Name _____ Date _____

LESSON 8.2

Study Guide

For use with pages 514–521

GOAL **Find angle and side measures in parallelograms.**

Vocabulary

A **parallelogram** is a quadrilateral with both pairs of opposite sides parallel.

Theorem 8.3: If a quadrilateral is a parallelogram, then its opposite sides are congruent.

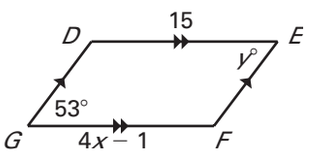
Theorem 8.4: If a quadrilateral is a parallelogram, then its opposite angles are congruent.

Theorem 8.5: If a quadrilateral is a parallelogram, then its consecutive angles are supplementary.

Theorem 8.6: If a quadrilateral is a parallelogram, then its diagonals bisect each other.

EXAMPLE 1 Use properties of parallelograms

Find the values of *x* and *y*.



Solution

DEFG is a parallelogram by the definition of a parallelogram. Use Theorem 8.3 to find the value of x.

$DE = FG$ Opposite sides of a $\square$ are $\cong$.

$15 = 4x - 1$ Substitute 15 for DE and $4x - 1$ for FG.

$4 = x$ Solve for x.

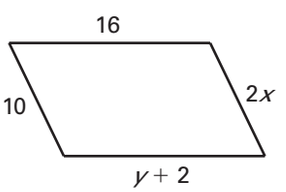
By Theorem 8.4, $\angle G \cong \angle E$, or $m\angle G = m\angle E$. So, $y° = 53°$.

In $\square DEFG$, $x = 4$ and $y = 53$.

Exercises for Example 1

Find the value of each variable in the parallelogram.

1.



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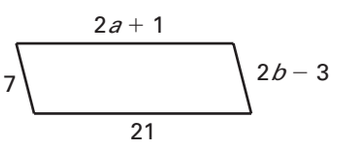

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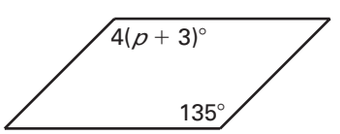

4.

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LESSON 8.2

Study Guide *continued*

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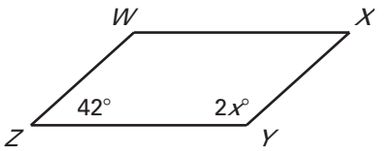
EXAMPLE 2 Use properties of parallelograms

Find the value of x in $\square WXYZ$.



Solution

Use Theorem 8.5 to find the value of x.

$m\angle WZY + m\angle XYZ = 180°$ Consecutive angles in a $\square$ are supplementary.

$42° + 2x° = 180°$ Substitute.

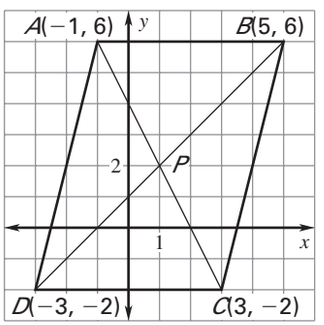
$x = 69$ Solve for x.

EXAMPLE 3 Find the intersection of diagonals

The vertices of $\square ABCD$ are $A(-1, 6)$, $B(5, 6)$, $C(3, -2)$, and $D(-3, -2)$. The diagonals of $\square ABCD$ intersect at point P. What are the coordinates of P?

Solution

STEP 1 Sketch $\square ABCD$ in the coordinate plane.



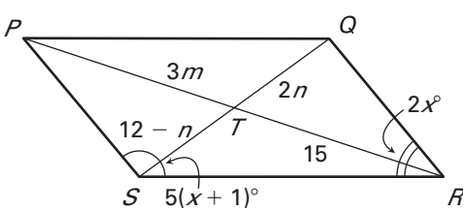
STEP 2 By Theorem 8.6, the diagonals of a parallelogram bisect each other. So, P is the midpoint of diagonals $\overline{AC}$ and $\overline{DB}$. Use the Midpoint Formula to find the midpoint P of $\overline{DB}$.

$$\text{Midpoint: } \left(\frac{5 + (-3)}{2}, \frac{6 + (-2)}{2}\right) = (1, 2)$$

The coordinates of P are (1, 2).

Exercises for Examples 2 and 3

Find the indicated measure in $\square PQRS$.



5. PR

6. ST

7. $m\angle SRQ$

8. $m\angle PQR$

9. The vertices of $\square ABCD$ are $A(-4, 2)$, $B(3, 2)$, $C(1, -1)$, and $D(-6, -1)$. The diagonals of $\square ABCD$ intersect at point P. What are the coordinates of P?

10. The vertices of $\square ABCD$ are $A(-5, 6)$, $B(1, 6)$, $C(4, 0)$, and $D(-2, 0)$. The diagonals of $\square ABCD$ intersect at point P. What are the coordinates of P?