LESSON 5.9

Exercise Set A

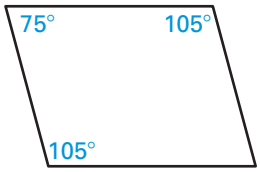
MM1G1a Determine the distance between two points.

MM1G1e Use the coordinate plane to investigate properties of and verify conjectures related to triangles and quadrilaterals.

MM1G3d Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.

What theorem can you use to show that the quadrilateral is a parallelogram?

1.



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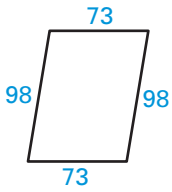

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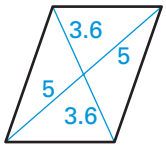

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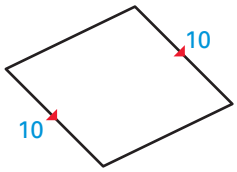
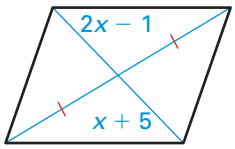


For what value of *x* is the quadrilateral a parallelogram?

5.



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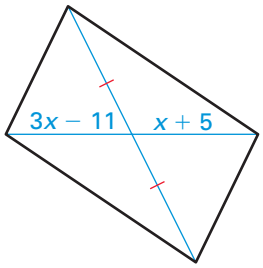

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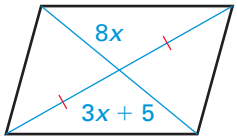

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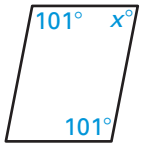

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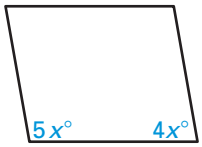

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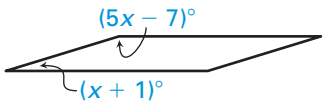
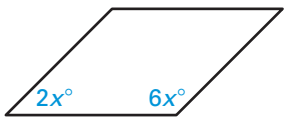


11.

12.



UNIT 5

Exercise Set A *(continued)*

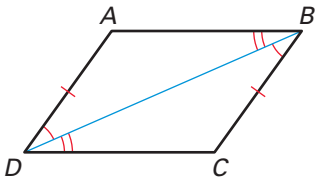
The vertices of quadrilateral *ABCD* are given. Draw *ABCD* in a coordinate plane and show that it is a parallelogram.

13. $A(-2, -3)$, $B(0, 5)$, $C(6, 5)$, $D(4, -3)$

14. $A(-3, -4)$, $B(-1, 2)$, $C(7, 0)$, $D(5, -6)$

***Describe* how to prove that *ABCD* is a parallelogram.**

15.



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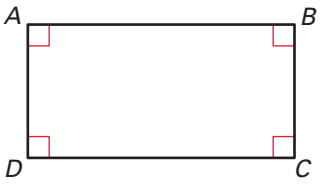
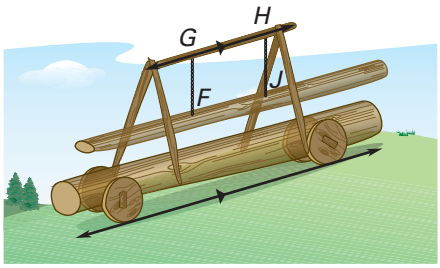
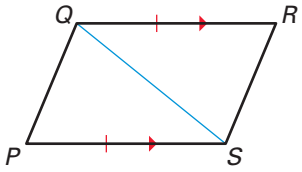


17. Three vertices of $\square ABCD$ are $A(-1, 4)$, $B(4, 4)$, and $C(11, -3)$. Find the coordinates of point D.

18. **History** The diagram shows a battering ram which was used in ancient times to break through walls. A log is suspended on ropes of equal length ($\overline{GF}$ and $\overline{HJ}$). The log swings, causing quadrilateral *FGHJ* to shift. In the diagram, $\overline{GH} \cong \overline{FJ}$ and $\overline{GH}$ is parallel to the ground. Identify *FGHJ*. *Explain*.

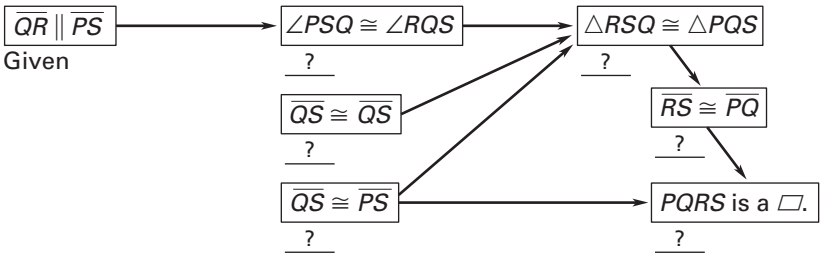


19. **Multiple Representations** Use the diagram of *PQRS* with the auxiliary line segment drawn. Copy and complete the flow proof of Theorem 5.24. Then write it as a two-column proof.



GIVEN: $\overline{QR} \parallel \overline{PS}$, $\overline{QR} \cong \overline{PS}$

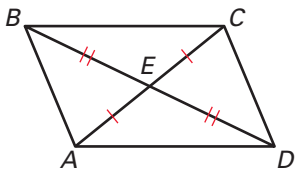
PROVE: *PQRS* is a parallelogram.



20. **Proof** Prove Theorem 5.25.

GIVEN: Diagonals $\overline{AC}$ and $\overline{CD}$ bisect each other.

PROVE: *ABCD* is a parallelogram.



LESSON 5.9

Exercise Set B

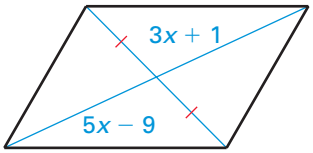
MM1G1a Determine the distance between two points.

MM1G1e Use the coordinate plane to investigate properties of and verify conjectures related to triangles and quadrilaterals.

MM1G3d Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.

For what value of *x* is the quadrilateral a parallelogram?

1.



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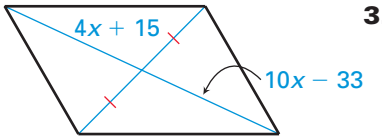

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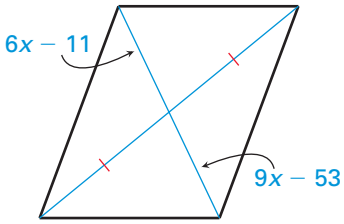

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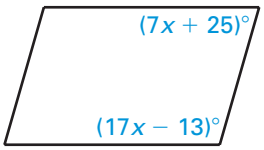

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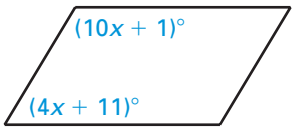

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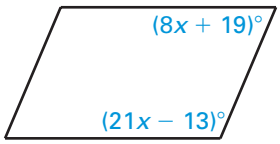


Decide whether you are given enough information to determine that the quadrilateral is a parallelogram.

7. Opposite sides are parallel.

8. Opposite sides are congruent.

9. Two pairs of consecutive sides are congruent.

10. Two pairs of consecutive angles are congruent.

11. Diagonals are congruent.

12. Diagonals bisect each other.

13. All four sides are congruent.

14. Consecutive angles are supplementary.

Prove that the points represent the vertices of a parallelogram. Use the method indicated.

15. $A(-4, 7)$, $B(3, 0)$, $C(2, -5)$, $D(-5, 2)$; Both pairs of opposite sides are parallel.

16. $A(-2, 8)$, $B(2, 7)$, $C(5, 1)$, $D(1, 2)$; Both pairs of opposite sides are congruent.

Find all the possible coordinates for the fourth vertex of a parallelogram with the given vertices. Then draw the parallelogram on a graph.

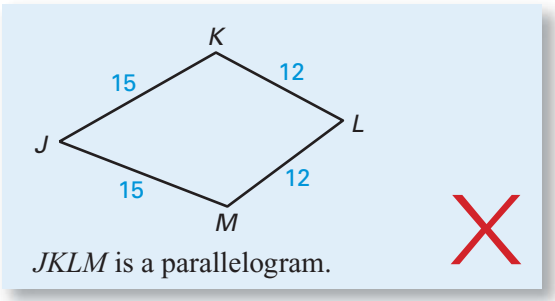
17. $(4, -1)$, $(-4, 1)$, $(0, 8)$

18. $(3, -4)$, $(-2, -1)$, $(1, 2)$

UNIT 5

Exercise Set B *(continued)*

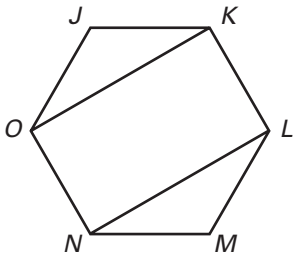
19. **Error Analysis** A student claims that because two pairs of sides are congruent, quadrilateral *JKLM* shown at the right is a parallelogram. *Describe* the student's error.



20. Copy and complete the proof.

GIVEN: Regular hexagon *JKLMNO*

PROVE: *OKLN* is a parallelogram.

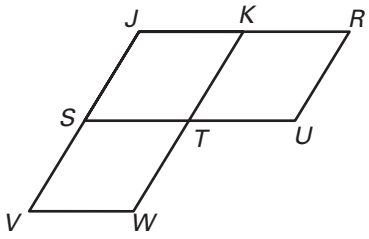


Statements	Reasons
1. ?	**1.** Given
2. $\overline{JO} \cong \overline{NM}$, $\overline{JK} \cong \overline{ML}$, $\angle J \cong \angle M$	**2.** ?
3. ?	**3.** SAS Congruence Postulate
4. $\overline{OK} \cong \overline{NL}$	**4.** ?
5. ?	**5.** Definition of regular polygon
6. *OKLN* is a $\square$.	**6.** ?

21. **Proof** Write a two-column proof.

GIVEN: *VWKJ* and *SJRU* are parallelograms.

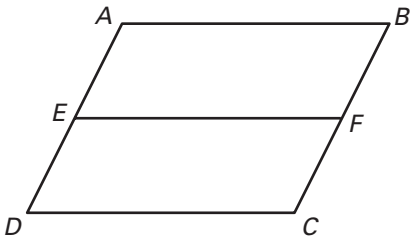
PROVE: $\angle W \cong \angle U$



22. **Proof** Write a paragraph proof.

GIVEN: *ABCD* is a $\square$.
E is the midpoint of $\overline{AD}$.
F is the midpoint of $\overline{BC}$.

PROVE: Quadrilateral *ABFE* is a parallelogram.



UNIT 5