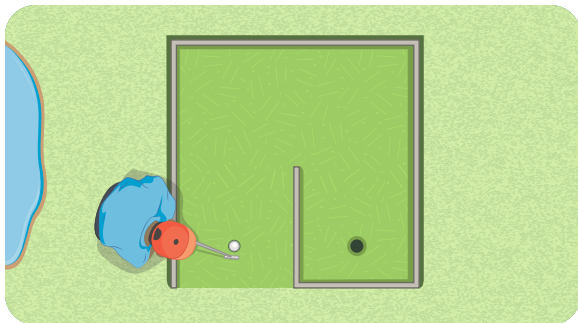




**UNDERSTAND**

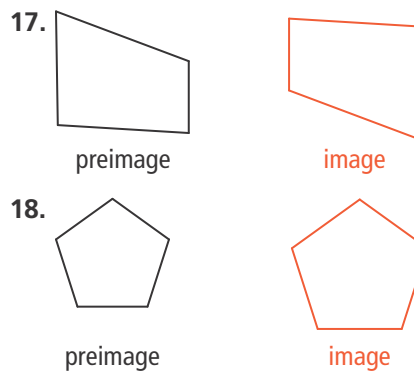
- Look for Relationships** Becky draws a triangle with vertices  $A(6,7)$ ,  $B(9,3)$ , and  $C(4, -2)$  on a coordinate grid. She reflects the triangle across the line  $y = 4$  to get  $\triangle A'B'C'$ . She then reflects the image across the line  $x = 3$  to get  $\triangle A''B''C''$ .
  - What are the coordinates of  $\triangle A'B'C'$  and  $\triangle A''B''C''$ ?
  - Write a rule for each reflection.
- Use Structure** Under a transformation, a preimage and its image are both squares with side length 3. The image, however, is rotated with respect to the preimage. Is the transformation a rigid motion? Explain.
- Error Analysis** Jacob is playing miniature golf. He states that he cannot hit the ball from the start, bounce it off the back wall once, and reach the hole in one shot. Is Jacob correct? Trace and label a diagram to support your answer.



- Higher Order Thinking** For the miniature golf hole in Exercise 13, Jacob wants to bounce the ball off the back wall and then the right wall. Draw a diagram to show how Jacob can hit the ball so that it reaches the hole after two bounces.
- Mathematical Connection** Dana reflects point  $A(2, 5)$  across line  $\ell$  to get image point  $A'(6, 1)$ . What is an equation for line  $\ell$ ?
- Look for Structure** Can a figure be reflected across three lines of reflection so the image is the original figure? Explain.

**PRACTICE**

For Exercises 17 and 18, does each transformation appear to be a rigid motion? Explain. SEE EXAMPLE 1

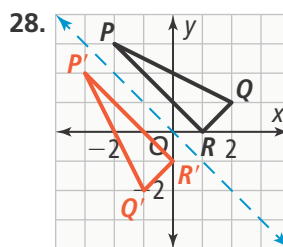


For Exercises 19–24, suppose  $m$  is the line with equation  $x = -5$ , line  $n$  is the line with equation  $y = 1$ , line  $g$  is the line with equation  $y = x$ , and line  $h$  is the line with equation  $y = -2$ . Given  $A(9, -3)$ ,  $B(6, 4)$ , and  $C(-1, -5)$ , what are the coordinates of the vertices of  $\triangle A'B'C'$  for each reflection? SEE EXAMPLES 2 AND 3

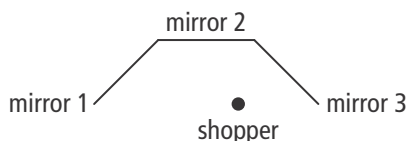
- $R_{x\text{-axis}}$
- $R_{y\text{-axis}}$
- $R_m$
- $R_n$
- $R_g$
- $R_h$

For Exercises 25–28, what is a reflection rule that maps each triangle and its image? SEE EXAMPLE 4

- $D(3, 6)$ ,  $E(-4, -3)$ ,  $F(6, 1)$  and  $D'(1, 6)$ ,  $E'(8, -3)$ ,  $F'(-2, 1)$
- $G(9, 12)$ ,  $H(-2, -15)$ ,  $J(3, 8)$  and  $G'(9, -2)$ ,  $H'(-2, 25)$ ,  $J'(3, 2)$
- $K(7, -6)$ ,  $L(9, -3)$ ,  $M(-4, 6)$  and  $K'(7, -4)$ ,  $L'(9, -7)$ ,  $M'(-4, -16)$

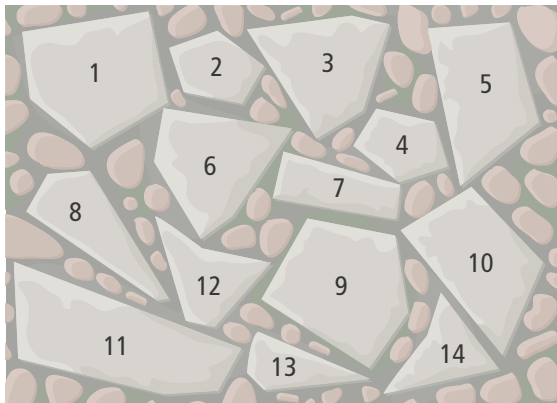


- Trace the diagram below. Where does the shopper in a dressing room see her image in each mirror? SEE EXAMPLE 5

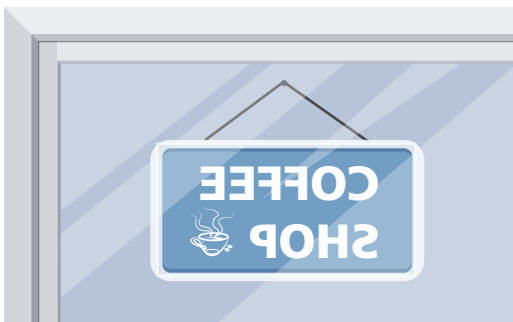


**APPLY**

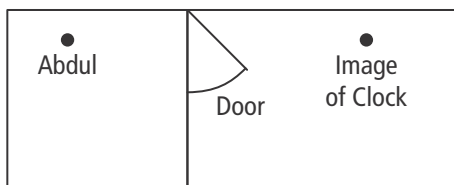
**30. Look for Relationships** Which of the numbered stones shown cannot be mapped to another with a rigid motion?



**31. Use Structure** Reese is inside a shop and sees the sign on the window from the back. Draw the letters as they would appear from the outside of the shop. Is the transformation a rigid motion?



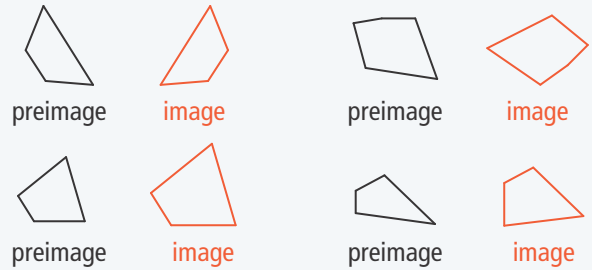
**32. Make Sense and Persevere** Look at the floor plan below. Abdul sees the image of a clock in the mirror on the door.



- Trace the diagram. Where is the line of reflection? Explain.
- Where is the clock located? Explain.
- Find where Abdul's image is located relative to the line of reflection. Can Abdul see himself in the mirror? Explain.

**ASSESSMENT PRACTICE**

**33.** Classify whether each pair of figures appears to be a *rigid motion* or *not a rigid motion*.



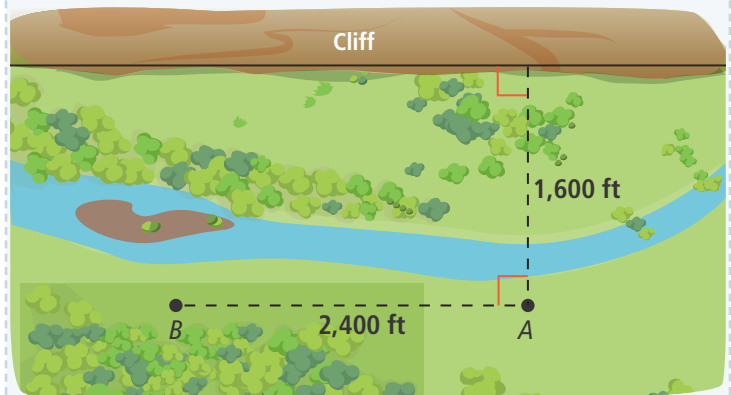
**34. SAT/ACT** Consider the following reflection.  
Preimage:  $A(3, 9)$ ,  $B(2, -7)$ ,  $C(6, 14)$

Image:  $A'(-25, 9)$ ,  $B'(-24, -7)$ ,  $C'(-28, 14)$

Suppose  $p$  is the line with equation  $x = 11$ ,  $q$  is the line with equation  $x = 22$ ,  $r$  is the line with equation  $x = -11$ , and  $s$  is the line with equation  $x = -22$ . What is the rule for the reflection?

- Ⓐ  $R_p(x, y)$                       Ⓒ  $R_r(x, y)$   
Ⓑ  $R_q(x, y)$                       Ⓓ  $R_s(x, y)$

**35. Performance Task** Sound echoes from a solid object in the same way that light reflects from a mirror. A hiker at point  $A$  shouts the word *hello*. The hiker at point  $B$  first hears the shout directly and later hears the echo.



**Part A** Trace the diagram. Show the path taken by the sound the hiker at point  $B$  hears echoing from the cliff.

**Part B** Sound travels at about 1,000 feet per second. After how long does the hiker at point  $B$  hear the shout directly? After how long does he hear the echo? Show your work.