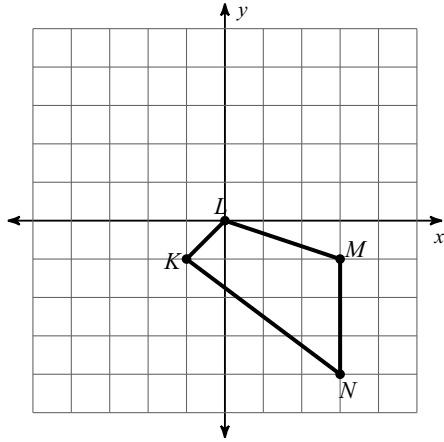


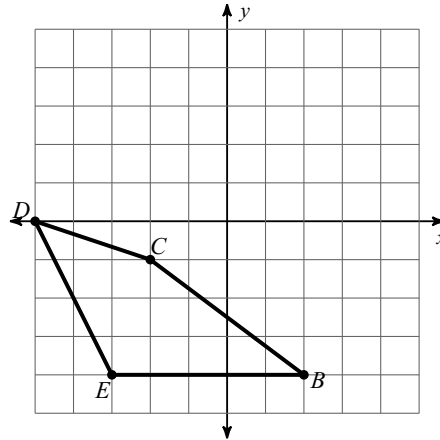
14.1-14.4 - Reflection, Translation & Rotation

Find the coordinates of the vertices of each figure after the given transformation and graph each transformation.

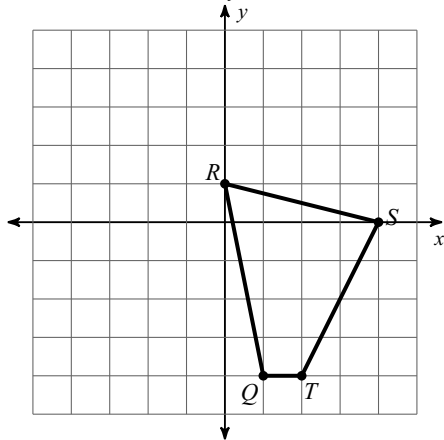
1) rotation 90° clockwise about the origin



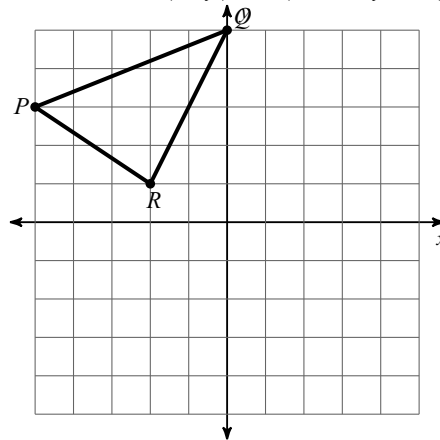
2) rotation 90° counterclockwise about the origin



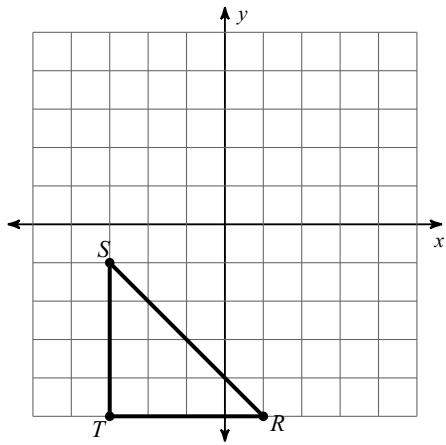
3) reflection across $y = x$



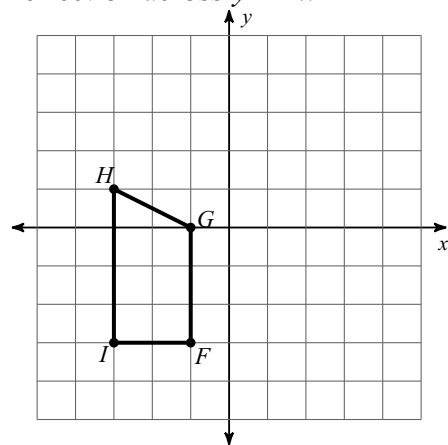
4) translation: $(x, y) \rightarrow (x + 2, y - 5)$



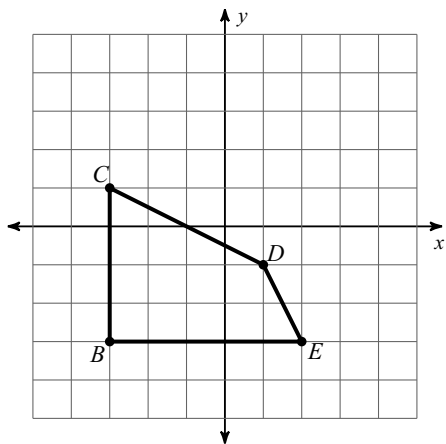
5) reflection across the x-axis



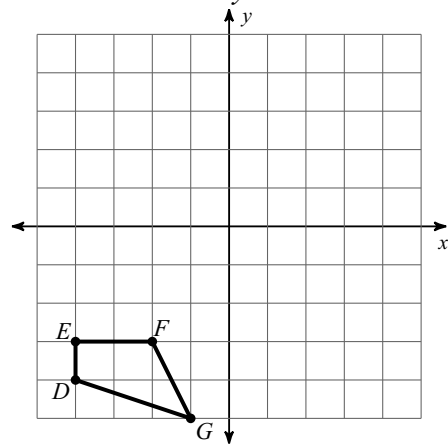
6) reflection across $y = -x$



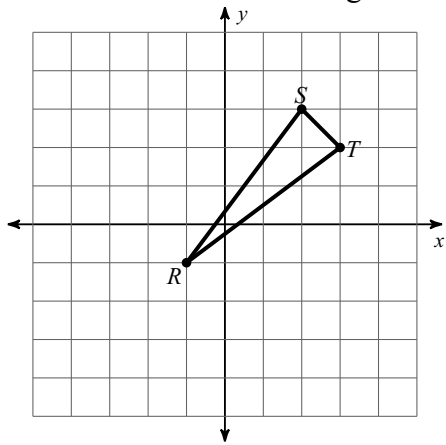
7) reflection across $x = 1$



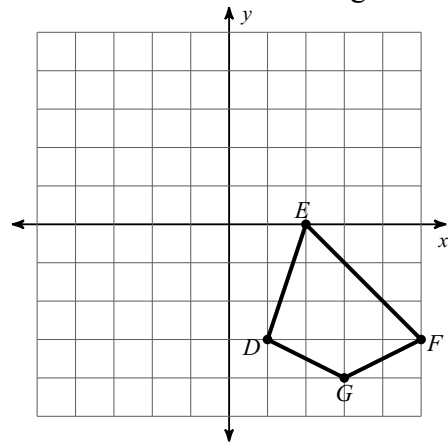
8) reflection across $y = -2$



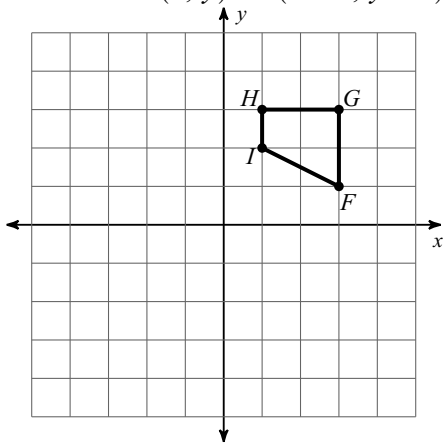
9) rotation 180° about the origin



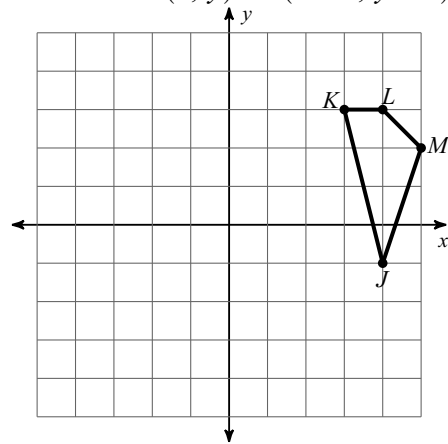
10) rotation 180° about the origin



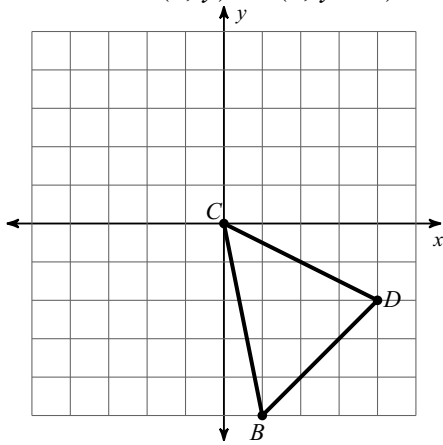
11) translation: $(x, y) \rightarrow (x - 2, y + 2)$



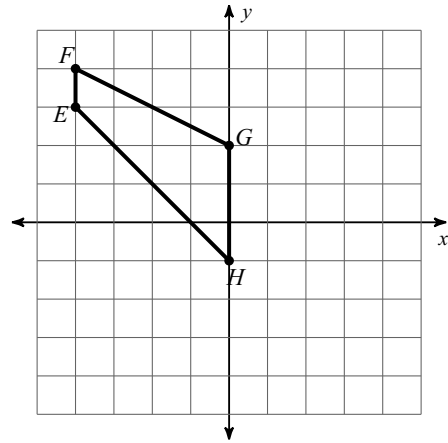
12) translation: $(x, y) \rightarrow (x - 5, y - 2)$



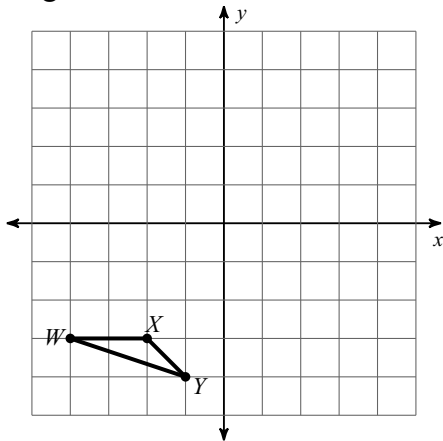
13) translation: $(x, y) \rightarrow (x, y + 1)$



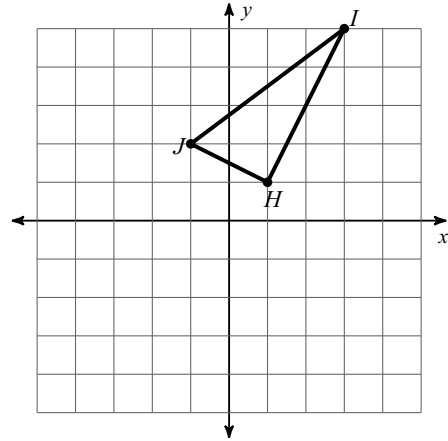
14) rotation 90° clockwise about the origin



15) rotation 90° counterclockwise about the origin



16) rotation 180° about the origin



17) rotation 90° clockwise about the origin
 $W(1, 0), X(4, 4), Y(4, 0)$

18) rotation 180° about the origin
 $Z(-4, 3), Y(-2, 5), X(0, 0)$

19) rotation 90° clockwise about the origin
 $Y(-3, 0), X(-2, 5), W(-1, 3)$

20) rotation 180° about the origin
 $L(-1, -2), K(-1, -1), J(4, -2), I(3, -4)$

21) reflection across $x = -2$
 $W(-3, -5), X(-5, -3), Y(-3, -2), Z(0, -3)$

22) reflection across the x-axis
 $H(-3, -2), I(-2, 2), J(1, -1), K(1, -5)$

23) translation: $(x, y) \rightarrow (x - 7, y + 2)$
 $E(4, -4), F(5, -4), G(5, -5)$

24) rotation 180° about the origin
 $I(-5, 0), J(-5, 4), K(-4, 4), L(-2, 2)$

25) translation: $(x, y) \rightarrow (x + 6, y)$
 $S(-5, 0), R(-5, 5), Q(-3, 3)$

26) translation: $(x, y) \rightarrow (x, y - 1)$
 $C(0, 2), D(2, 5), E(4, 4), F(4, 1)$

27) rotation 90° clockwise about the origin
 $T(-5, 2), U(-5, 3), V(-3, 2), W(-3, 1)$

28) reflection across the y-axis
 $G(1, -2), H(5, -1), I(5, -3)$

29) translation: $(x, y) \rightarrow (x - 6, y - 6)$
 $P(1, 4), Q(5, 5), R(4, 3)$

30) translation: $(x, y) \rightarrow (x + 3, y + 1)$
 $I(-5, 2), H(-5, 4), G(-1, 1), F(-4, 1)$

31) rotation 90° counterclockwise about the origin
 $H(3, -5), G(4, -3), F(5, -4)$

32) reflection across the y-axis
 $H(-1, -1), I(1, 2), J(3, -1), K(2, -5)$

Write a rule to describe each transformation.

$$33) \begin{array}{c} U(-1, 1), T(-1, 4), S(3, 3) \\ \text{to} \\ U'(-1, -1), T'(-4, -1), S'(-3, 3) \end{array}$$

$$34) \begin{array}{c} V(-4, 2), W(-5, 5), X(-3, 2) \\ \text{to} \\ V'(1, 2), W'(0, 5), X'(2, 2) \end{array}$$

$$35) \begin{array}{c} H(1, -2), I(1, 3), J(3, 3), K(3, -1) \\ \text{to} \\ H'(-2, -1), I'(3, -1), J'(3, -3), K'(-1, -3) \end{array}$$

$$36) \begin{array}{c} C(3, -3), D(4, 0), E(4, -3) \\ \text{to} \\ C'(-3, -3), D'(-2, 0), E'(-2, -3) \end{array}$$

$$37) \begin{array}{c} S(0, 0), R(4, 3), Q(5, 0) \\ \text{to} \\ S'(-3, -3), R'(1, 0), Q'(2, -3) \end{array}$$

$$38) \begin{array}{c} M(0, -1), L(2, 2), K(4, -3) \\ \text{to} \\ M'(-2, -1), L'(0, 2), K'(2, -3) \end{array}$$

$$39) \begin{array}{c} S(0, 2), T(5, 3), U(3, 0) \\ \text{to} \\ S'(-4, 0), T'(1, 1), U'(-1, -2) \end{array}$$

$$40) \begin{array}{c} G(-4, 2), F(-3, 4), E(1, 3) \\ \text{to} \\ F'(-4, 3), E'(-3, -1), G'(-2, 4) \end{array}$$

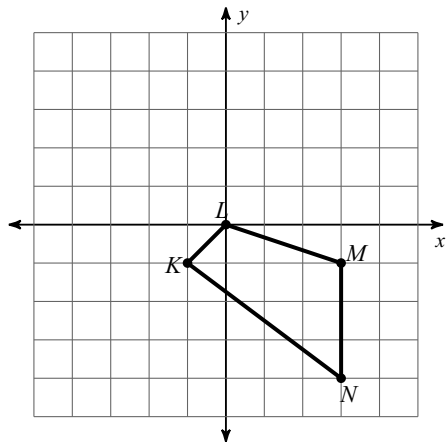
$$41) \begin{array}{c} Q(0, -5), R(-2, -2), S(-1, 2), T(3, -1) \\ \text{to} \\ Q'(-2, -5), R'(-4, -2), S'(-3, 2), T'(1, -1) \end{array}$$

$$42) \begin{array}{c} H(3, -3), I(2, 1), J(5, 0) \\ \text{to} \\ I'(0, 1), J'(-3, 0), H'(-1, -3) \end{array}$$

14.1-14.4 - Reflection, Translation & Rotation

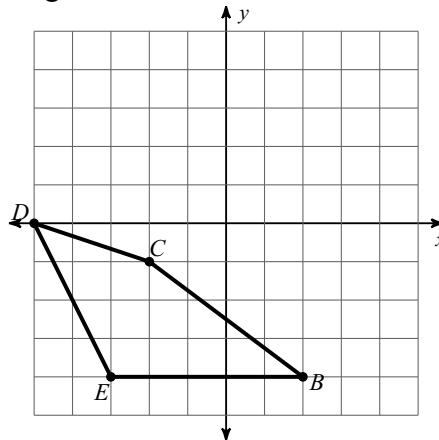
Find the coordinates of the vertices of each figure after the given transformation and graph each transformation.

1) rotation 90° clockwise about the origin



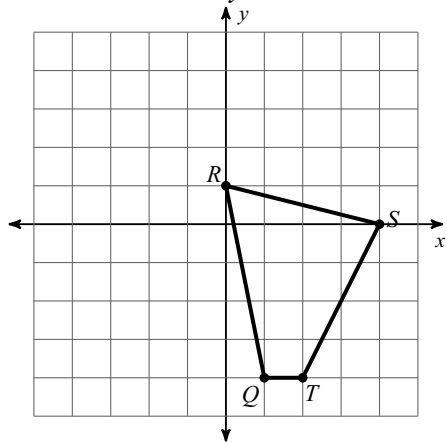
$K'(-1, 1), L'(0, 0), M'(-1, -3), N'(-4, -3)$

2) rotation 90° counterclockwise about the origin



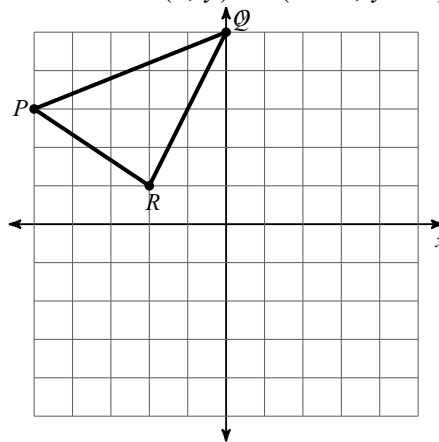
$E'(4, -3), D'(0, -5), C'(1, -2), B'(4, 2)$

3) reflection across $y = x$



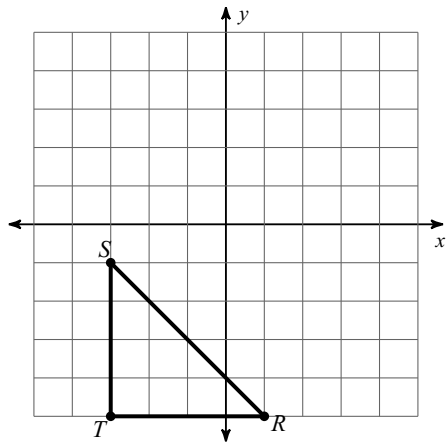
$R'(1, 0), S'(0, 4), T'(-4, 2), Q'(-4, 1)$

4) translation: $(x, y) \rightarrow (x + 2, y - 5)$



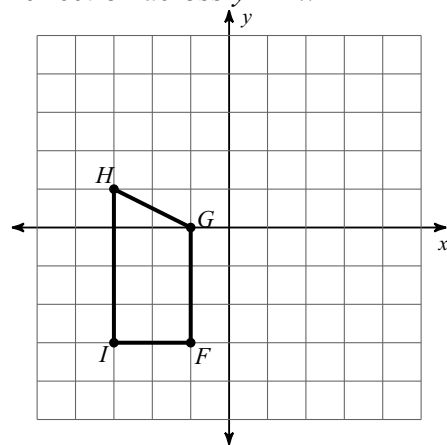
$P'(-3, -2), Q'(2, 0), R'(0, -4)$

5) reflection across the x-axis



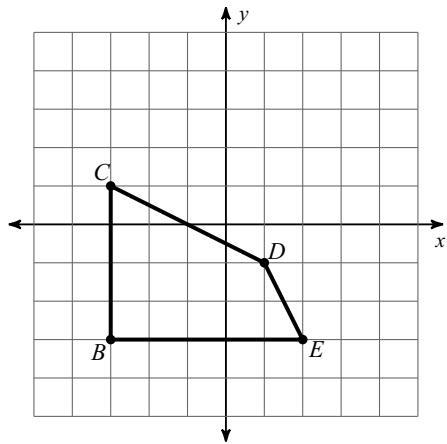
$S'(-3, 1), R'(1, 5), T'(-3, 5)$

6) reflection across $y = -x$



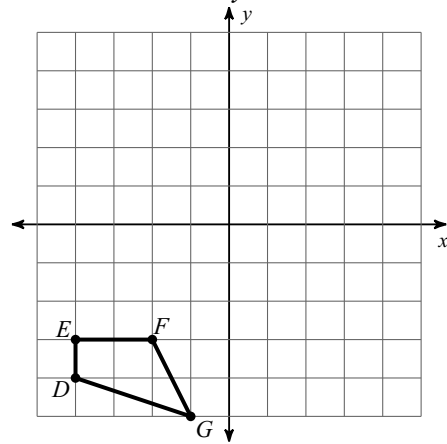
$H'(-1, 3), G'(0, 1), F'(3, 1), I'(3, 3)$

7) reflection across $x = 1$



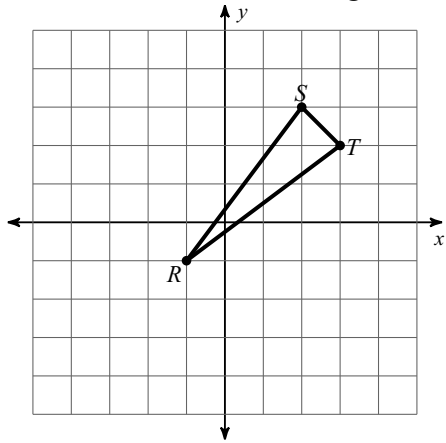
$C'(5, 1), D'(1, -1), E'(0, -3), B'(5, -3)$

8) reflection across $y = -2$



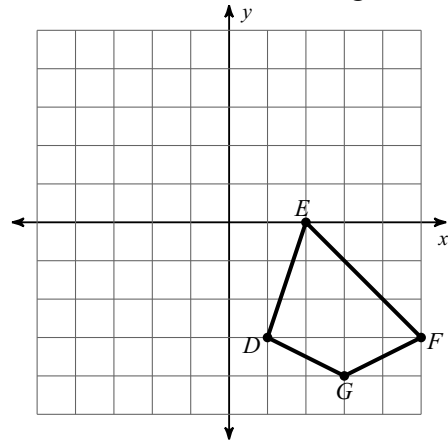
$E'(-4, -1), F'(-2, -1), G'(-1, 1), D'(-4, 0)$

9) rotation 180° about the origin



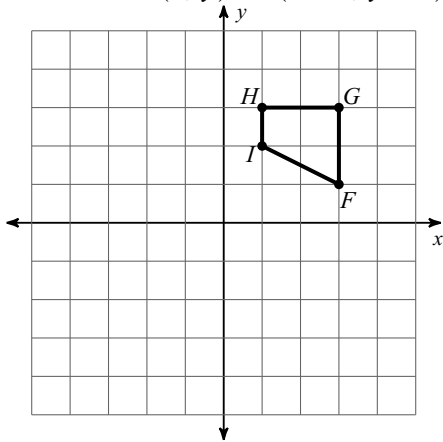
$R(1, 1), S(-2, -3), T(-3, -2)$

10) rotation 180° about the origin



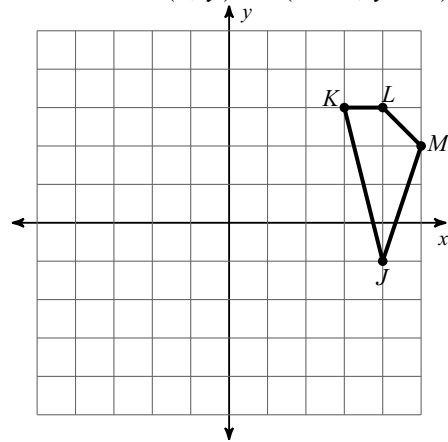
$D(-1, 3), E(-2, 0), F(-5, 3), G(-3, 4)$

11) translation: $(x, y) \rightarrow (x - 2, y + 2)$



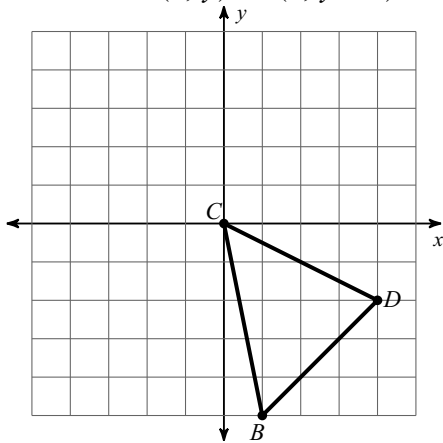
$I(-1, 4), H(-1, 5), G(1, 5), F(1, 3)$

12) translation: $(x, y) \rightarrow (x - 5, y - 2)$



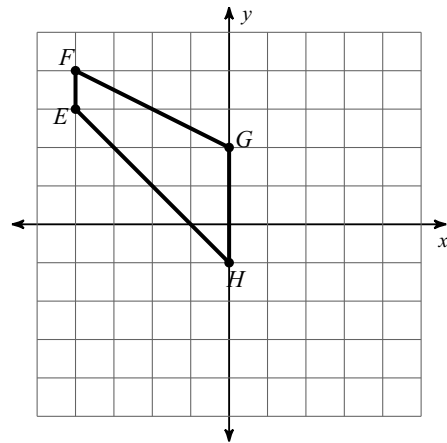
$J(-1, -3), K(-2, 1), L(-1, 1), M(0, 0)$

13) translation: $(x, y) \rightarrow (x, y + 1)$



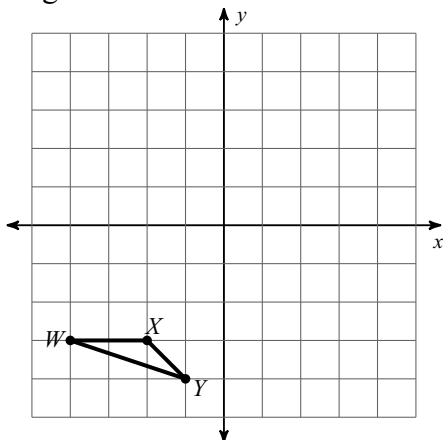
$B'(1, -4), C'(0, 1), D'(4, -1)$

14) rotation 90° clockwise about the origin



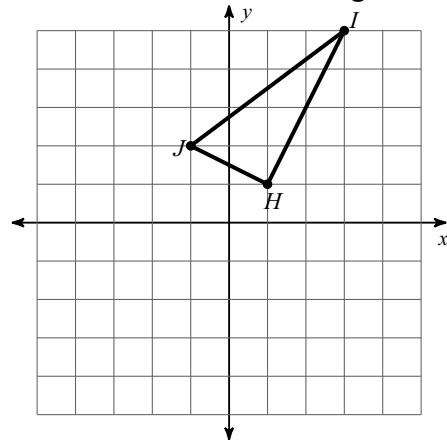
$E'(3, 4), F'(4, 4), G'(2, 0), H'(-1, 0)$

15) rotation 90° counterclockwise about the origin



$W'(3, -4), X'(3, -2), Y'(4, -1)$

16) rotation 180° about the origin



$J'(1, -2), I'(-3, -5), H'(-1, -1)$

17) rotation 90° clockwise about the origin
 $W(1, 0), X(4, 4), Y(4, 0)$

$W'(0, -1), X'(4, -4), Y'(0, -4)$

18) rotation 180° about the origin
 $Z(-4, 3), Y(-2, 5), X(0, 0)$

$Z'(4, -3), Y'(2, -5), X'(0, 0)$

19) rotation 90° clockwise about the origin
 $Y(-3, 0), X(-2, 5), W(-1, 3)$

$Y'(0, 3), X'(5, 2), W'(3, 1)$

20) rotation 180° about the origin
 $L(-1, -2), K(-1, -1), J(4, -2), I(3, -4)$

$L'(1, 2), K'(1, 1), J'(-4, 2), I'(-3, 4)$

21) reflection across $x = -2$
 $W(-3, -5), X(-5, -3), Y(-3, -2), Z(0, -3)$
 $X'(1, -3), Y'(-1, -2), Z'(-4, -3), W'(-1, -5)$

22) reflection across the x-axis
 $H(-3, -2), I(-2, 2), J(1, -1), K(1, -5)$
 $I'(-2, -2), J'(1, 1), K'(1, 5), H'(-3, 2)$

23) translation: $(x, y) \rightarrow (x - 7, y + 2)$
 $E(4, -4), F(5, -4), G(5, -5)$
 $E'(-3, -2), F'(-2, -2), G'(-2, -3)$

24) rotation 180° about the origin
 $I(-5, 0), J(-5, 4), K(-4, 4), L(-2, 2)$
 $I'(5, 0), J'(5, -4), K'(4, -4), L'(2, -2)$

25) translation: $(x, y) \rightarrow (x + 6, y)$
 $S(-5, 0), R(-5, 5), Q(-3, 3)$
 $S'(1, 0), R'(1, 5), Q'(3, 3)$

26) translation: $(x, y) \rightarrow (x, y - 1)$
 $C(0, 2), D(2, 5), E(4, 4), F(4, 1)$
 $C'(0, 1), D'(2, 4), E'(4, 3), F'(4, 0)$

27) rotation 90° clockwise about the origin
 $T(-5, 2), U(-5, 3), V(-3, 2), W(-3, 1)$
 $T'(2, 5), U'(3, 5), V'(2, 3), W'(1, 3)$

28) reflection across the y-axis
 $G(1, -2), H(5, -1), I(5, -3)$
 $H'(-5, -1), I'(-5, -3), G'(-1, -2)$

29) translation: $(x, y) \rightarrow (x - 6, y - 6)$
 $P(1, 4), Q(5, 5), R(4, 3)$
 $P'(-5, -2), Q'(-1, -1), R'(-2, -3)$

30) translation: $(x, y) \rightarrow (x + 3, y + 1)$
 $I(-5, 2), H(-5, 4), G(-1, 1), F(-4, 1)$
 $I'(-2, 3), H'(-2, 5), G'(2, 2), F'(-1, 2)$

31) rotation 90° counterclockwise about the origin
 $H(3, -5), G(4, -3), F(5, -4)$
 $H'(5, 3), G'(3, 4), F'(4, 5)$

32) reflection across the y-axis
 $H(-1, -1), I(1, 2), J(3, -1), K(2, -5)$
 $I'(-1, 2), J'(-3, -1), K'(-2, -5), H'(1, -1)$

Write a rule to describe each transformation.

33) $U(-1, 1), T(-1, 4), S(3, 3)$

to
 $U'(-1, -1), T'(-4, -1), S'(-3, 3)$

rotation 90° counterclockwise about the origin

34) $V(-4, 2), W(-5, 5), X(-3, 2)$

to
 $V'(1, 2), W'(0, 5), X'(2, 2)$

translation: $(x, y) \rightarrow (x + 5, y)$

35) $H(1, -2), I(1, 3), J(3, 3), K(3, -1)$

to
 $H'(-2, -1), I'(3, -1), J'(3, -3), K'(-1, -3)$

rotation 90° clockwise about the origin

36) $C(3, -3), D(4, 0), E(4, -3)$

to
 $C'(-3, -3), D'(-2, 0), E'(-2, -3)$

translation: $(x, y) \rightarrow (x - 6, y)$

37) $S(0, 0), R(4, 3), Q(5, 0)$

to
 $S'(-3, -3), R'(1, 0), Q'(2, -3)$

translation: $(x, y) \rightarrow (x - 3, y - 3)$

38) $M(0, -1), L(2, 2), K(4, -3)$

to
 $M'(-2, -1), L'(0, 2), K'(2, -3)$

translation: $(x, y) \rightarrow (x - 2, y)$

39) $S(0, 2), T(5, 3), U(3, 0)$

to
 $S'(-4, 0), T'(1, 1), U'(-1, -2)$

translation: $(x, y) \rightarrow (x - 4, y - 2)$

40) $G(-4, 2), F(-3, 4), E(1, 3)$

to
 $F'(-4, 3), E'(-3, -1), G'(-2, 4)$

reflection across $y = -x$

41) $Q(0, -5), R(-2, -2), S(-1, 2), T(3, -1)$

to
 $Q'(-2, -5), R'(-4, -2), S'(-3, 2), T'(1, -1)$

translation: $(x, y) \rightarrow (x - 2, y)$

42) $H(3, -3), I(2, 1), J(5, 0)$

to
 $I'(0, 1), J'(-3, 0), H'(-1, -3)$

reflection across $x = 1$