

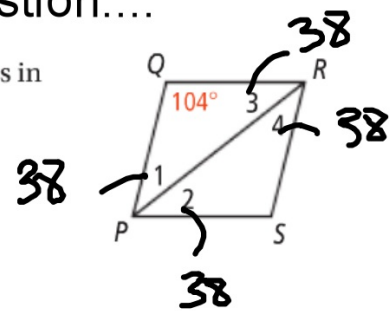
Do Now:

Please get out WB 6-3 and get a graphic organizer off my desk. Then answer this question....



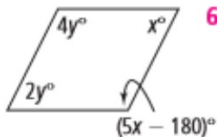
**Got It?**

2. What are the measures of the numbered angles in rhombus  $PQRS$ ?



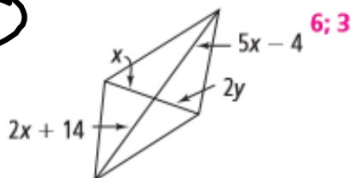
## Homework Check:

1.  $4y^\circ$   $x^\circ$  **60; 30**



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

3.



**6; 3**

9.



**Yes; diagonals bisect each other.**

10.



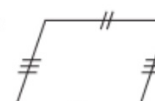
**no; not enough information**

11.



**Yes; two pairs of  $\cong$  alt. int.  $\Delta$  implies two pairs of parallel sides.**

12.



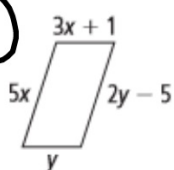
**Yes; two pairs of opposite sides are  $\cong$ .**

5.



**64; 10**

7.



**3; 10**

$$2x + 14 = 5x - 4$$

$$-3x = -18$$

$$x = 6$$

$$x = 2y$$

$$6 = 2y$$

$$y = 3$$

$$3x + 1 = 4$$

$$5x = 2y - 5$$

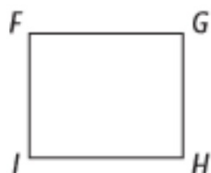
$$5x = 2(3x + 1) - 5$$

$$5x = 6x + 2 - 5$$

$$\begin{aligned} 5x &= 6x - 3 \\ -x &= -3 \\ x &= 3 \end{aligned}$$

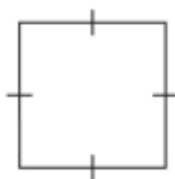
Can you prove that the quadrilateral is a parallelogram based on the given information? Explain.

14.  $\overline{FG} \parallel \overline{IH}, \overline{FI} \parallel \overline{GH}$



yes; opp. sides parallel

17.



yes; opposite sides  $\cong$

15.



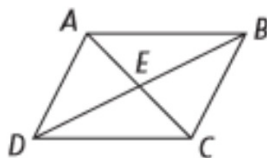
yes; opposite sides  $\cong$

16.



yes; opposite  $\angle$   $\cong$

18.  $\overline{AE} \cong \overline{EC}, \overline{BE} \cong \overline{ED}$



Yes; diagonals bisect each other.

19.



Yes; one pair of opposite sides is parallel and  $\cong$ .

## 6-4 Properties of Rhombuses, Rectangle, and Squares

**\*\*Take notes on your graphic organizer!\*\***



### Key Concept Special Parallelograms

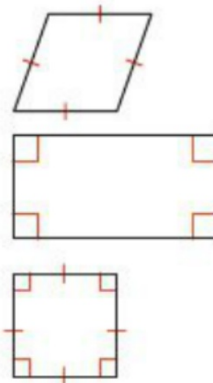
#### Definition

A **rhombus** is a parallelogram with four congruent sides.

A **rectangle** is a parallelogram with four right angles.

A **square** is a parallelogram with four congruent sides and four right angles.

#### Diagram



Take note

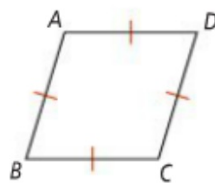
### Theorem 6-13

#### Theorem

If a parallelogram is a rhombus, then its diagonals are perpendicular.

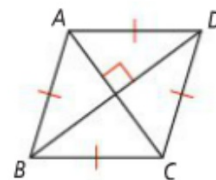
#### If ...

$ABCD$  is a rhombus



#### Then ...

$\overline{AC} \perp \overline{BD}$



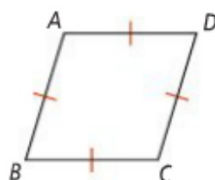
### Theorem 6-14

#### Theorem

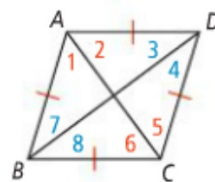
If a parallelogram is a rhombus, then each diagonal bisects a pair of opposite angles.

#### If ...

$ABCD$  is a rhombus

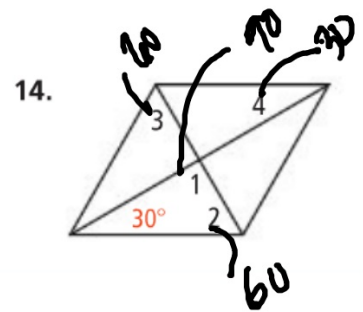
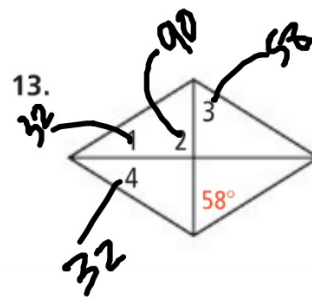
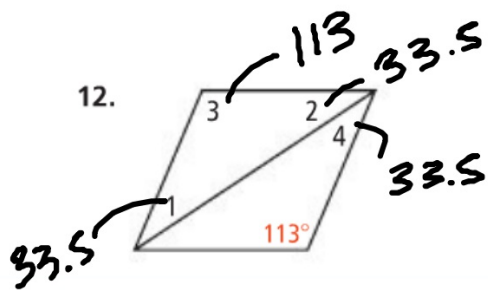


#### Then ...



$\angle 1 \cong \angle 2$   
 $\angle 3 \cong \angle 4$   
 $\angle 5 \cong \angle 6$   
 $\angle 7 \cong \angle 8$

You will prove Theorem 6-14 in Exercise 45.



take note

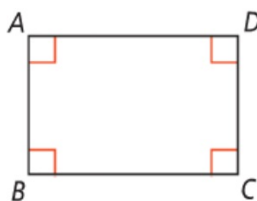
### Theorem 6-15

#### Theorem

If a parallelogram is a rectangle, then its diagonals are congruent.

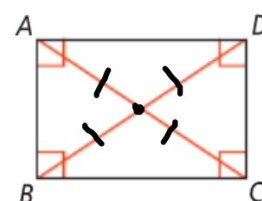
If ...

$ABCD$  is a rectangle



Then ...

$\overline{AC} \cong \overline{BD}$



You will prove Theorem 6-15 in Exercise 41.



### Problem 3 Finding Diagonal Length

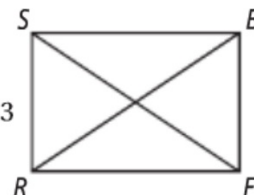
**Multiple Choice** In rectangle  $RSBF$ ,  $SF = 2x + 15$  and  $RB = 5x - 12$ . What is the length of a diagonal?

(A) 1

(B) 9

(C) 18

(D) 33



Think

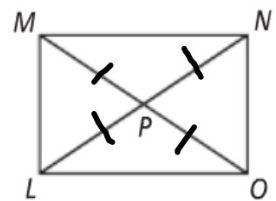
Write

$$\begin{aligned} 2x + 15 &= 5x - 12 \\ -3x &= -27 \\ x &= 9 \end{aligned}$$



**Got It?**

3. a. If  $LN = 4x - 17$  and  $MO = 2x + 13$ , what are the lengths of the diagonals of rectangle  $LMNO$ ?  
b. **Reasoning** What type of triangle is  $\triangle PMN$ ? Explain.



$$4x - 17 = 2x + 13$$

$$2x = 30$$

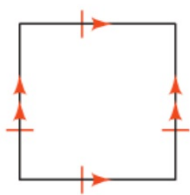
$$x = 15$$

$$2(15) + 13 = 43$$



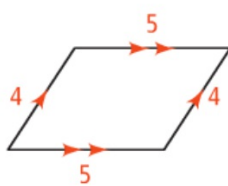
Determine the most precise name for each quadrilateral.

24.



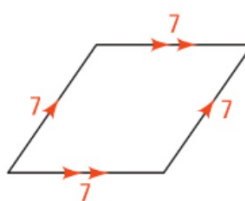
rhombus

25.



parallelogram

26.



rhombus

27.



rectangle

List the quadrilaterals that have the given property. Choose among *parallelogram, rhombus, rectangle, and square*.

28. All sides are  $\cong$ . *Square + rhombus*

30. Opposite sides are  $\parallel$ . *ALL*

32. All  $\angle$ s are right  $\angle$ s. *rectangle + square*

34. Diagonals bisect each other. *ALL*

36. Diagonals are  $\perp$ . *Square, rhombus*

List the quadrilaterals that have the given property. Choose among *parallelogram, rhombus, rectangle, and square.*

29. Opposite sides are  $\cong$ . All

31. Opposite  $\angle$ s are  $\cong$ . All

33. Consecutive  $\angle$ s are supplementary. All

35. Diagonals are  $\cong$ . rectangle & square

37. Each diagonal bisects opposite  $\angle$ s.

Square & rhombus

## 6-5 Conditions for Rhombuses, Rectangles, and Squares

take note

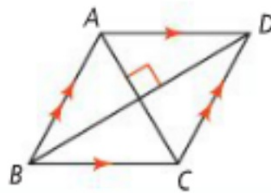
### Theorem 6-16

#### Theorem

If the diagonals of a parallelogram are perpendicular, then the parallelogram is a rhombus.

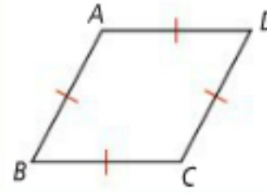
If ...

$ABCD$  is a  $\square$  and  $\overline{AC} \perp \overline{BD}$



Then ...

$ABCD$  is a rhombus





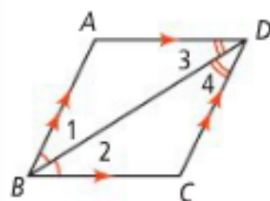
### Theorem 6-17

#### Theorem

If one diagonal of a parallelogram bisects a pair of opposite angles, then the parallelogram is a rhombus.

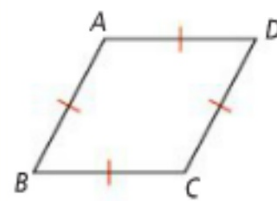
#### If ...

$ABCD$  is a  $\square$ ,  $\angle 1 \cong \angle 2$ , and  $\angle 3 \cong \angle 4$



#### Then ...

$ABCD$  is a rhombus



You will prove Theorem 6-17 in Exercise 23.

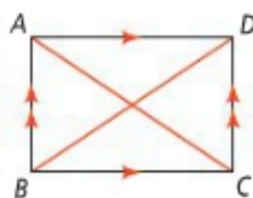
### Theorem 6-18

#### Theorem

If the diagonals of a parallelogram are congruent, then the parallelogram is a rectangle.

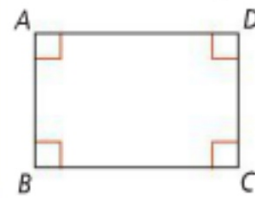
#### If ...

$ABCD$  is a  $\square$ , and  $\overline{AC} \cong \overline{BD}$



#### Then ...

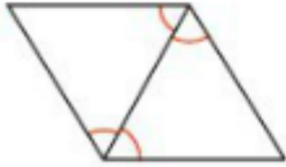
$ABCD$  is a rectangle



You will prove Theorem 6-18 in Exercise 24.

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

**A**



rhombus

**B**



Square

e

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

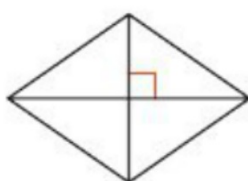
 See Problem 1

8.



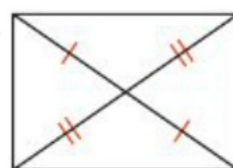
rhombus

9.



rhombus

10.



No  
parallelogram



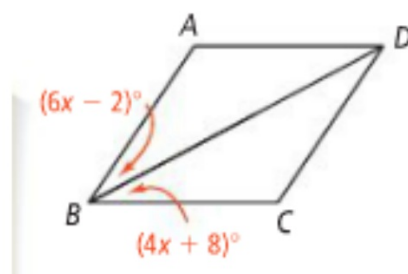
**Problem 2** Using Properties of Special Parallelograms

**Algebra** For what value of  $x$  is  $\square ABCD$  a rhombus?

$$6x - 2 = 4x + 8$$

$$2x = 10$$

$$\boxed{x = 5}$$



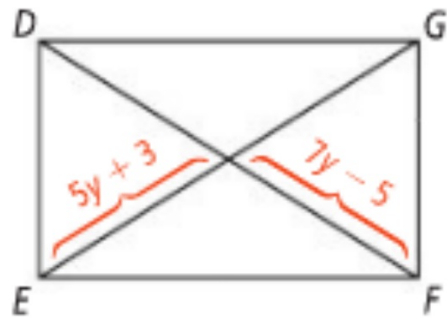




**Got It?**

2. For what value of  $y$  is  $\square DEFG$  a rectangle?

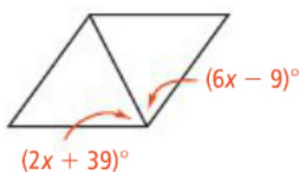
$$\begin{aligned} 5y + 3 &= 7y - 5 \\ -2y &= -8 \\ y &= 4 \end{aligned}$$



For what value of  $x$  is the figure the given special parallelogram?

See Problem 2.

11. rhombus

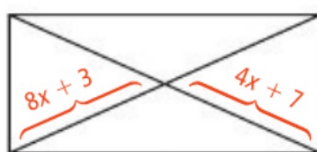


$$2x + 39 = 6x - 9$$

$$-4x = -48$$

$$x = 12$$

12. rectangle

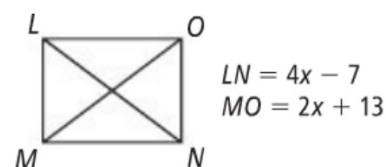


$$8x + 3 = 4x + 7$$

$$4x = 4$$

$$x = 1$$

13. rectangle



$$4x - 7 = 2x + 13$$

$$2x = 20$$

$$x = 10$$

Homework:

WB 6-4 # 1-17 odds, 20-23

WB 6-5 #1-10, 13-16

p159

p163