



UNDERSTAND

10. **Use Appropriate Tools** If you are given a drawing of a quadrilateral, how can you determine whether or not it is a parallelogram? What tool or tools can you use?
11. **Error Analysis** Ahmed uses the following explanation to prove that a figure is a parallelogram. What is Ahmed's error?

The quadrilateral has a pair of opposite sides congruent and a pair of opposite sides parallel. According to Theorem 6-15, the figure is a parallelogram.

12. **Construct Arguments** Write a proof of Theorem 6-12.

Given: $m\angle F + m\angle G = 180$
 $m\angle F + m\angle J = 180$

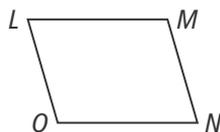


Prove: $FGHJ$ is a parallelogram.

13. **Mathematical Connections** A rectangle is defined as a quadrilateral with four right angles. Which theorem or theorems from the lesson explain why a rectangle is a parallelogram? Explain how the theorem or theorems apply.

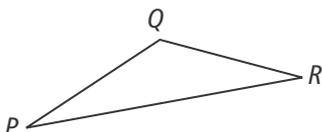
14. **Construct Arguments** Write a proof of Theorem 6-13.

Given: $\angle L \cong \angle N$, $\angle M \cong \angle O$



Prove: $LMNO$ is a parallelogram.

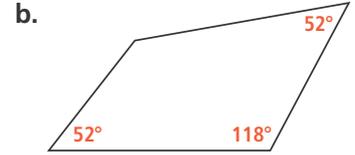
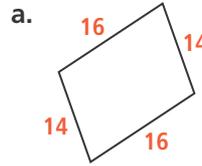
15. **Higher Order Thinking** Describe rigid motions you can apply to $\triangle PQR$ to construct three different parallelograms by combining the preimage and image. Explain why the resulting figures are parallelograms.



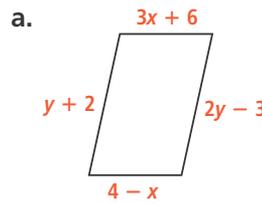
PRACTICE

16. Is each quadrilateral a parallelogram? Explain.

SEE EXAMPLES 1 AND 2

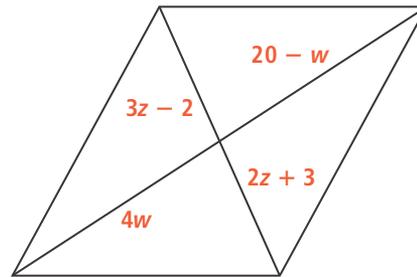


17. In each figure, for what values of x and y is the figure a parallelogram? SEE EXAMPLE 3



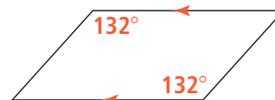
18. Given the lengths shown, for what values of w and z is the figure a parallelogram?

SEE EXAMPLE 4



19. Is the figure below a parallelogram? Explain.

SEE EXAMPLES 5 AND 6



20. Write a proof of Theorem 6-15.

Given: $\overline{KL} \parallel \overline{JM}$, $\overline{KL} \cong \overline{JM}$

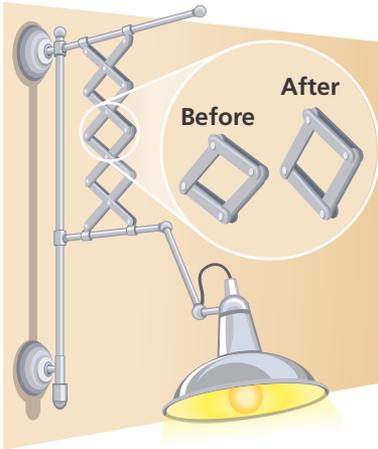
Prove: $JKLM$ is a parallelogram.



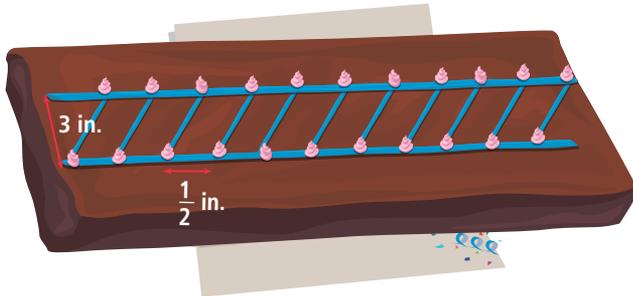
Hint: Construct diagonal \overline{JL} .

APPLY

21. **Make Sense and Persevere** A lamp on a wall is suspended from an extendable arm that allows the lamp to slide up and down. When it expands, does the shape shown remain a parallelogram? Explain.



22. **Model With Mathematics** Simon wants to decorate a cake with a pattern of parallelograms. He first pipes two parallel lines that are 3 inches apart. He then makes a mark every $\frac{1}{2}$ inch along each line. He pipes a line from one mark to the next on the opposite side. Does this ensure that the lines will be parallel? Explain your answer.

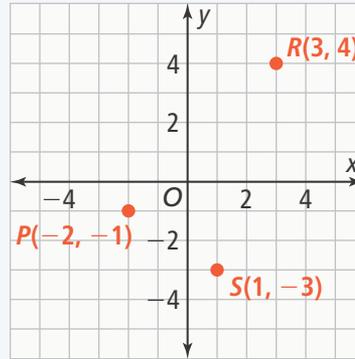


23. **Communicate Precisely** In the game shown, the arrangement of marbles on the board is called a *parallelogram formation*. Why is that name appropriate? Explain.

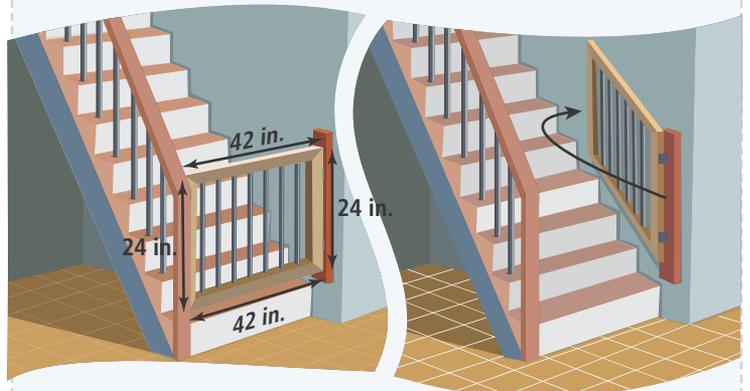


ASSESSMENT PRACTICE

24. Copy the graph and plot all possible coordinate pairs for point Q on the coordinate plane so that points P , Q , R , and S form the vertices of a parallelogram.



25. **SAT/ACT** In quadrilateral $ABCD$, $\angle A \cong \angle C$. Which additional statement can be used to show that $ABCD$ is a parallelogram?
- Ⓐ $m\angle A + m\angle C = 180$ Ⓒ $m\angle B + m\angle D = 180$
 Ⓑ \overline{BD} bisects \overline{AC} Ⓓ $\angle B \cong \angle D$
26. **Performance Task** Margaret helps her sister build a baby gate that is built from dowels hinged at the top and bottom, so the gate can open up against the wall along the stairs. They call it the parallelogram gate.



Part A Are they correct to call it a parallelogram gate? Explain.

Part B What are the measurements of the sides of the gate when the gate is open? Explain.

Part C Margaret's father suggests that they add two diagonal slats at the front of the baby gate. What would that do to the gate? Explain.