



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

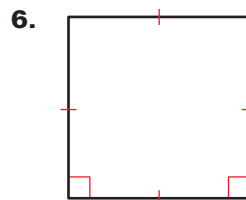
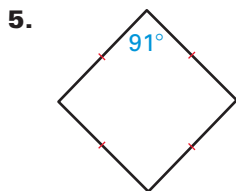
For any rhombus $ABCD$, decide whether the statement is *always* or *sometimes* true. Draw a diagram and explain your reasoning.

1. $\angle ABC \cong \angle CDA$
2. $\overline{CA} \cong \overline{DB}$

For any rectangle $FGHJ$, decide whether the statement is *always* or *sometimes* true. Draw a diagram and explain your reasoning.

3. $\angle F \cong \angle H$
4. $\overline{GH} \cong \overline{HJ}$

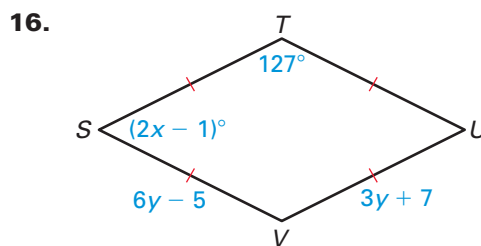
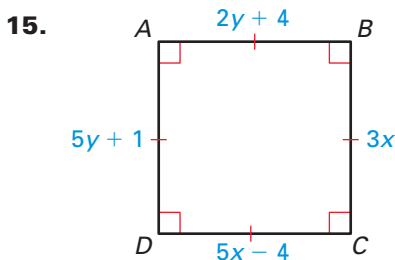
Classify the quadrilateral. *Explain your reasoning.*



Name each quadrilateral—*parallelogram, rectangle, rhombus, and square*—for which the statement is true.

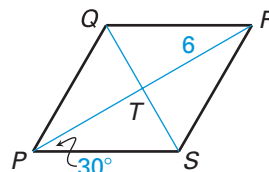
7. It is equilateral.
8. The diagonals are congruent.
9. It can contain obtuse angles.
10. It contains no acute angles.
11. It is equiangular.
12. The diagonals are perpendicular.
13. The diagonals bisect each other.
14. It is equiangular and equilateral.

Classify the special quadrilateral. *Explain your reasoning. Then find the values of x and y .*



The diagonals of rhombus $PQRS$ intersect at T . Given that $m\angle RPS = 30^\circ$ and $RT = 6$, find the indicated measure.

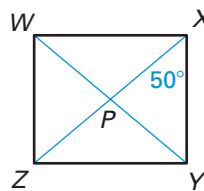
17. $m\angle QPR$
18. $m\angle QTP$
19. RP
20. QT



Exercise Set A *(continued)*

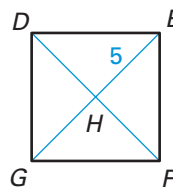
The diagonals of rectangle $WXYZ$ intersect at P . Given that $m\angle YXZ = 50^\circ$ and $XZ = 12$, find the indicated measure.

21. $m\angle WXZ$ 22. $m\angle WPX$
 23. PY 24. WX



The diagonals of square $DEFG$ intersect at H . Given that $EH = 5$, find the indicated measure.

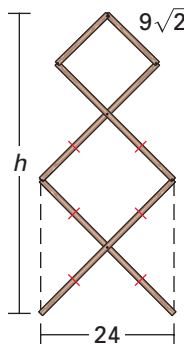
25. $m\angle GHF$ 26. $m\angle DGH$
 27. HF 28. DE



29. **Windows** In preparation for a storm, a window is protected by nailing boards along its diagonals. The lengths of the boards are the same. Can you conclude that the window is square? *Explain.*

30. **Clothing** The side view of a wooden clothes dryer is shown at the right. Measurements shown are in inches.

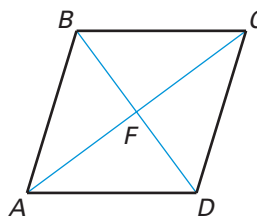
- a. The uppermost quadrilateral is a square. Classify the quadrilateral below the square. *Explain* your reasoning.
 b. Find the height h of the clothes dryer.



31. **Proof** The diagonals of rhombus $ABCD$ form several triangles. Using a two-column proof, prove that $\triangle BFA \cong \triangle DFC$.

GIVEN: $ABCD$ is a rhombus.

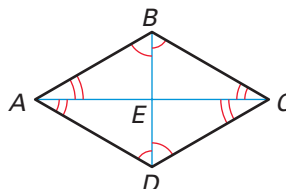
PROVE: $\triangle BFA \cong \triangle DFC$



32. **Proof** Write a two-column proof for one part of Theorem 5.27.

GIVEN: $ABCD$ is a parallelogram.
 \overline{AC} bisects $\angle DAB$ and $\angle BCD$.
 \overline{DB} bisects $\angle ADC$ and $\angle CBA$.

PROVE: $ABCD$ is a rhombus.



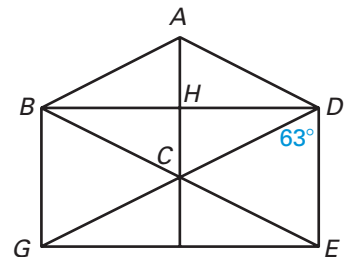


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Decide whether the statement is *true* or *false*. Decide whether the converse is *true* or *false*. If both statements are *true*, write a biconditional statement.

- If a quadrilateral is a rectangle, then it is a parallelogram.
- If a quadrilateral is a parallelogram, then it is a rhombus.
- If a quadrilateral is a square, then it is a rhombus.
- If a quadrilateral is a rectangle, then it is a rhombus.
- If a rhombus is a square, then it is a rectangle.

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

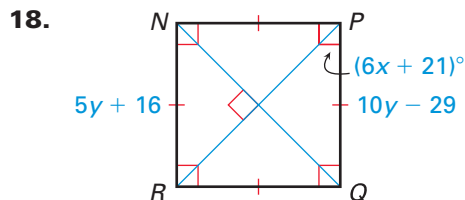
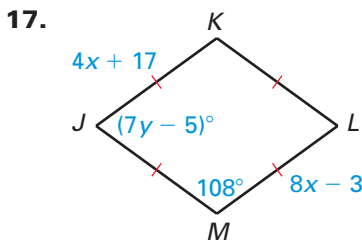


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|------------------|------------------|
| 6. $\angle GDB$ | 7. $\angle ABC$ |
| 8. $\angle DAB$ | 9. $\angle BCG$ |
| 10. $\angle GCE$ | 11. $\angle DEG$ |
| 12. $\angle AHB$ | 13. $\angle DGB$ |

Find the length or angle measure.

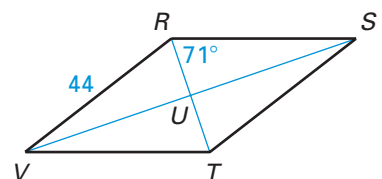
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|--|---|---|
| 14. $WXYZ$ is a square.
$WX = 1 - 10x$
$YZ = 14 + 3x$
$XY = \underline{\quad?}$ | 15. $WXYZ$ is a rhombus.
$m\angle X = 24(10 - x)^\circ$
$m\angle Z = 6(x + 15)^\circ$
$m\angle Y = \underline{\quad?}$ | 16. $WXYZ$ is a rectangle.
Perimeter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

Classify the special quadrilateral. Explain your reasoning. Then find the values of x and y .



The diagonals of rhombus **RSTV** intersect at **U**. Given that $m\angle URS = 71^\circ$ and $RV = 44$, find the indicated measure.

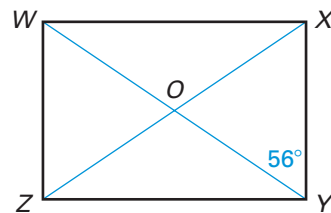
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| 19. $m\angle URV$ | 20. $m\angle RVT$ |
| 21. RT | 22. SU |



Exercise Set B *(continued)*

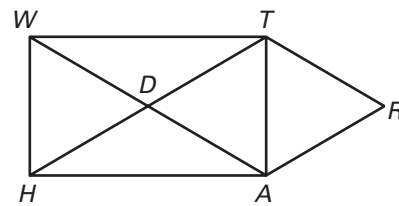
The diagonals of rectangle $WXYZ$ intersect at O . Given that $m\angle XYW = 56^\circ$ and $WY = 33$, find the indicated measure.

23. $m\angle XWO$ 24. $m\angle ZOY$
 25. XO 26. WZ
 27. Copy and complete the proof.



GIVEN: $WHAT$ is a parallelogram.
 $DART$ is a rhombus.

PROVE: $WHAT$ is a rectangle.

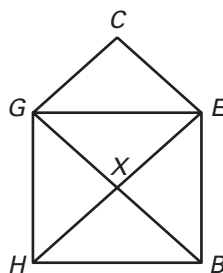


Statements	Reasons
1. $WHAT$ is a \square .	1. <u>?</u>
2. $\overline{WD} \cong \overline{DA}$	2. <u>?</u>
3. <u>?</u>	3. Diagonals of \square bisect each other.
4. <u>?</u>	4. Given
5. $\overline{DT} \cong \overline{DA}$	5. <u>?</u>
6. $\overline{WD} \cong \overline{HD} \cong \overline{DA} \cong \overline{DT}$	6. <u>?</u>
7. <u>?</u>	7. Segment Addition Postulate
8. <u>?</u>	8. Substitution
9. $WHAT$ is a rectangle.	9. <u>?</u>

28. **Proof** Write a two-column or paragraph proof.

GIVEN: $\triangle GEC \cong \triangle GHX$
 $GEBH$ is a parallelogram.

PROVE: $GEBH$ is a rhombus.



29. **Proof** Write a coordinate proof of the following statement, which is part of Theorem 5.28.

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