4 Chapter Review

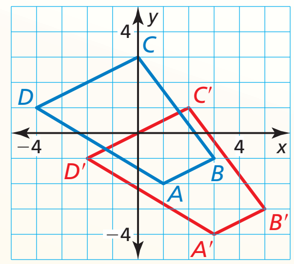
Dynamic Solutions available at *BigIdeasMath.com*

4.1 Translations (pp. 173–180)

(pp. 173–180)

Graph quadrilateral *ABCD* with vertices $A(1, -2)$, $B(3, -1)$, $C(0, 3)$, and $D(-4, 1)$ and its image after the translation $(x, y) \rightarrow (x + 2, y - 2)$.

Graph quadrilateral *ABCD*. To find the coordinates of the vertices of the image, add 2 to the *x*-coordinates and subtract 2 from the *y*-coordinates of the vertices of the preimage. Then graph the image.



$$\mathbf{(x, y) \rightarrow (x + 2, y - 2)}$$

$A(1, -2) \rightarrow A'(3, -4)$

$B(3, -1) \rightarrow B'(5, -3)$

$C(0, 3) \rightarrow C'(2, 1)$

$D(-4, 1) \rightarrow D'(-2, -1)$

Graph $\triangle XYZ$ with vertices $X(2, 3)$, $Y(-3, 2)$, and $Z(-4, -3)$ and its image after the translation.

1. $(x, y) \rightarrow (x, y + 2)$

2. $(x, y) \rightarrow (x - 3, y)$

3. $(x, y) \rightarrow (x + 3, y - 1)$

4. $(x, y) \rightarrow (x + 4, y + 1)$

Graph $\triangle PQR$ with vertices $P(0, -4)$, $Q(1, 3)$, and $R(2, -5)$ and its image after the composition.

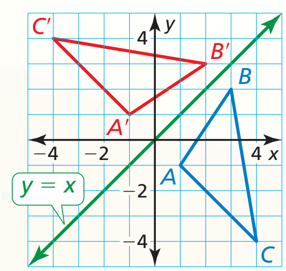
5. **Translation:** $(x, y) \rightarrow (x + 1, y + 2)$
Translation: $(x, y) \rightarrow (x - 4, y + 1)$

6. **Translation:** $(x, y) \rightarrow (x, y + 3)$
Translation: $(x, y) \rightarrow (x - 1, y + 1)$

4.2 Reflections (pp. 181–188)

Graph $\triangle ABC$ with vertices $A(1, -1)$, $B(3, 2)$, and $C(4, -4)$ and its image after a reflection in the line $y = x$.

Graph $\triangle ABC$ and the line $y = x$. Then use the coordinate rule for reflecting in the line $y = x$ to find the coordinates of the vertices of the image.



$$\mathbf{(a, b) \rightarrow (b, a)}$$

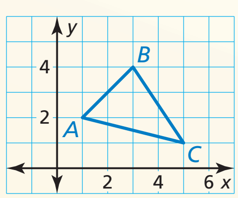
$A(1, -1) \rightarrow A'(-1, 1)$

$B(3, 2) \rightarrow B'(2, 3)$

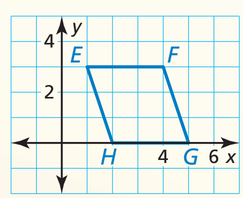
$C(4, -4) \rightarrow C'(-4, 4)$

Graph the polygon and its image after a reflection in the given line.

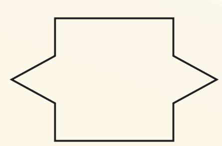
7. $x = 4$



8. $y = 3$



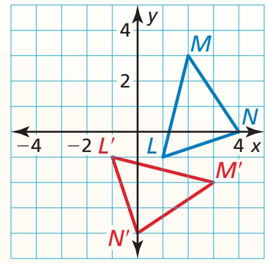
9. How many lines of symmetry does the figure have?



4.3 Rotations (pp. 189–196)

Graph $\triangle LMN$ with vertices $L(1, -1)$, $M(2, 3)$, and $N(4, 0)$ and its image after a 270° rotation about the origin.

Use the coordinate rule for a 270° rotation to find the coordinates of the vertices of the image. Then graph $\triangle LMN$ and its image.



$(a, b) \rightarrow (b, -a)$

$L(1, -1) \rightarrow L'(-1, -1)$

$M(2, 3) \rightarrow M'(3, -2)$

$N(4, 0) \rightarrow N'(0, -4)$

Graph the polygon with the given vertices and its image after a rotation of the given number of degrees about the origin.

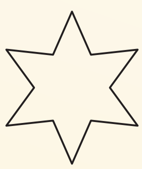
10. $A(-3, -1)$, $B(2, 2)$, $C(3, -3)$; 90°

11. $W(-2, -1)$, $X(-1, 3)$, $Y(3, 3)$, $Z(3, -3)$; 180°

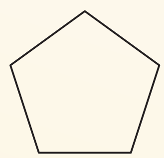
12. Graph $\overline{XY}$ with endpoints $X(5, -2)$ and $Y(3, -3)$ and its image after a reflection in the x-axis and then a rotation of 270° about the origin.

Determine whether the figure has rotational symmetry. If so, describe any rotations that map the figure onto itself.

13.

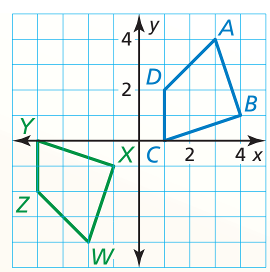


14.



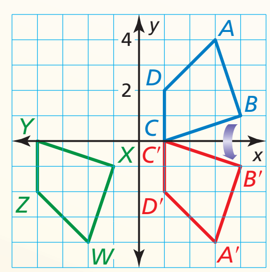
4.4 Congruence and Transformations (pp. 199–206)

Describe a congruence transformation that maps quadrilateral *ABCD* to quadrilateral *WXYZ*, as shown at the right.



$\overline{AB}$ falls from left to right, and $\overline{WX}$ rises from left to right. If you reflect quadrilateral $ABCD$ in the x-axis as shown at the bottom right, then the image, quadrilateral $A'B'C'D'$, will have the same orientation as quadrilateral $WXYZ$. Then you can map quadrilateral $A'B'C'D'$ to quadrilateral $WXYZ$ using a translation of 5 units left.

▶ So, a congruence transformation that maps quadrilateral $ABCD$ to quadrilateral $WXYZ$ is a reflection in the x-axis followed by a translation of 5 units left.



Describe a congruence transformation that maps $\triangle DEF$ to $\triangle JKL$.

15. $D(2, -1)$, $E(4, 1)$, $F(1, 2)$ and $J(-2, -4)$, $K(-4, -2)$, $L(-1, -1)$

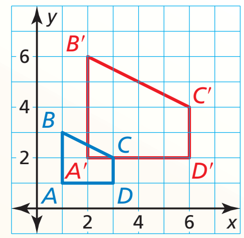
16. $D(-3, -4)$, $E(-5, -1)$, $F(-1, 1)$ and $J(1, 4)$, $K(-1, 1)$, $L(3, -1)$

17. Which transformation is the same as reflecting an object in two parallel lines? in two intersecting lines?

4.5 Dilations (pp. 207–214)

Graph trapezoid *ABCD* with vertices *A*(1, 1), *B*(1, 3), *C*(3, 2), and *D*(3, 1) and its image after a dilation with a scale factor of 2.

Use the coordinate rule for a dilation with $k = 2$ to find the coordinates of the vertices of the image. Then graph trapezoid *ABCD* and its image.



$$(x, y) \rightarrow (2x, 2y)$$

$A(1, 1) \rightarrow A'(2, 2)$

$B(1, 3) \rightarrow B'(2, 6)$

$C(3, 2) \rightarrow C'(6, 4)$

$D(3, 1) \rightarrow D'(6, 2)$

Graph the triangle and its image after a dilation with scale factor *k*.

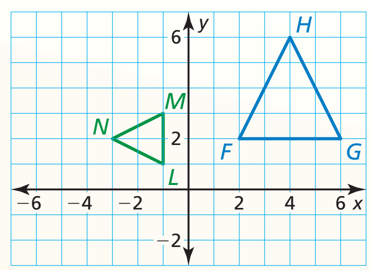
18. $P(2, 2)$, $Q(4, 4)$, $R(8, 2)$; $k = \frac{1}{2}$

19. $X(-3, 2)$, $Y(2, 3)$, $Z(1, -1)$; $k = -3$

20. You are using a magnifying glass that shows the image of an object that is eight times the object's actual size. The image length is 15.2 centimeters. Find the actual length of the object.

4.6 Similarity and Transformations (pp. 215–220)

Describe a similarity transformation that maps $\triangle FGH$ to $\triangle LMN$, as shown at the right.



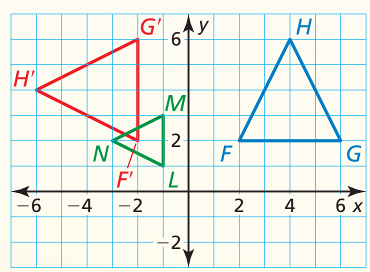
$\overline{FG}$ is horizontal, and $\overline{LM}$ is vertical. If you rotate $\triangle FGH$ 90° about the origin as shown at the bottom right, then the image, $\triangle F'G'H'$, will have the same orientation as $\triangle LMN$. $\triangle LMN$ appears to be half as large as $\triangle F'G'H'$. Dilate $\triangle F'G'H'$ using a scale factor of $\frac{1}{2}$.

$$(x, y) \rightarrow \left(\tfrac{1}{2}x, \tfrac{1}{2}y\right)$$

$F'(-2, 2) \rightarrow F''(-1, 1)$

$G'(-2, 6) \rightarrow G''(-1, 3)$

$H'(-6, 4) \rightarrow H''(-3, 2)$



The vertices of $\triangle F''G''H''$ match the vertices of $\triangle LMN$.

▶ So, a similarity transformation that maps $\triangle FGH$ to $\triangle LMN$ is a rotation of 90° about the origin followed by a dilation with a scale factor of $\frac{1}{2}$.

Describe a similarity transformation that maps $\triangle ABC$ to $\triangle RST$.

21. $A(1, 0)$, $B(-2, -1)$, $C(-1, -2)$ and $R(-3, 0)$, $S(6, -3)$, $T(3, -6)$

22. $A(6, 4)$, $B(-2, 0)$, $C(-4, 2)$ and $R(2, 3)$, $S(0, -1)$, $T(1, -2)$

23. $A(3, -2)$, $B(0, 4)$, $C(-1, -3)$ and $R(-4, -6)$, $S(8, 0)$, $T(-6, 2)$