a paragraph proof using each method.

15. **Given:** $\triangle MJK \cong \triangle KLM$
Prove: $MJKL$ is a parallelogram.



- a. By Theorem 6.6: If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.
- b. By Theorem 6.10: If one pair of opposite sides of a quadrilateral are congruent and parallel, then the quadrilateral is a parallelogram.

Lesson 6.3

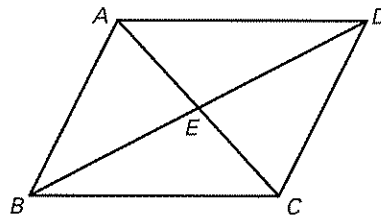
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Practice B

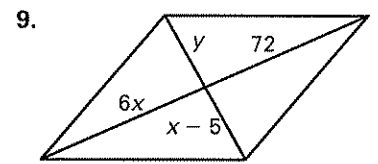
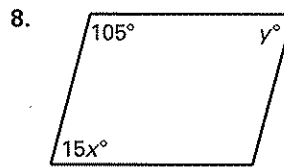
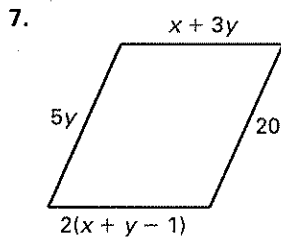
For use with pages 338–346

Decide whether each piece of given information alone is sufficient to prove that quadrilateral $ABCD$ is a parallelogram.

1. E is the midpoint of \overline{AC} and \overline{BD} .
2. $m\angle ABC + m\angle BCD = 180^\circ$
3. $\overline{AB} \parallel \overline{DC}$ and $\overline{BC} \cong \overline{DA}$
4. $\angle ABC \cong \angle ADC$, and $\angle BAD \cong \angle BCD$
5. $\triangle ABE \cong \triangle DCE$
6. $\triangle ABE \cong \triangle CDE$



What value of x and y will make the polygon a parallelogram?

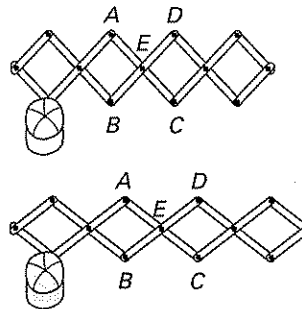


Prove that the points represent the vertices of a parallelogram. Use a different method for each exercise.

10. $A(2, -1)$, $B(1, 3)$, $C(6, 5)$, and $D(7, 1)$
11. $A(-2, -4)$, $B(1, 2)$, $C(2, 10)$, and $D(-1, 4)$

Use the diagram of the adjustable hat rack at the right to answer the following.

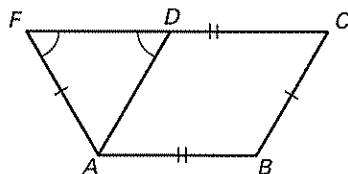
12. Draw the quadrilateral $ABCD$.
13. If the hat rack were expanded outward, would $ABCD$ still be a parallelogram? Explain.



Write a two-column or a paragraph proof.

14. Given: $\overline{AB} \cong \overline{CD}$, $\overline{BC} \cong \overline{AF}$
 $\angle AFD \cong \angle ADF$

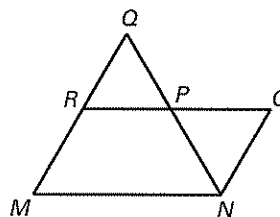
Prove: $ABCD$ is a parallelogram.



- 15 Given: $\triangle RQP \cong \triangle ONP$

R is the midpoint of \overline{MQ} .

Prove: $MRON$ is a parallelogram.



LESSON
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Practice C

For use with pages 338–346

Decide whether you are given enough information to determine that the quadrilateral is a parallelogram.

1. Opposite sides are parallel.
2. Opposite sides are congruent.
3. Two pairs of consecutive sides are congruent.
4. Two pairs of consecutive angles are congruent.
5. Diagonals are congruent.
6. Diagonals bisect each other.
7. All four sides are congruent.
8. Consecutive angles are supplementary.

Prove that the points represent the vertices of a parallelogram. Use a different method for each exercise.

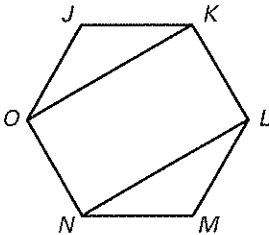
9. $A(-4, 7)$, $B(3, 0)$, $C(2, -5)$, and $D(-5, 2)$
10. $A(-2, 8)$, $B(2, 7)$, $C(5, 1)$, and $D(1, 2)$

Find all the possible coordinates for the fourth vertex of a parallelogram with the given vertices.

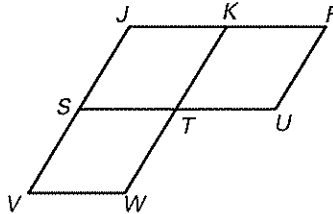
11. $(4, -1)$, $(-4, 1)$, and $(0, 8)$
12. $(3, -4)$, $(-2, -1)$, and $(1, 2)$

Write a two-column or a paragraph proof.

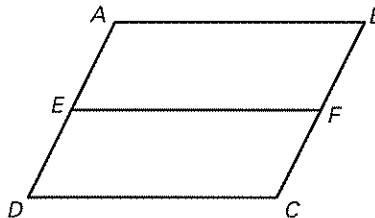
13. **Given:** Regular hexagon $JKLMNO$
Prove: $OKLN$ is a parallelogram.



14. **Given:** $VWKJ$ and $SJRU$ are parallelograms.
Prove: $\angle W \cong \angle U$



15. **Given:** $\square ABCD$
 E is the midpoint of AD .
 F is the midpoint of BC .
Prove: Quadrilateral $ABFE$ is a parallelogram.



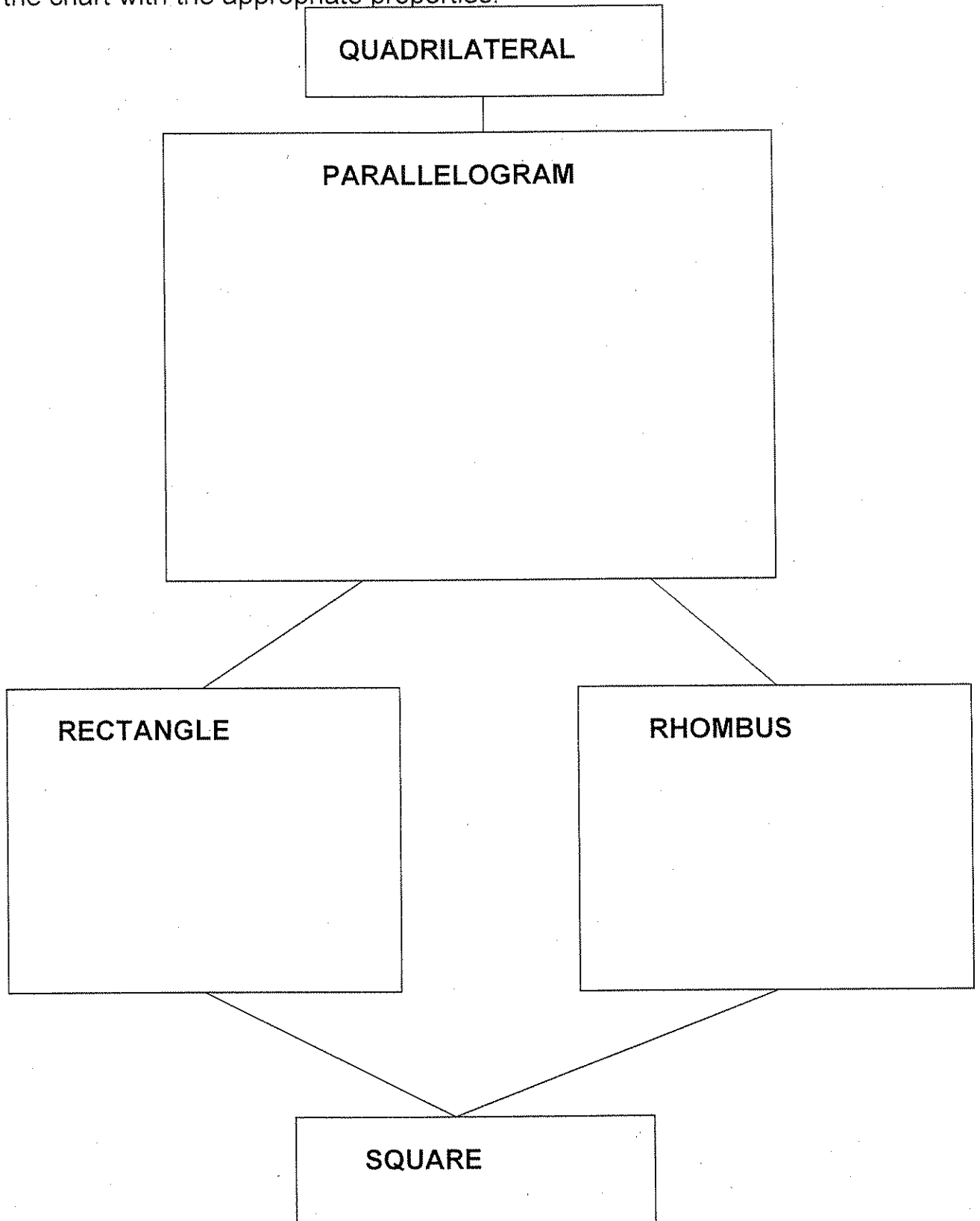
Lesson 6.3

Name _____

Honors Geometry

Pop Quiz

Fill in the chart with the appropriate properties.



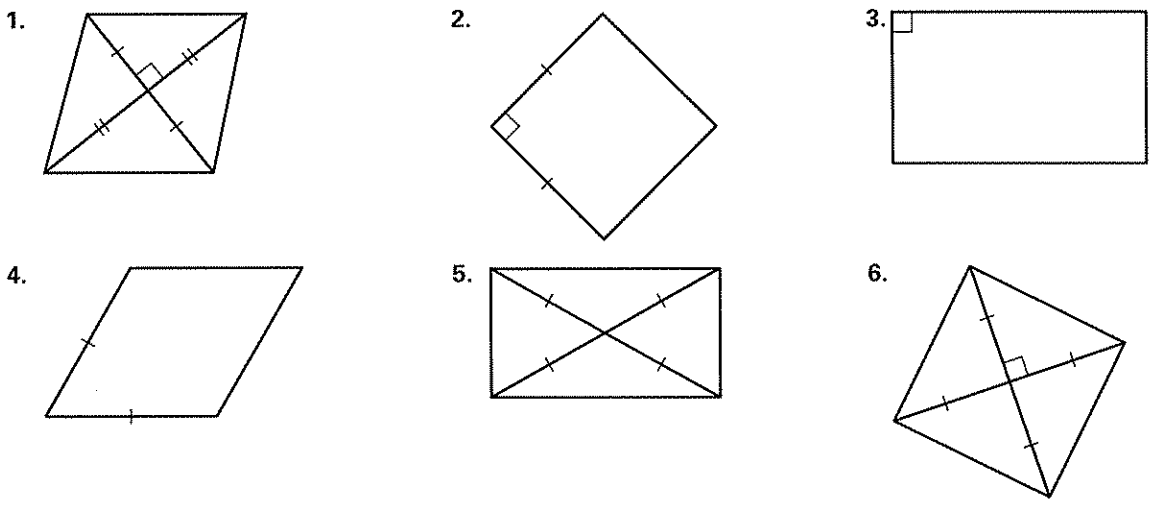
LESSON
6.4

NAME _____ DATE _____

Practice A

For use with pages 347–355

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

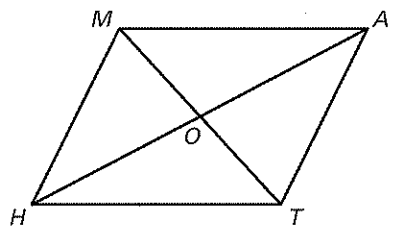


Match the properties of a quadrilateral with all of the types of quadrilateral which have that property.

- | | |
|--|------------------|
| 7. The diagonals are congruent. | A. Parallelogram |
| 8. Both pairs of opposite sides are congruent. | B. Rectangle |
| 9. Both pairs of opposite sides are parallel. | C. Rhombus |
| 10. All angles are congruent. | D. Square |
| 11. All sides are congruent. | |
| 12. Diagonals bisect the angles. | |

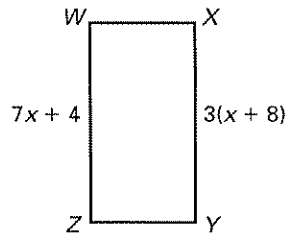
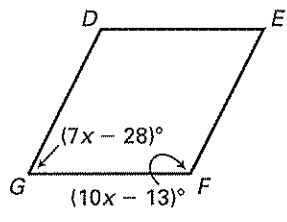
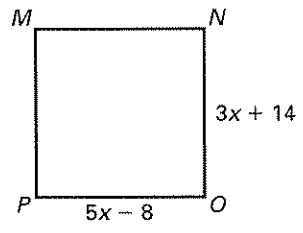
MATH is a parallelogram with diagonals intersecting at **O**. Identify the type depending upon the given conditions.

- | | |
|--|--|
| 13. $\overline{MT} \perp \overline{AH}$ | 14. $\overline{MT} \cong \overline{AH}$ |
| 15. $\overline{MA} \perp \overline{AT}, \overline{AM} \cong \overline{MH}$ | 16. $\overline{MO} \cong \overline{OT}, \overline{AO} \cong \overline{OH}$ |



Find the value of **x**.

17. **MNOP** is a square. 18. **DEFG** is a rhombus. 19. **WXYZ** is a rectangle.



Lesson 6.4

Practice B

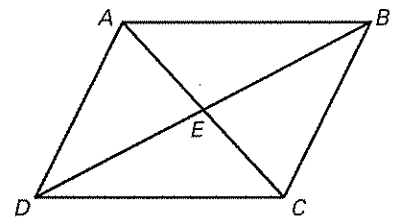
For use with pages 347–355

Decide whether the statement is *sometimes*, *always*, or *never* true.

1. A rhombus is equilateral.
2. The diagonals of a rectangle are perpendicular.
3. The opposite angles of a rhombus are supplementary.
4. A square is a rectangle.
5. The diagonals of a rectangle bisect each other.
6. The consecutive angles of a square are supplementary.

Quadrilateral $ABCD$ is a rhombus.

7. If $m\angle BAE = 32^\circ$, find $m\angle ECD$.
8. If $m\angle EDC = 43^\circ$, find $m\angle CBA$.
9. If $m\angle EAB = 57^\circ$, find $m\angle ADC$.
10. If $m\angle BEC = 3x - 15^\circ$, solve for x .
11. If $m\angle ADE = 5x - 8^\circ$ and $m\angle CBE = 3x + 24$, solve for x .
12. If $m\angle BAD = 4x + 14^\circ$ and $m\angle ABC = 2x + 10^\circ$, solve for x .



It is given that $PQRS$ is a parallelogram. Decide whether it is a rectangle, a rhombus, a square, or none of the above. Justify your answer using theorems about quadrilaterals.

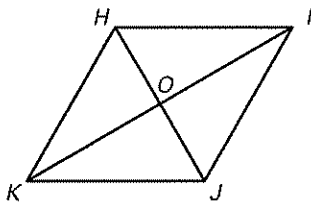
- | | | | |
|--|--|---|--|
| 13. $P(-2, 3)$
$Q(-2, -4)$
$R(2, -4)$
$S(2, 3)$ | 14. $P(7, -1)$
$Q(3, 6)$
$R(-1, -1)$
$S(3, -8)$ | 15. $P(-4, 0)$
$Q(3, 7)$
$R(6, 4)$
$S(-1, -3)$ | 16. $P(1, 1)$
$Q(-2, 4)$
$R(-5, 1)$
$S(-2, -2)$ |
|--|--|---|--|

Write a two-column or a paragraph proof.

17. Given: Parallelogram $HIJK$

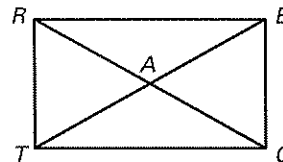
$$\triangle HOI \cong \triangle JOI$$

Prove: $HIJK$ is a rhombus.



18. Given: Rectangle $RECT$

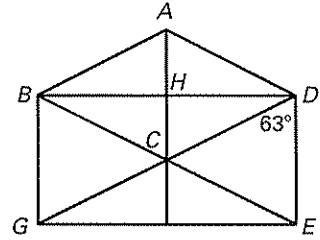
Prove: $\triangle ART \cong \triangle ACE$



Practice C

For use with pages 347–355

In the diagram shown, $BDEG$ is a rectangle and $ABCD$ is a rhombus. Find the measure of the indicated angle.



- | | |
|-----------------|-----------------|
| 1. $\angle GDB$ | 2. $\angle ABC$ |
| 3. $\angle DAB$ | 4. $\angle BCG$ |
| 5. $\angle GCE$ | 6. $\angle DEG$ |
| 7. $\angle AHB$ | 8. $\angle DGB$ |

Decide whether the statement is *true* or *false*. Decide whether the converse is *true* or *false*. If both statements are *true*, write a biconditional statement.

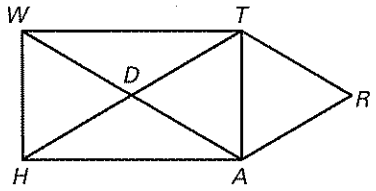
9. If a quadrilateral is a rectangle, then it is a parallelogram.
10. If a quadrilateral is a parallelogram, then it is a rhombus.
11. If a quadrilateral is a square, then it is a rhombus.
12. If a quadrilateral is a rectangle, then it is a rhombus.
13. If a rhombus is a square, then it is a rectangle.

Find the length or angle measure.

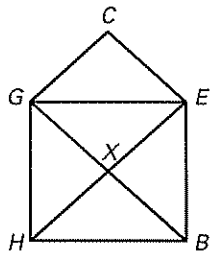
- | | | |
|---|--|--|
| 14. $WXYZ$ is a square.
$WX = 1 - 10x$
$YZ = 14 + 3x$
$XY = \underline{\quad ? \quad}$ | 15. $WXYZ$ is a rhombus.
$m\angle X = 24(10 - x)^\circ$
$m\angle Z = 6(x + 15)^\circ$
$m\angle Y = \underline{\quad ?^\circ \quad}$ | 16. $WXYZ$ is a rectangle.
Perimeter of $\triangle XYZ = 24$
$XY + YZ = 5x - 1$
$XZ = 13 - x$
$WY = \underline{\quad ? \quad}$ |
|---|--|--|

Write a two-column or a paragraph proof.

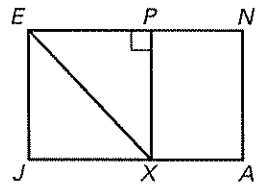
17. **Given:** $WHAT$ is a parallelogram.
 $DART$ is a rhombus.
Prove: $WHAT$ is a rectangle.



18. **Given:** $\triangle GEC \cong \triangle GHX$
 $GEBH$ is a parallelogram.
Prove: $GEBH$ is a rhombus.



19. **Given:** $JANE$ is a parallelogram.
 $JXPE$ is a parallelogram.
 $XP \perp EN$
Prove: $JANE$ is a rectangle.



Lesson 6.4



Tests for Parallelograms

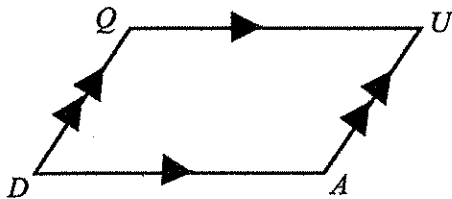
A **Parallelogram** is defined as a quadrilateral with **both pairs** of opposite sides **parallel**.

Does the given information make the **QUADRILATERAL** a **PARALLELOGRAM**?

If the information does not **guarantee** a parallelogram, sketch a counterexample that demonstrates another possible shape having the same characteristics.

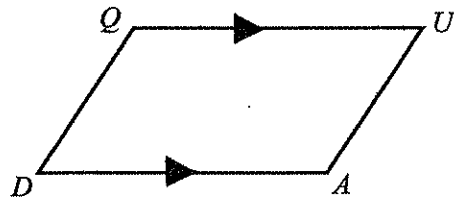
1) Will this always form a parallelogram?

Yes No (provide a counterexample)



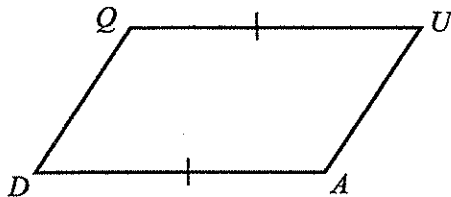
2) Will this always form a parallelogram?

Yes No (provide a counterexample)



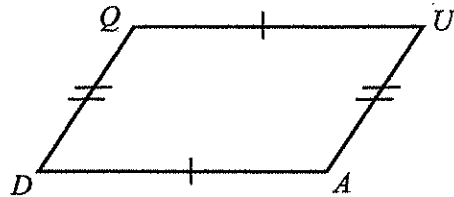
3) Will this always form a parallelogram?

Yes No (provide a counterexample)



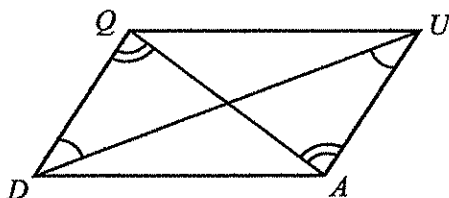
4) Will this always form a parallelogram?

Yes No (provide a counterexample)



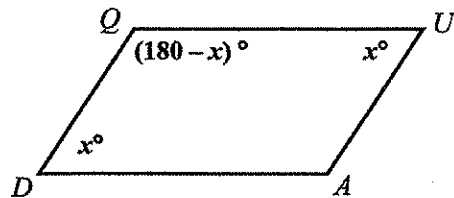
5) Will this always form a parallelogram?

Yes No (provide a counterexample)



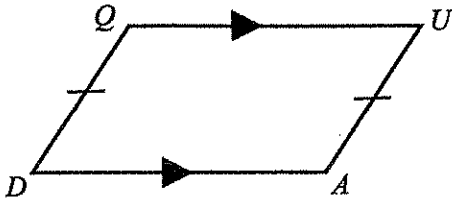
6) Will this always form a parallelogram?

Yes No (provide a counterexample)



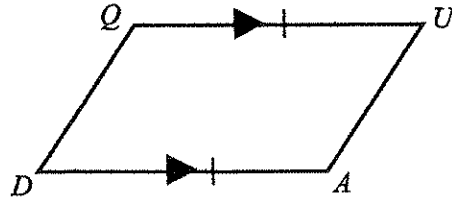
7) Will this always form a parallelogram?

Yes No (provide a counterexample)



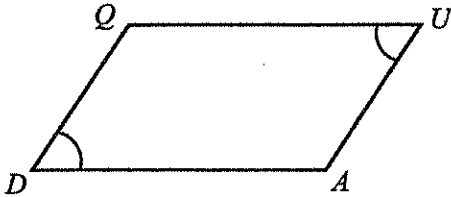
8) Will this always form a parallelogram?

Yes No (provide a counterexample)



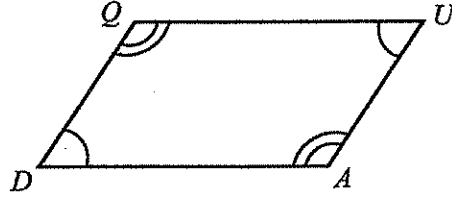
9) Will this always form a parallelogram?

Yes No (provide a counterexample)



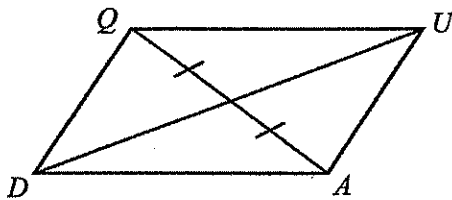
10) Will this always form a parallelogram?

Yes No (provide a counterexample)



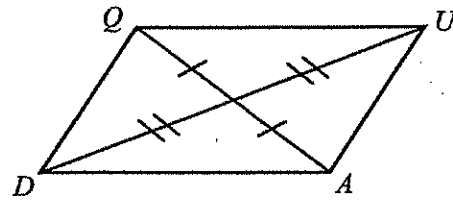
11) Will this always form a parallelogram?

Yes No (provide a counterexample)



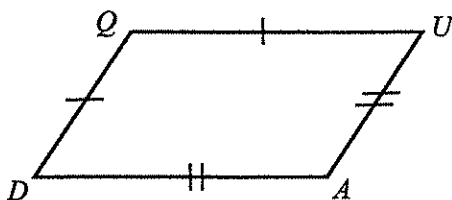
12) Will this always form a parallelogram?

Yes No (provide a counterexample)



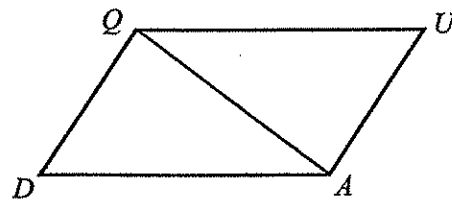
13) Will this always form a parallelogram?

Yes No (provide a counterexample)



14) Given: $QUAD$ is a parallelogram

Prove: $\triangle QDA \cong \triangle AUQ$



Tests for Parallelograms

We can test if a quadrilateral is a parallelogram if it possesses certain properties.

Complete the following:

A quadrilateral is a parallelogram if...

- 1) Both pairs of opposite sides are _____.
- 2) Both pairs of opposite sides are _____.
- 3) Both pairs of opposite angles are _____.
- 4) One pair of opposite sides is **both** _____ and _____.
- 5) Consecutive angles are _____.
- 6) The diagonals _____ each other.
- 7) A diagonal of a parallelogram will always divide the parallelogram into two _____.

These tests describe properties of **ALL** parallelograms. In certain parallelograms, we find even more specific properties... these parallelograms are called **Special Parallelograms**.

SPECIAL PARALLELOGRAMS... A Rectangle, Rhombus, and Square have all the properties described above, but other properties make them special.

What is the name of the parallelogram where...

- 1) All angles are right angles: _____
- 2) All sides are congruent: _____
- 3) Diagonals are congruent: _____
- 4) Diagonals are perpendicular: _____
- 5) Diagonals bisect both pairs of opposite angles: _____

Geometry

NAME: _____

WORKSHEET: *Special Parallelograms*

PERIOD: _____ DATE: _____

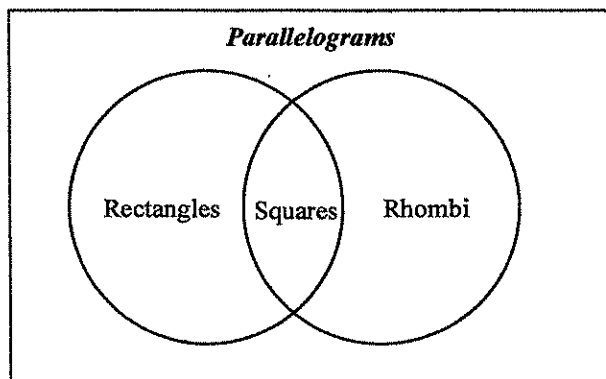
Special Parallelograms

A *Rhombus* is a parallelogram with...

A *Rectangle* is a parallelogram with...

A *Square* is a parallelogram with...

Use the Venn Diagram below to answer the questions that follow.



TRUE or FALSE.

- 1) ____ All rectangles are squares.
- 2) ____ A rectangle can be a square.
- 3) ____ All squares are rectangles.
- 4) ____ A rhombus can be a square.
- 5) ____ All rhombi are squares.
- 6) ____ Every square is also a rhombus.
- 7) ____ Some rectangles are rhombi.
- 8) ____ All rectangles are rhombi.

Complete the following.

- 9) A rhombus can be a rectangle if it is _____.
- 10) A rectangle can be a rhombus if it is _____.

PRACTICE

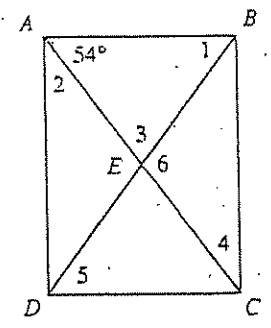
Properties of Rectangles and Squares

Complete the table. Place a check mark under the name of each figure for which the property is always true.

	Parallelogram	Rhombus	Rectangle	Square
1. The diagonals are perpendicular.				
2. The figure has four right angles.				
3. The opposite sides are congruent.				
4. The diagonals are congruent.				
5. The figure has four congruent sides.				
6. The diagonals bisect each other.				
7. The consecutive angles are supplementary.				
8. Each diagonal bisects a pair of opposite angles.				
9. The figure has exactly four lines of symmetry.				
10. The figure is a rectangle.				

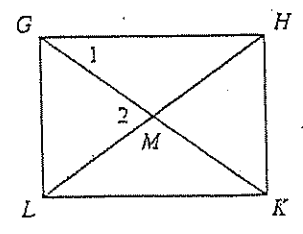
$ABCD$ is a rectangle, with $AC = 18$. Find each length or angle measure.

- | | | |
|-------------------------|-----------------------|-----------------------|
| 11. $m\angle BCD$ _____ | 12. $m\angle 1$ _____ | 13. $m\angle 2$ _____ |
| 14. $m\angle 3$ _____ | 15. $m\angle 4$ _____ | 16. $m\angle 5$ _____ |
| 17. $m\angle 6$ _____ | 18. AE _____ | 19. DB _____ |



$GHKL$ is a rectangle that is not a square. Answer true or false.

20. $GHKL$ and its diagonals form four congruent triangles. _____
21. $GHKL$ and its diagonals form four isosceles triangles. _____
22. $\angle 1 \cong \angle 2$ _____
23. $\triangle GHL \cong \triangle KHL$ _____
24. \overline{GK} is a line of symmetry. _____
25. $\triangle GML \cong \triangle HMK$ _____
26. $\overline{GK} \cong \overline{HL}$ _____



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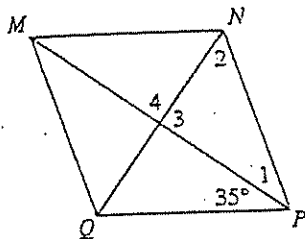
PRACTICE

Properties of Rhombuses

True or false?

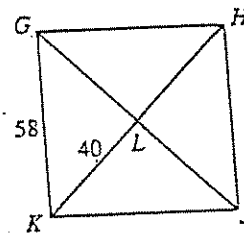
1. Every rhombus is a parallelogram. _____
2. The diagonals of a rhombus bisect each other. _____
3. The diagonals of a rhombus are congruent. _____
4. The diagonals of a rhombus are perpendicular to each other. _____
5. The consecutive angles of a rhombus are congruent. _____
6. The consecutive sides of a rhombus are congruent. _____
7. A rhombus and one of its diagonals form two isosceles triangles. _____

8. $MNPQ$ is a rhombus. Find the measure of each angle.



- $m\angle 1$ _____ $m\angle NMQ$ _____
 $m\angle MNP$ _____ $m\angle 2$ _____
 $m\angle 3$ _____ $m\angle 4$ _____

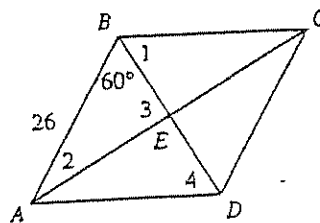
9. $GHJK$ is a rhombus, with $GJ = 42$. Find the length of each segment.



- GH _____ HJ _____
 LJ _____ LH _____
 KH _____

10. $ABCD$ is a rhombus. Find each angle measure or segment length.

- $m\angle 1$ _____ $m\angle DAB$ _____
 $m\angle 2$ _____ $m\angle 3$ _____
 $m\angle 4$ _____ AD _____
 BD _____ ED _____



11. $EFGH$ is a rhombus, with $m\angle EFG = (3x - 15)^\circ$ and

$m\angle EHF = (2x - 30)^\circ$. Find x and $m\angle EFG$. _____

Name _____
Systems Practice

Honors - Rectangles &

Using Rectangle ABCD whose diagonals intersect at E, answer the following.
Each question is independent (i.e. the information does not carry through)

1. $m\angle BCD = 18x - 3y$
 $AB = x - 2$
 $CD = 2y + 14$

Find x & y

2. $m\angle ABD = 3x - 1$
 $m\angle EDC = 2y + 6$
 $m\angle ADB = 4x + y$
 $m\angle DBC = x + 8$

Find x & y

3. $AC = 18$
 $BE = x + y$
 $BD = 3x - 2y$

Find x & y

4. $m\angle BCE = 23^\circ$
 $m\angle ADE =$
 $m\angle DEC =$
 $m\angle CBE =$

18

Rhombus & Factoring Practice

- 1) Given Rhombus ABCD whose diagonals intersect at E.

$$AB = 7x^2 + 28$$

$$BC = x^2 + 31x$$

$$m\angle BCA = 2w^2 - 18w$$

$$m\angle DBA = 3w + 63$$

$$BE = y^2 - 3y$$

$$DB = 17y - 15$$

Find w, x, & y

- 2) Solve the following systems:

$$3x^2 - 4x - 20$$

$$6x^2 - 11x - 12$$

$$8x^2 - 26x + 15$$

$$2x^2 + x - 36$$

- 3) Solve the following questions given Rhombus USCG whose diagonals intersect at A.

- If $m\angle USA = 44^\circ$ find $m\angle CGA$
- If $m\angle GUS = 102^\circ$ find $m\angle ACG$
- If $UC = 18$ find SG
- If $UC = 10$ find AC
- If $m\angle SGU = 12^\circ$ find $m\angle SCG$
- If $m\angle USC = 81^\circ$ find $m\angle UAS$

2-5 Parallelograms

Terms to know:

parallelogram
rhombus

rectangle
square

Things to know:

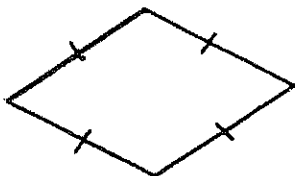
The 3 properties of parallelograms

Give the most specific name for each quadrilateral. (*parallelogram, rectangle, rhombus, or square*)

1)



2)



3)



4) equiangular parallelogram

5) regular quadrilateral

Tell if the statement is TRUE or FALSE.

6) Every square is a rectangle. _____

7) A rhombus has 4 congruent sides. _____

8) Every rectangle is a square. _____

9) All angles of a rectangle are congruent. _____

Find the length or angle measure.

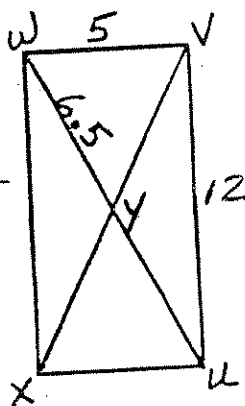
10) rectangle UVWX

a) $UW =$ _____

b) $m\angle VWX =$ _____

c) $XW =$ _____

d) $YU =$ _____



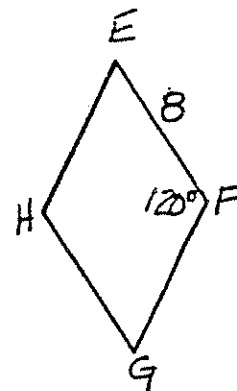
11) rhombus EFGH

a) $HG =$ _____

b) $GF =$ _____

c) $m\angle G =$ _____

d) $m\angle H =$ _____

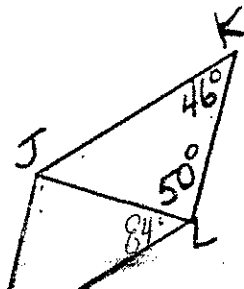


12) parallelogram JKLM

a) $m\angle JLM =$ _____

b) $m\angle KLM =$ _____

c) $m\angle JML =$ _____

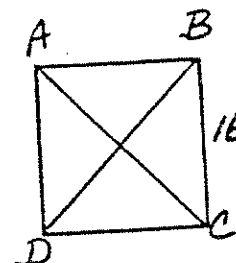


13) square ABCD

a) $m\angle ABC =$ _____

b) $AD =$ _____

c) $AB =$ _____



Properties of Rectangles, Rhombuses, and Squares

Rectangles

all properties of parallelograms
plus

- diagonals are congruent
- all angles measure 90°

Rhombuses

all properties of parallelograms
plus

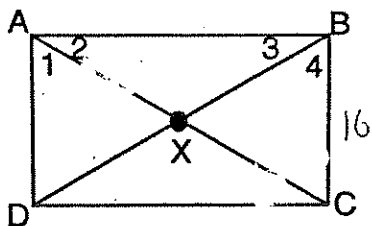
- all sides are congruent
- diagonals are perpendicular
- diagonals bisect opposite angles

Squares

- all properties of parallelograms
- all properties of rectangles
- all properties of rhombuses

Use the properties to find measures of segments and angles in the diagrams.

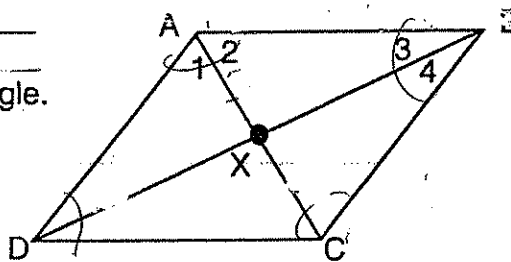
1. ABCD is a rectangle. If $AB = 24$, $BC = 10$, and $\angle 1 = 50^\circ$, find the following:



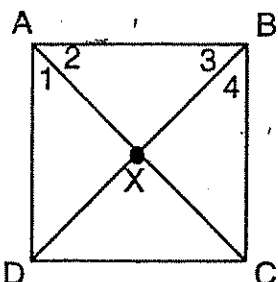
- | | | |
|-----------------|-----------------|-------------------------|
| a. $CD =$ _____ | d. $BD =$ _____ | g. $\angle DAB =$ _____ |
| b. $AD =$ _____ | e. $AX =$ _____ | h. $\angle 3 =$ _____ |
| c. $AC =$ _____ | f. $BX =$ _____ | i. $\angle AXB =$ _____ |

2. ABCD is a rhombus. If $AB = 6$, $XC = 3$, and $\angle DAB = 120^\circ$, find the following:

- | | | |
|--|-------------------------|-----------------------|
| a. $BC =$ _____ | d. $\angle AXB =$ _____ | g. $\angle 3 =$ _____ |
| b. $\angle ADC =$ _____ | e. $\angle 1 =$ _____ | h. $\angle 4 =$ _____ |
| c. $\angle DCB =$ _____ | f. $\angle 2 =$ _____ | i. $AX =$ _____ |
| j. $\triangle ABC$ is an _____ triangle. | | |

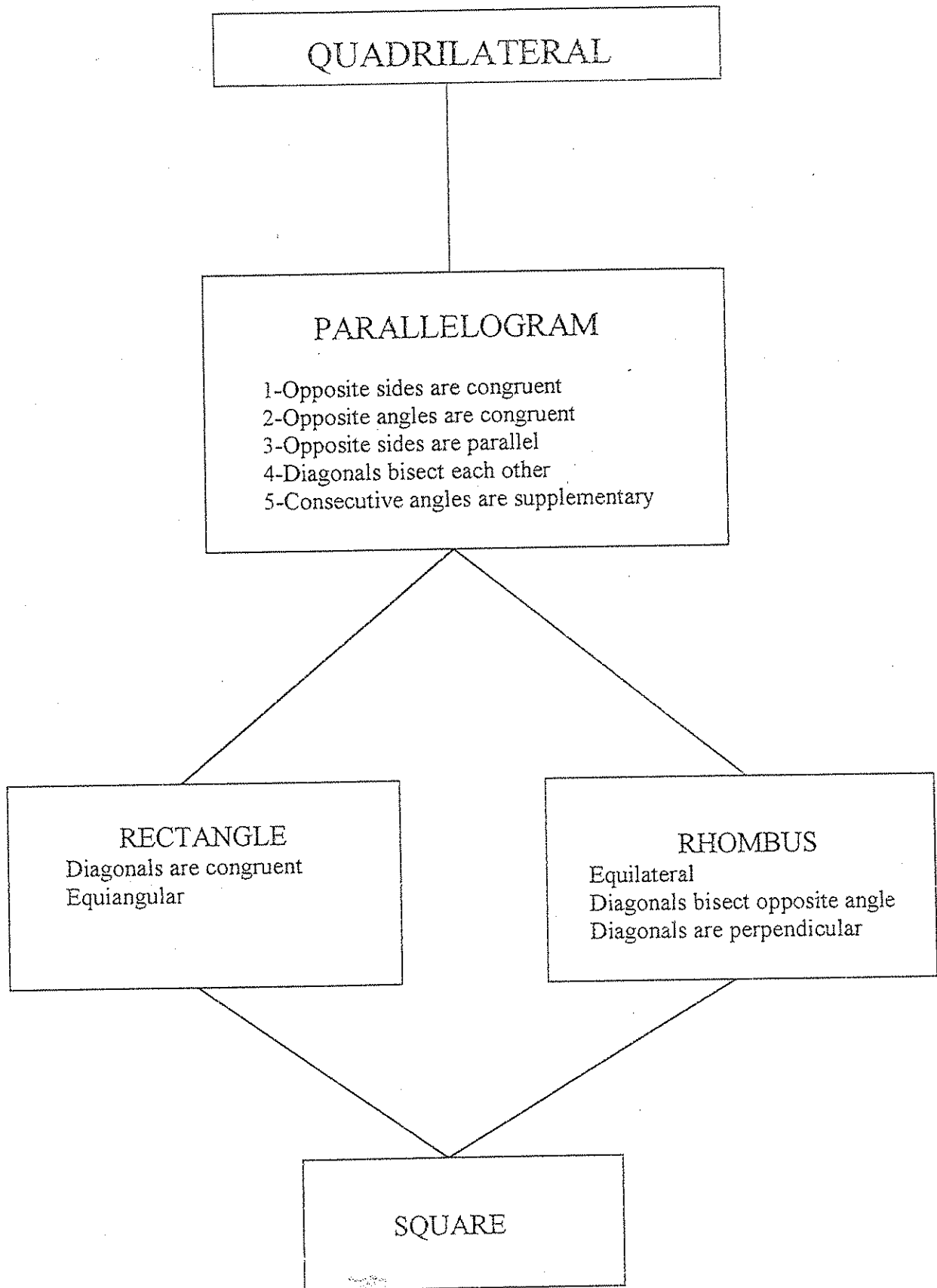


3. ABCD is a square. If $AB = 16$ and $AC = 16\sqrt{2}$, find the following:



- | | |
|-----------------------|-------------------------|
| a. $BC =$ _____ | e. $\angle 2 =$ _____ |
| b. $BD =$ _____ | f. $\angle AXB =$ _____ |
| c. $AD =$ _____ | g. $\angle BXC =$ _____ |
| d. $\angle 1 =$ _____ | h. $\angle 4 =$ _____ |

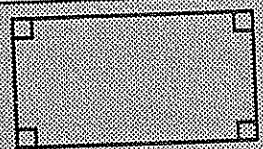
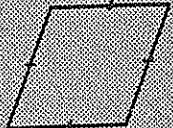
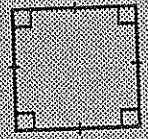
18



DO NOW

Quadrilaterals

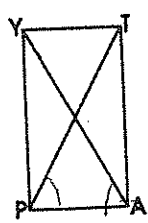
Rectangles, Rhombuses and Squares

		
<p>Rectangle ▭ with 4 right \angles Diagonals are \cong</p>	<p>Rhombus ▭ with 4 \cong sides Diagonals are \perp</p>	<p>Square ▭ with 4 right \angles & 4 \cong sides Diagonals are \cong & \perp</p>

True or False.

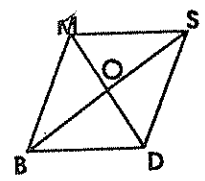
1. A rhombus is a parallelogram with four congruent sides.
2. A rectangle is a parallelogram with four right angles.
3. A square is a rectangle and a rhombus.
4. A rhombus is always a square.
5. Every parallelogram is a regular quadrilateral.
6. In a rectangle, the diagonals are perpendicular.

Rectangle

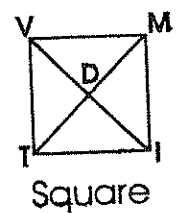


7. Which angles are congruent to $\angle PAT$?
8. Which segment is congruent to \overline{YT} ?
9. Which segment is congruent to \overline{PT} ?

10. Which segments are congruent to \overline{SD} ?
11. Which segment is congruent to \overline{MO} ?
12. What is the measure of $\angle BOD$?



Rhombus



Square

13. Which segments are congruent to \overline{TV} ?
14. Which angles are congruent to $\angle TIM$?
15. Which segment is congruent to \overline{IM} ?

Study Guide

Rectangles, Rhombi, and Squares

A **rectangle** is a quadrilateral with four right angles. A **rhombus** is a quadrilateral with four congruent sides. A **square** is a quadrilateral with four right angles and four congruent sides. A square is both a rectangle and a rhombus. Rectangles, rhombi, and squares are all examples of parallelograms.

Rectangles	Rhombi
<ul style="list-style-type: none"> • Opposite sides are congruent. • Opposite angles are congruent. • Consecutive angles are supplementary. • Diagonals bisect each other. • All four angles are right angles. • Diagonals are congruent. 	<ul style="list-style-type: none"> • Diagonals are perpendicular. • Each diagonal bisects a pair of opposite angles.

Determine whether each statement is always, sometimes, or never true.

1. The diagonals of a rectangle are perpendicular.
2. Consecutive sides of a rhombus are congruent.
3. A rectangle has at least one right angle.
4. The diagonals of a parallelogram are congruent.
5. A diagonal of a square bisects opposite angles.

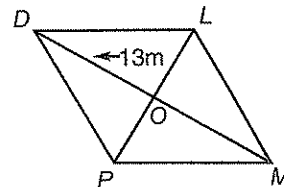
Use rhombus DLMP to determine whether each statement is true or false.

6. $OM = 13$

7. $PL = 26$

8. $\overline{MD} \cong \overline{PL}$

9. $m\angle DLO = m\angle LDO$



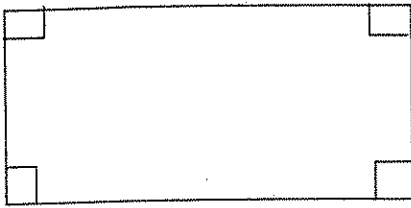
10. $\angle LDP \cong \angle LMP$

11. $m\angle DPM = m\angle PML$

Name _____

Basic Geometry

Rectangles



A Rectangle is a parallelogram with 4 right angles.

A rectangle is an _____ parallelogram.

What are the five properties of a parallelogram?

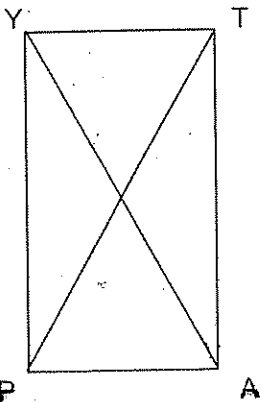
- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____

Why is it special?

It has all of the properties of a parallelogram **PLUS** ...

Its diagonals are _____.

1) Rectangle YPAT

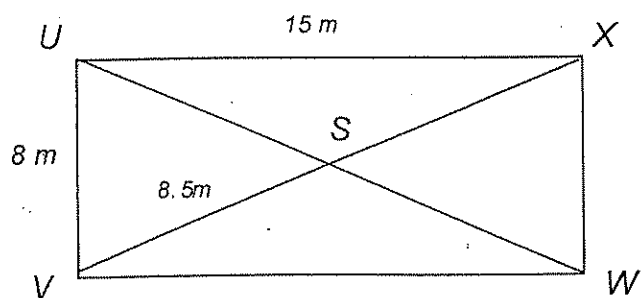


Which angles are congruent to $\angle PAT$? _____

Which segment is congruent to \overline{YT} ? _____

Which segment is congruent to \overline{PT} ? _____

2) Rectangle UVWX



Find:

$UW = \underline{\quad\quad}$

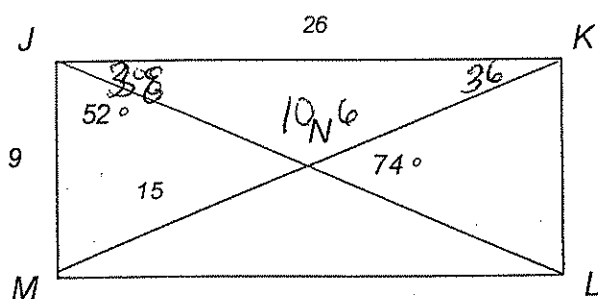
$XV = \underline{\quad\quad}$

$VW = \underline{\quad\quad}$

$XW = \underline{\quad\quad}$

$m\angle XWV = \underline{\quad\quad}$

3) Rectangle JKLM



Find:

$NK = \underline{\quad\quad}$

$ML = \underline{\quad\quad}$

$JL = \underline{\quad\quad}$

$m\angle JML = \underline{\quad\quad}$

$m\angle JNK = \underline{\quad\quad}$

$m\angle KJN = \underline{\quad\quad}$

$m\angle JKN = \underline{\quad\quad}$

True or False

A rectangle is a parallelogram that always has four right angles.

A rectangle is always a parallelogram.

A rectangle is a parallelogram that always has four congruent sides.

Every parallelogram is a rectangle.

In a rectangle the diagonals are congruent.

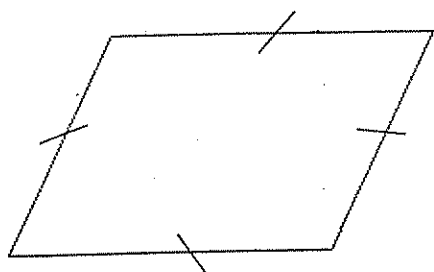
In a rectangle the diagonals bisect each other.

In a rectangle opposite sides are not congruent.

Name _____

Basic Geometry

Rhombuses



A rhombus is a parallelogram with 4 congruent sides.

A rhombus is an _____ parallelogram.

What are the five properties of a parallelogram?

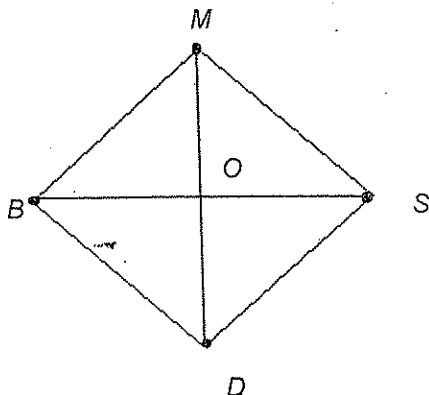
- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____

Why is it special?

It has all of the properties of a parallelogram **PLUS** ...

- Its diagonals are _____
- Each diagonal _____ a pair of opposite angles.

1) Rhombus MSDB

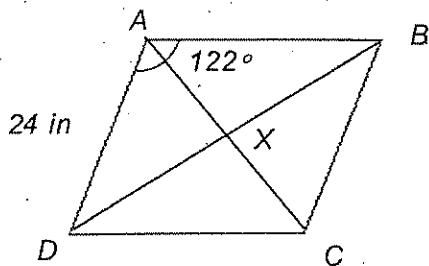


Which segments are congruent to \overline{SD}

Which segment is congruent to \overline{MO} ?

What is $m\angle BOD$?

2) Rhombus ABCD



Find:

$AB = \underline{\hspace{2cm}}$

$m\angle ADC = \underline{\hspace{2cm}}$

$BC = \underline{\hspace{2cm}}$

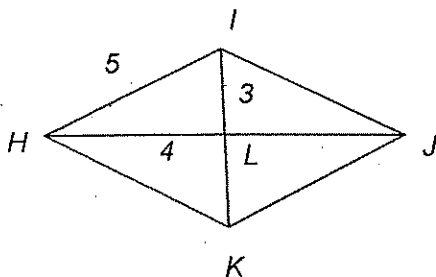
$m\angle AXB = \underline{\hspace{2cm}}$

$DC = \underline{\hspace{2cm}}$

$m\angle ABC = \underline{\hspace{2cm}}$

$m\angle ACD = \underline{\hspace{2cm}}$

3) Rhombus HIJK



Find:

$IJ = \underline{\hspace{2cm}}$

$KJ = \underline{\hspace{2cm}}$

$KH = \underline{\hspace{2cm}}$

$LJ = \underline{\hspace{2cm}}$

$HJ = \underline{\hspace{2cm}}$

$IK = \underline{\hspace{2cm}}$

$m\angle ILH = \underline{\hspace{2cm}}$

$m\angle JLK = \underline{\hspace{2cm}}$

$m\angle KLH = \underline{\hspace{2cm}}$

$m\angle HLJ = \underline{\hspace{2cm}}$

True or False

A rhombus is a parallelogram that always has four congruent sides.

A rhombus is always a parallelogram.

A rhombus a parallelogram that always has four congruent angles.

Every parallelogram is a rhombus.

In a rhombus the diagonals are congruent.

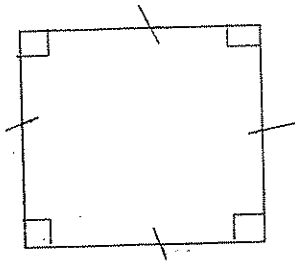
In a rhombus the diagonals bisect each other.

In a rhombus opposite angles are not congruent.

Name _____

Basic Geometry

Squares



A square is a parallelogram with 4 congruent sides and 4 congruent angles.

A square is an _____ and an _____ parallelogram.

A square is a _____ quadrilateral.

What are the five properties of a parallelogram?

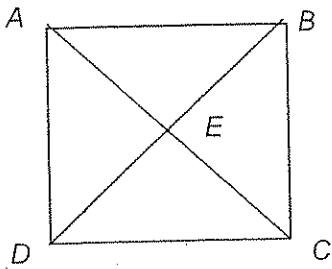
- 1) Opp. angles are \cong
- 2) Opp. sides are \cong
- 3) Opp. sides are \parallel
- 4) Diagonals bisect each other
- 5) consecutive angles are supp

Why is it special?

It has all of the properties of a parallelogram **PLUS** ...

- Its diagonals are _____.
- Its diagonals are _____.
- Each diagonal _____ a pair of opposite angles.

1) Square ABCD



Which segments are congruent to \overline{AB}

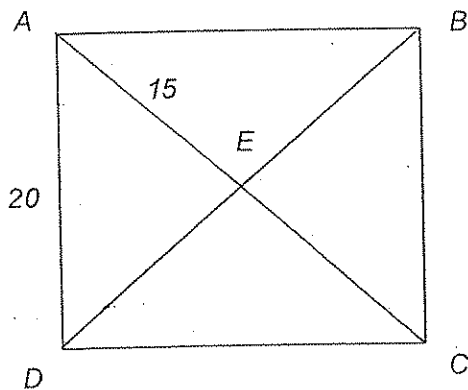
Which segment is congruent to \overline{BD} ?

What segments are congruent to \overline{AE} ? _____

What is $m\angle BEC$?

What is $m\angle BCD$? _____

2) Square ABCD



Find:

$AB =$ _____ $m\angle EBC =$ _____

$BC =$ _____ $m\angle EAD =$ _____

$DC =$ _____

$AC =$ _____

$DE =$ _____

$DB =$ _____

$m\angle ABC =$ _____

$m\angle BCD =$ _____

$m\angle AEB =$ _____

$m\angle DEC =$ _____

True or False

Every square is a rectangle and a rhombus. _____

Every rectangle is a square. _____

Every parallelogram is a square. _____

A square has 4 congruent sides. _____

A square is always a parallelogram. _____

A square a parallelogram that always has four congruent angles. _____

In a square the diagonals are congruent. _____

In a square the diagonals bisect each other. _____

In a square opposite angles are not congruent. _____

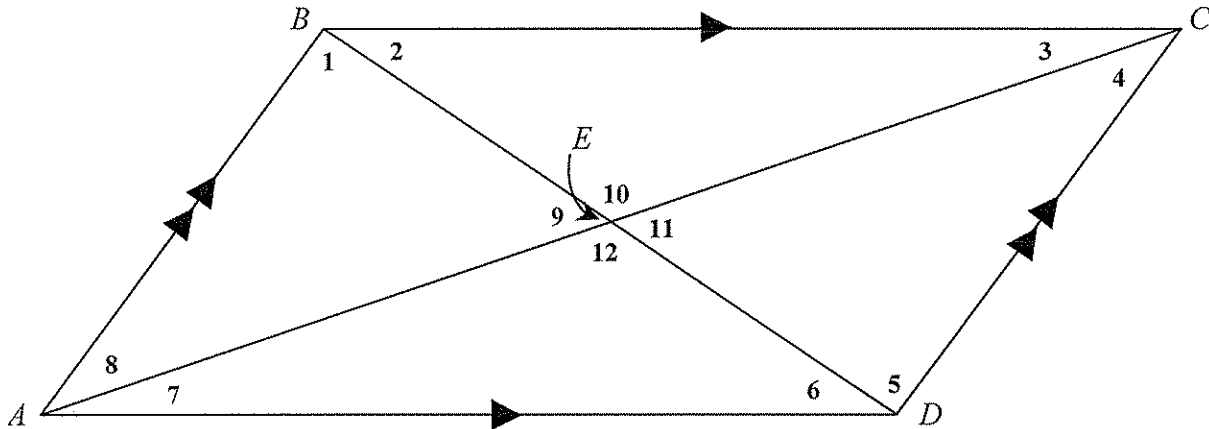
Geometry

NAME: _____

WORKSHEET: *Parallelogram Properties*

PERIOD: _____ DATE: _____

Parallelograms – Using Properties



Complete each of the following:

- 1) $m\angle 1 = m\angle$ _____
- 2) $m\angle 7 = m\angle$ _____
- 3) $m\angle ABC = m\angle$ _____
- 4) $m\angle BCD = m\angle$ _____
- 5) $m\angle 9 = m\angle$ _____
- 6) $mBE = m$ _____
- 7) $mAB = m$ _____
- 8) $\triangle ABD \cong \triangle$ _____
- 9) $\triangle CAB \cong \triangle$ _____
- 10) $2 \cdot mBE = m$ _____
- 11) $mAD = m$ _____
- 12) $mAE = m$ _____
- 13) $\angle BAD$ is supplementary with \angle _____ and also with \angle _____.

IF $ABCD$ is a *rectangle*, then:

- 14) $m\angle ABC =$ _____ $^\circ$
- 15) $mAC = m$ _____
- 16) $m\angle 2 + m\angle 5 =$ _____ $^\circ$
- 17) $m\angle 2 = m\angle$ _____ $= m\angle$ _____ $= m\angle$ _____
- 18) The diagonals form _____ isosceles Δ 's

IF $ABCD$ is a *rhombus*, then:

- 19) $m\angle 10 =$ _____ $^\circ$
- 20) $m\angle 2 + m\angle 3 =$ _____ $^\circ$
- 21) mAB _____ mBC
- 22) $m\angle 8 = m\angle$ _____ $= m\angle$ _____ $= m\angle$ _____

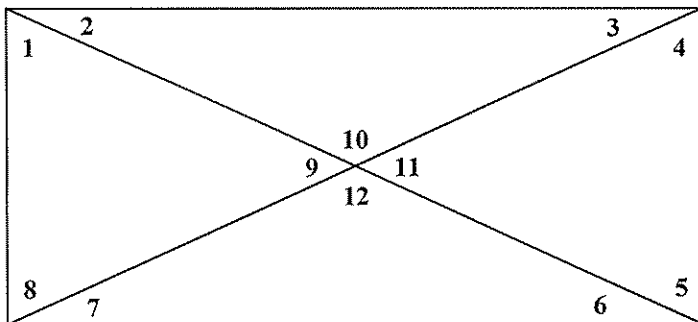
IF $ABCD$ is a *square*, then:

- 23) $mAC = m$ _____
- 24) $m\angle 9 = m\angle 10 = m\angle 11 = m\angle 12 =$ _____ $^\circ$
- 25) $m\angle 1 = m\angle 2 = m\angle 3 = m\angle 4 = m\angle 5 = m\angle 6 = m\angle 7 = m\angle 8 =$ _____ $^\circ$

Fill in all the numbered angles with the appropriate angle measures.

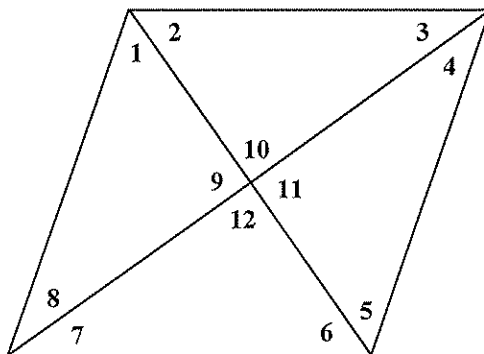
RECTANGLE...

$m\angle 1 = 70^\circ$



RHOMBUS...

$m\angle 1 = 40^\circ$



SQUARE...

