

6-5

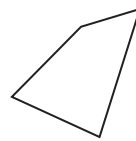
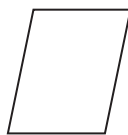
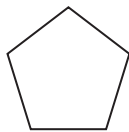
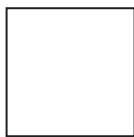
Conditions for Rhombuses, Rectangles, and Squares



Vocabulary

Review

1. A *quadrilateral* is a polygon with sides.
2. Cross out the figure that is NOT a *quadrilateral*.

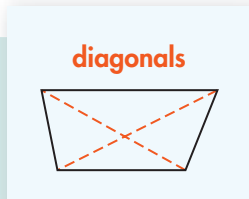


Vocabulary Builder

diagonal (noun) dy AG uh nul

Definition: A **diagonal** is a segment with endpoints at two nonadjacent vertices of a polygon.

Word Origin: The word **diagonal** comes from the Greek prefix *dia-*, which means “through,” and *gonia*, which means “angle” or “corner.”



Use Your Vocabulary

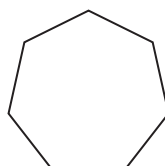
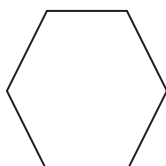
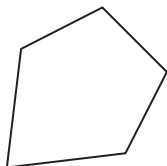
3. Circle the polygon that has no *diagonal*.

triangle quadrilateral pentagon hexagon

4. Circle the polygon that has two *diagonals*.

triangle quadrilateral pentagon hexagon

5. Draw the *diagonals* from one vertex in each figure.



6. Write the number of diagonals you drew in each of the figures above.

pentagon:

hexagon:

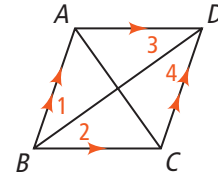
heptagon:

Theorems 6-16, 6-17, and 6-18

Theorem 6-16 If the diagonals of a parallelogram are perpendicular, then the parallelogram is a rhombus.

Theorem 6-17 If one diagonal of a parallelogram bisects a pair of opposite angles, then the parallelogram is a rhombus.

7. Insert a right angle symbol in the parallelogram at the right to illustrate Theorem 6-16. Insert congruent marks to illustrate Theorem 6-17.

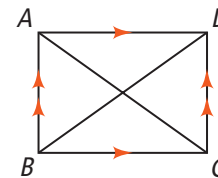


Use the diagram from Exercise 7 to complete Exercises 8 and 9.

8. If $ABCD$ is a parallelogram and $\overline{AC} \perp \square$, then $ABCD$ is a rhombus.
9. If $ABCD$ is a parallelogram, $\angle 1 \cong \square$, and $\angle 3 \cong \square$, then $ABCD$ is a rhombus.

Theorem 6-18 If the diagonals of a parallelogram are congruent, then the parallelogram is a rectangle.

10. Insert congruent marks and right angle symbols in the parallelogram to the right to illustrate Theorem 6-18.
11. Use the diagram from Exercise 10 to complete the statement.



If $ABCD$ is a parallelogram, and $\overline{BD} \cong \square$ then $ABCD$ is a rectangle.

12. Circle the parallelogram that has diagonals that are both perpendicular and congruent.

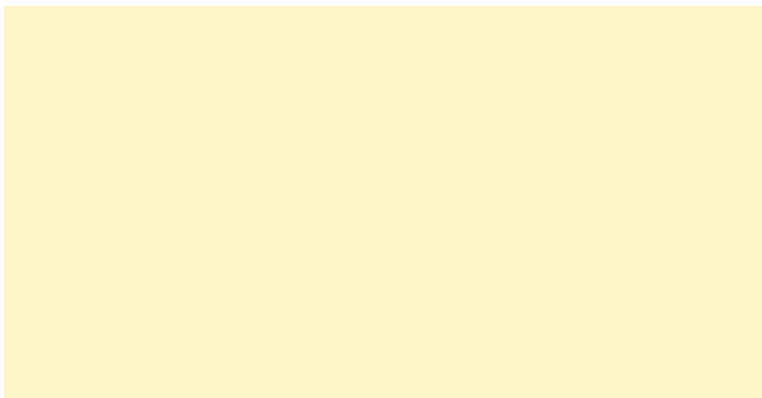
parallelogram rectangle rhombus square



Problem 1 Identifying Special Parallelograms

Got It? A parallelogram has angle measures of 20, 160, 20, and 160. Can you conclude that it is a rhombus, a rectangle, or a square? Explain.

13. Draw a parallelogram in the box below. Label the angles with their measures. Use a protractor to help you make accurate angle measurements.



Underline the correct word or words to complete each sentence.

14. You do / do not know the lengths of the sides of the parallelogram.
15. You do / do not know the lengths of the diagonals.
16. The angles of a rectangle are all acute / obtuse / right angles.
17. The angles of a square are all acute / obtuse / right angles.
18. Can you conclude that the parallelogram is a rhombus, a rectangle, or a square? Explain.

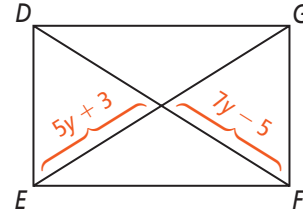
Problem 2 Using Properties of Special Parallelograms

Got It? For what value of y is $\square DEFG$ a rectangle?

19. For $\square DEFG$ to be a parallelogram, the diagonals must ? each other.

20. $EG = 2(\text{ })$
 $= \text{ }$

21. $DF = 2(\text{ })$
 $= \text{ }$



22. For $\square DEFG$ to be a rectangle, the diagonals must be ?.

23. Now write an equation and solve for y .

24. $\square DEFG$ is a rectangle for $y = \text{ }$.

Problem 3 Using Properties of Parallelograms

Got It? Suppose you are on the volunteer building team at the right. You are helping to lay out a square play area. How can you use properties of diagonals to locate the four corners?

25. You can cut two pieces of rope that will be the diagonals of the square play area. Cut them the same length because a parallelogram is a ? if the diagonals are congruent.



26. You join the two pieces of rope at their midpoints because a quadrilateral is a ? if the diagonals bisect each other.

27. You move so the diagonals are perpendicular because a parallelogram is a ? if the diagonals are perpendicular.

28. Explain why the polygon is a square when you pull the ropes taut.



Lesson Check • Do you UNDERSTAND?

Name all of the special parallelograms that have each property.

A. Diagonals are perpendicular. B. Diagonals are congruent. C. Diagonals are angle bisectors.

D. Diagonals bisect each other. E. Diagonals are perpendicular bisectors of each other.

29. Place a ✓ in the box if the parallelogram has the property. Place an ✗ if it does not.

Property	Rectangle	Rhombus	Square
A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Math Success

Check off the vocabulary words that you understand.

rhombus rectangle square diagonal

Rate how well you can use *properties of parallelograms*.

