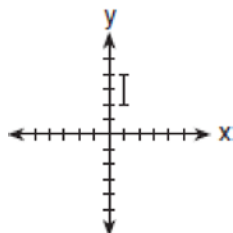


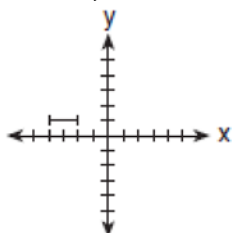
G.G.54: Compositions of Transformations 2: Define, investigate, justify, and apply isometries in the plane (rotations, reflections, translations, glide reflections)

- 1 The accompanying graph represents the figure **I** .

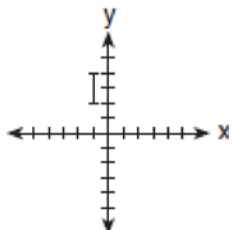


Which graph represents **I** after a transformation defined by $r_{y=x} \circ R_{90^\circ}$?

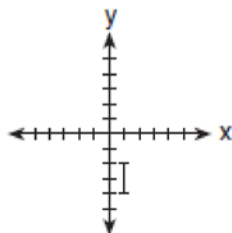
1)



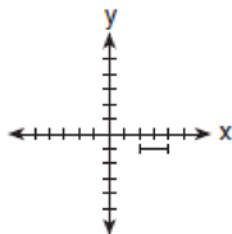
2)



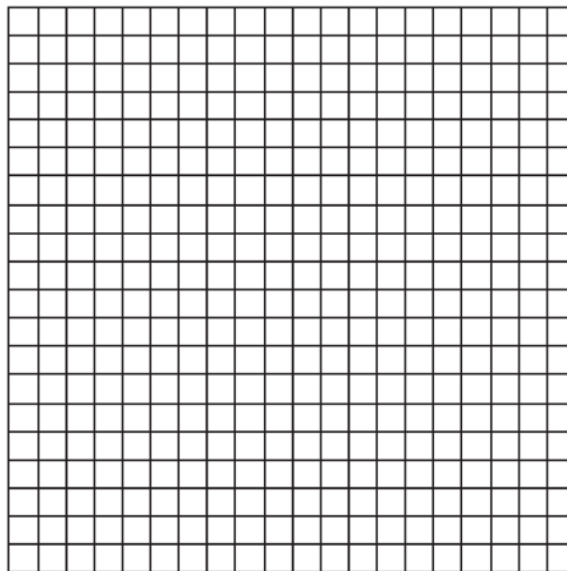
3)



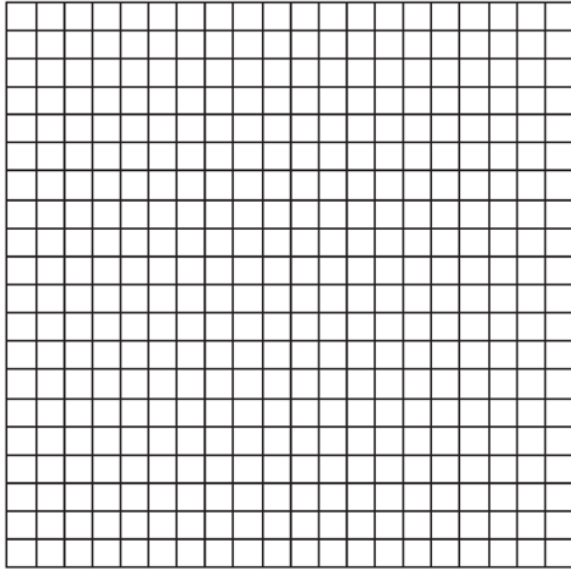
4)



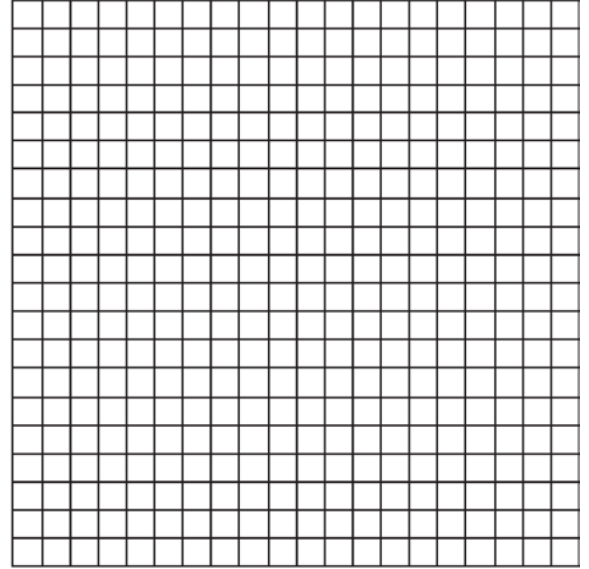
- 2 Given point $A(-2, 3)$. State the coordinates of the image of A under the composition $T_{(-3, -4)} \circ r_{x\text{-axis}}$.
 [The use of the accompanying grid is optional.]



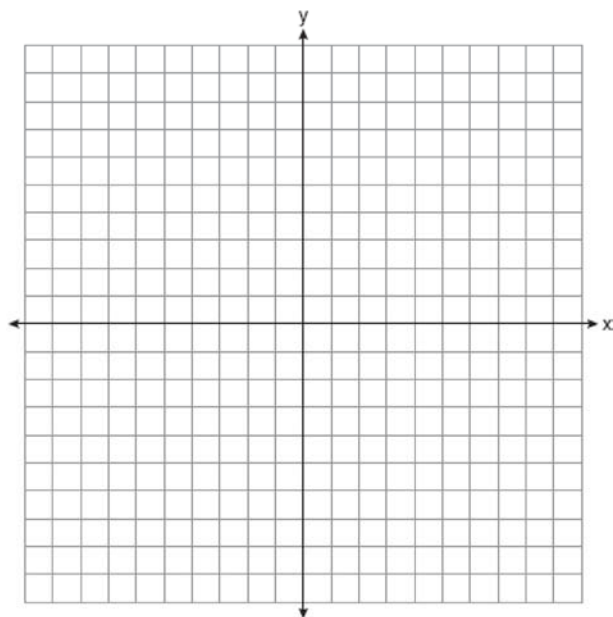
- 3 On the accompanying grid, graph and label \overline{AB} , where A is $(0,5)$ and B is $(2,0)$. Under the transformation $r_{x\text{-axis}} \circ r_{y\text{-axis}}(\overline{AB})$, A maps to A'' , and B maps to B'' . Graph and label $\overline{A''B''}$. What single transformation would map \overline{AB} to $\overline{A''B''}$?



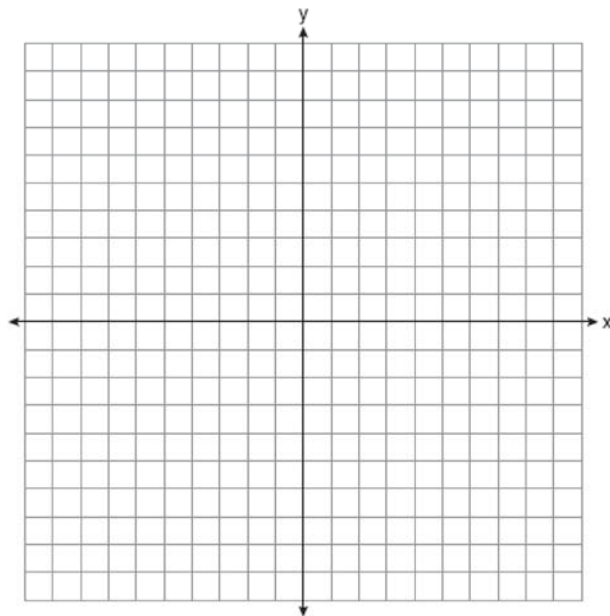
- 4 On the accompanying grid, graph and label $\triangle ABC$ with vertices $A(3,1)$, $B(0,4)$, and $C(-5,3)$. On the same grid, graph and label $\triangle A''B''C''$, the image of $\triangle ABC$ after the transformation $r_{x\text{-axis}} \circ r_{y=x}$.



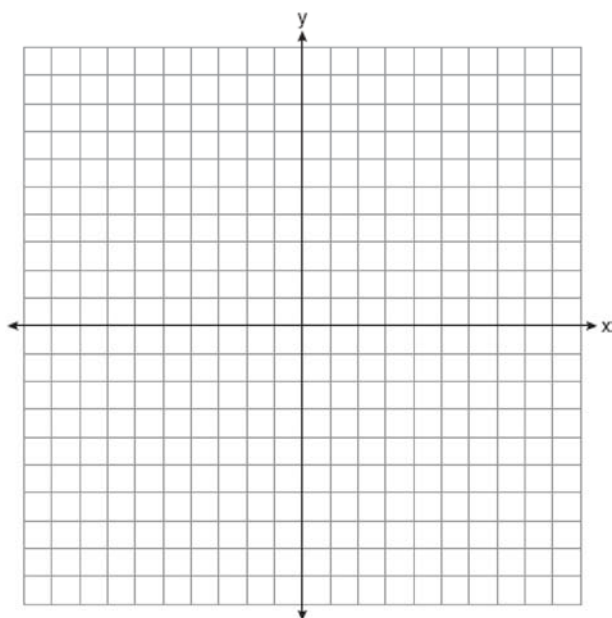
- 5 The coordinates of the vertices of $\triangle ABC$ are $A(1,6)$, $B(2,9)$, and $C(7,10)$.
- On the graph below, draw and label $\triangle ABC$.
 - Graph and state the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection over the line $y = x$.
 - Graph and state the coordinates of $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after a reflection in the x -axis.
 - Graph and state the coordinates of $\triangle A'''B'''C'''$, the image of $\triangle A''B''C''$ after the transformation $(x,y) \rightarrow (x-5,y+3)$.



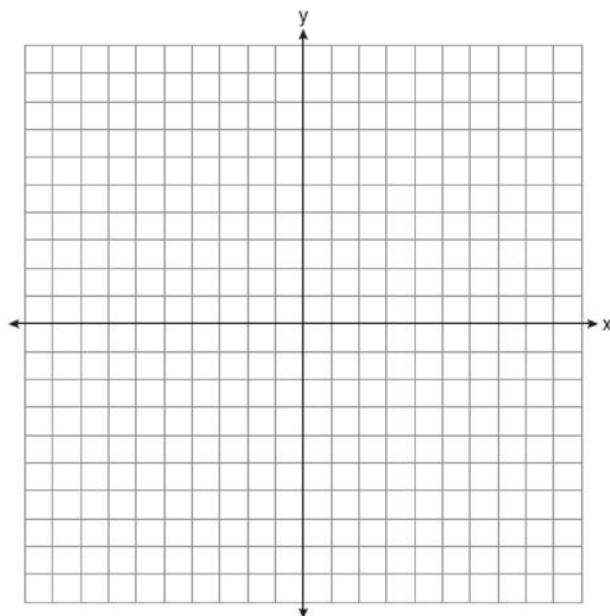
- 6 Given: $\triangle ABC$ with coordinates $A(1,2)$, $B(0,5)$, and $C(5,4)$.
- On the graph below, draw and label $\triangle ABC$.
 - Graph and state the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after the translation $T_{-6,3}$.
 - Graph and state the coordinates of $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after a reflection in the x -axis.
 - Graph and state the coordinates of $\triangle A'''B'''C'''$, the image of $\triangle A''B''C''$ after a reflection in the origin.



- 7 Triangle ABC has coordinates $A(-1,3)$, $B(3,7)$, and $C(0,6)$.
- On the graph below, draw and label $\triangle ABC$.
 - Graph and state the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection in the line $y = x$.
 - Graph and state the coordinates of $\triangle A''B''C''$, the image of $\triangle A'B'C'$ following $r_{y\text{-axis}}(\triangle A'B'C')$.
 - Graph and state the coordinates of $\triangle A'''B'''C'''$, the image of $\triangle A''B''C''$ after a translation that maps $P(0,0)$ onto $P(0,-5)$.



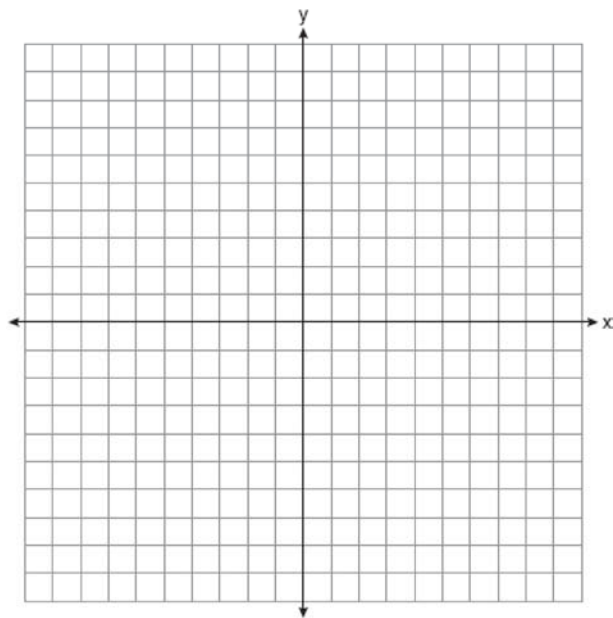
- 8 Triangle ABC has coordinates $A(-1,2)$, $B(6,2)$, and $C(3,4)$.
- On the grid below, draw and label $\triangle ABC$.
 - Graph and state the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after the composition $R_{90^\circ} \circ r_{x\text{-axis}}$.
 - Write a transformation equivalent to $R_{90^\circ} \circ r_{x\text{-axis}}$.



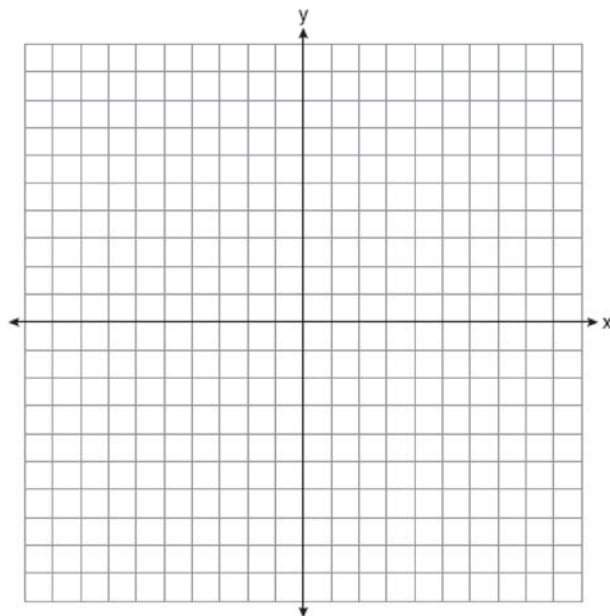
- 9 On the graph below, draw and label $\triangle PQR$, whose vertices are $P(3, 5)$, $Q(9, 5)$, and $R(7, 7)$. On the same set of axes, graph and state the coordinates of
- a $\triangle P'Q'R'$, the image of $\triangle PQR$ after R_{90° .
 - b $\triangle P''Q''R''$, the image of $\triangle P'Q'R'$ after r_{x-axis} .
 - c $\triangle P'''Q'''R'''$, the image of $\triangle P''Q''R''$ after r_{y-axis} .

Based upon these graphs, write a single transformation that shows the composition

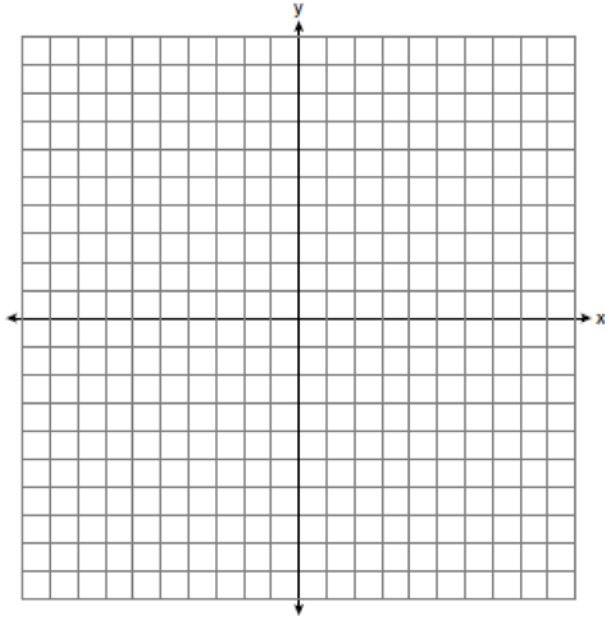
$$r_{y-axis} \circ r_{x-axis} \circ R_{90^\circ}.$$



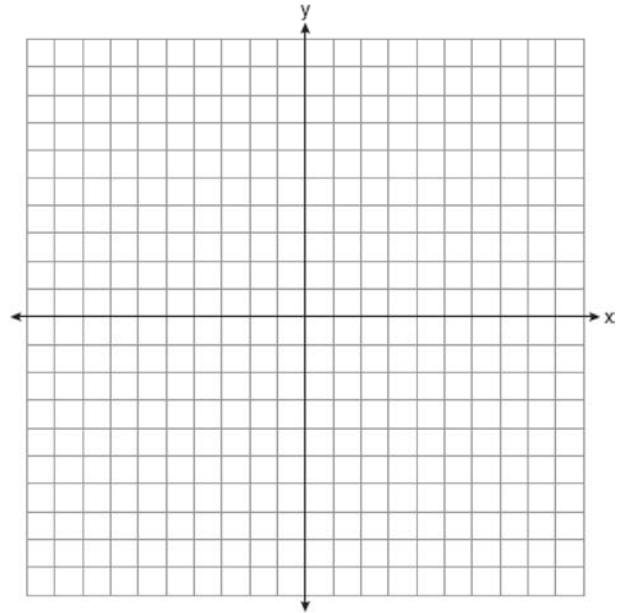
- 10 Given $\triangle ABC$ with points $A(4, 3)$, $B(4, -2)$, and $C(2, 3)$. On the grid below, sketch $\triangle ABC$. On the same set of axes, graph and state the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after a reflection in the line $y = x$. On the same set of axes, graph and state the coordinates of $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after the translation $T_{-4, 3}$.



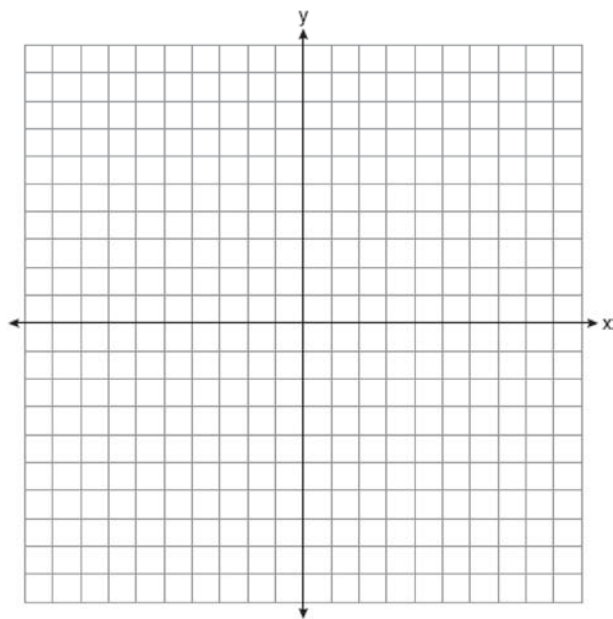
- 11 The coordinates of the vertices of parallelogram $ABCD$ are $A(-2,2)$, $B(3,5)$, $C(4,2)$, and $D(-1,-1)$. State the coordinates of the vertices of parallelogram $A''B''C''D''$ that result from the transformation $r_{y\text{-axis}} \circ T_{2,-3}$. [The use of the set of axes below is optional.]



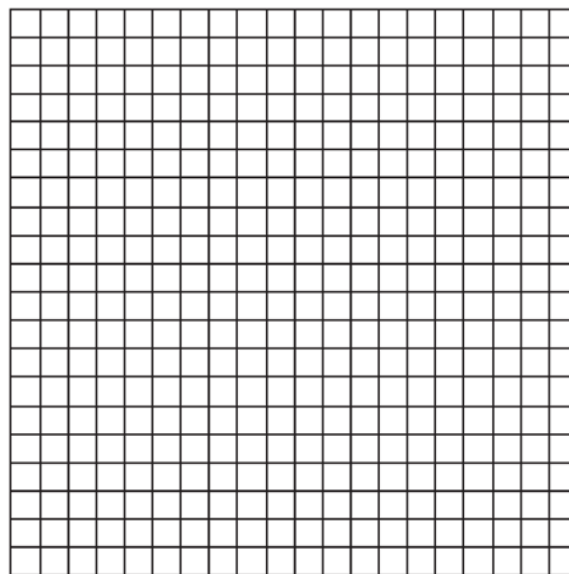
- 12 Given triangle ABC with coordinates $A(-1,-2)$, $B(0,-4)$, and $C(3,-1)$.
- On the graph below, draw and label $\triangle ABC$.
 - Graph and label $\triangle A'B'C'$, the image of $\triangle ABC$ after translation $T_{4,-3}$.
 - Graph and label $\triangle A''B''C''$, the image of $\triangle A'B'C'$ after a reflection in the origin.
 - Graph and label $\triangle A'''B'''C'''$, the image of $\triangle A''B''C''$ after a reflection in the line $y = -x$.



- 13 Triangle ABC has coordinates $A(-3, -7)$, $B(-3, -3)$, and $C(0, -3)$.
- On the graph below, graph and label $\triangle ABC$.
 - Graph and state the coordinates of $\triangle A'B'C'$, the image of $\triangle ABC$ after a point reflection in the origin.
 - Graph and state the coordinates of $\triangle A''B''C''$, the image of $\triangle A'B'C'$ reflected in the line $y = 2$.
 - Graph and state the coordinates of $\triangle A'''B'''C'''$, the image of $\triangle A''B''C''$ after translation $T_{(-8, 2)}$.



- 14 *a* On the accompanying grid, graph the equation $2y = 2x^2 - 4$ in the interval $-3 \leq x \leq 3$ and label it *a*.
- b* On the same grid, sketch the image of *a* under $T_{5, -2} \circ r_{x\text{-axis}}$ and label it *b*.

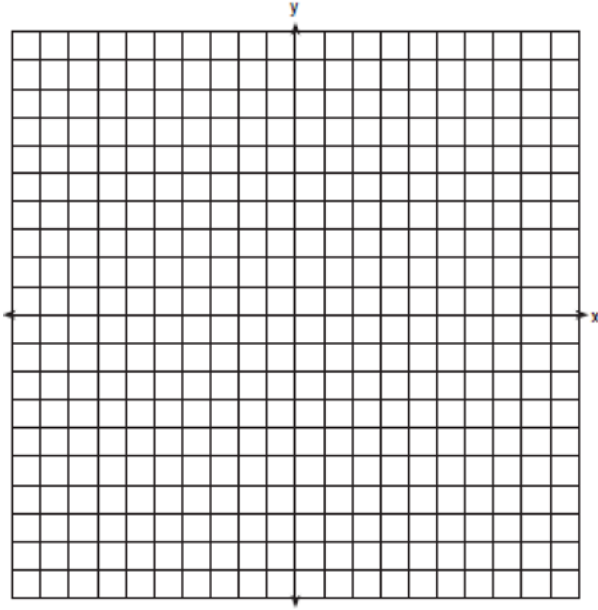


- 15 Graph and label the following equations, a and b , on the accompanying set of coordinate axes.

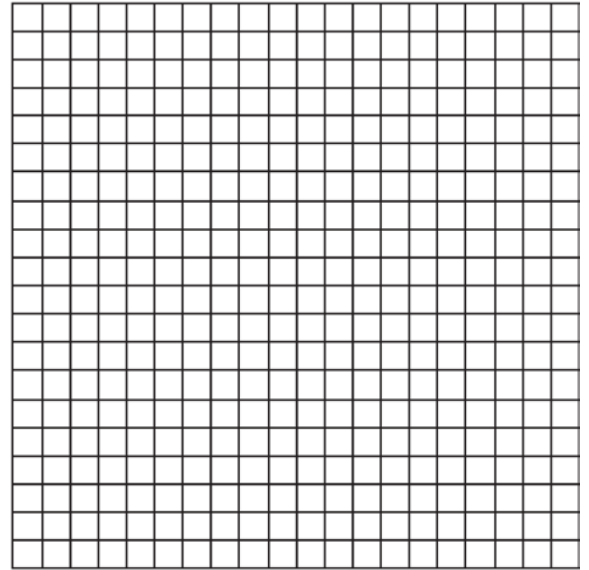
$$a: y = x^2$$

$$b: y = -(x - 4)^2 + 3$$

Describe the composition of transformations performed on a to get b .



- 16 A shape to be used in a computer game is placed on a Cartesian coordinate plane. The equation of the shape is $(x - 4)^2 + (y + 2)^2 = 4$. On the accompanying grid, graph the shape and label it a . In the game, the shape is moved under the composition $T_{2,3} \circ r_{y\text{-axis}}$. Draw this image, label it b , and state its equation.



G.G.54: Compositions of Transformations 2: Define, investigate, justify, and apply isometries in the plane (rotations, reflections, translations, glide reflections)

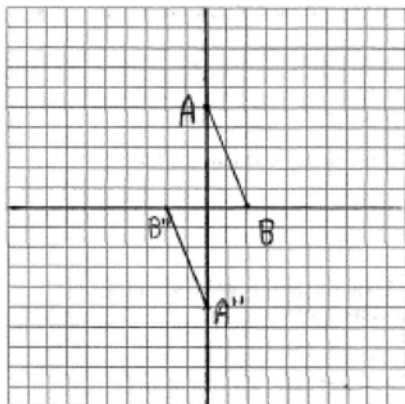
Answer Section

1 ANS: 3 PTS: 2 REF: 080219b

2 ANS:
 $(-5, -7)$

PTS: 2 REF: 080626b

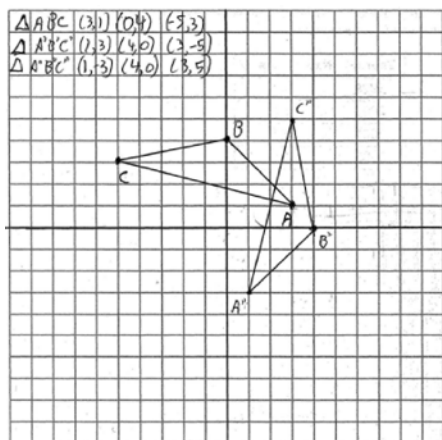
3 ANS:



Single transformations include R_{180° , R_{-180° , and $r_{(0,0)}$.

PTS: 4 REF: 080327b

4 ANS:



PTS: 4 REF: 060928b

5 ANS:

$A'(6, 1), B'(9, 2), C'(10, 7); A''(6, -1), B''(9, -2), C''(10, -7); A'''(1, 2), B'''(4, 1), C'''(5, -4)$

PTS: 10 REF: 088440siii

6 ANS:

$A'(-5, 5), B'(-6, 8), C'(-1, 7); A''(-5, -5), B''(-6, -8), C''(-1, -7); A'''(5, 5), B'''(6, 8), C'''(1, 7)$

PTS: 10 REF: 018739siii

7 ANS:

 $A'(3, -1), B'(7, 3), C'(6, 0); A''(-3, -1), B''(-7, 3), C''(-6, 0); A'''(-3, -6), B'''(-7, -2), C'''(-6, -5)$

PTS: 10

REF: 018936siii

8 ANS:

 $A'(2, -1), B'(2, 6), C'(4, 3); r_{y=x}$

PTS: 4

REF: 019541siii

9 ANS:

 $P'(-5, 3), Q'(-5, 9), R'(-7, 7); P''(-5, -3), Q''(-5, -9), R''(-7, -7); P'''(5, -3), Q'''(5, -9), R'''(7, -7); R_{270}$

PTS: 10

REF: 089938siii

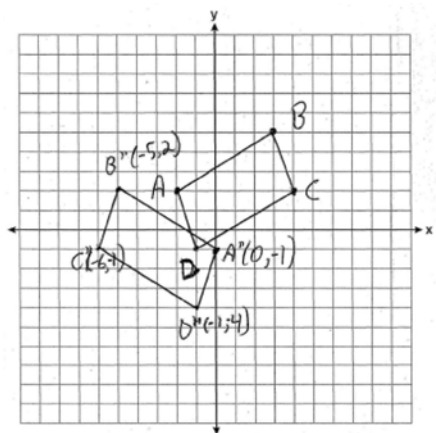
10 ANS:

 $A'(3, 4), B'(-2, 4), C'(3, 2); A''(-1, 7), B''(-6, 7), C''(-1, 5)$

PTS: 5

REF: 080141siii

11 ANS:



PTS: 4

REF: 060937ge

12 ANS:

 $A'(3, -5), B'(4, -7), C'(7, -4); A''(1, 2), B''(0, 4), C''(-3, 1); A'''(2, 1), B'''(4, 0), C'''(1, -3)$

PTS: 10

REF: 018541siii

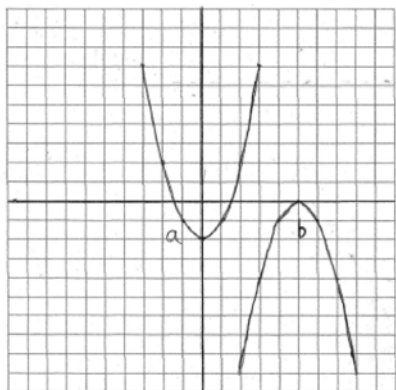
13 ANS:

 $A'(3, 7), B'(3, 3), C'(0, 3); A''(3, -3), B''(3, 1), C''(0, 1); A'''(-5, -1), B'''(-5, 3), C'''(-8, 3)$

PTS: 10

REF: 088741siii

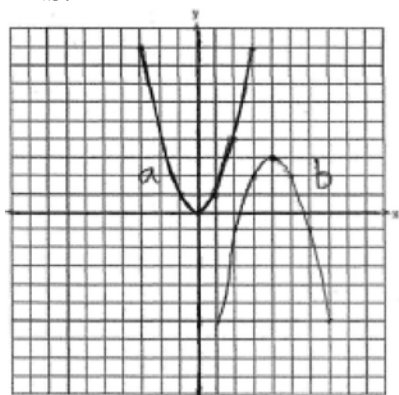
14 ANS:



PTS: 4

REF: 010232b

15 ANS:

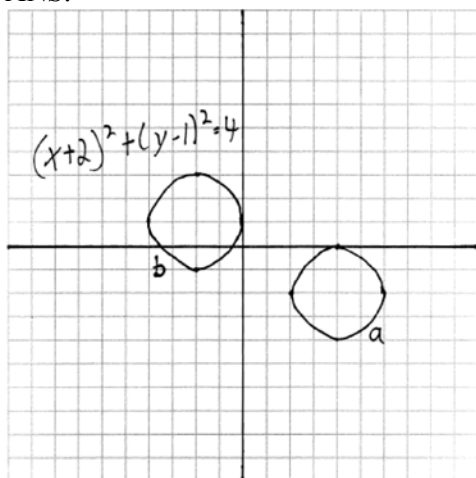


$$T_{4,3} \circ r_{x\text{-axis}}, r_{x=3} \circ T_{4,3} \text{ or } T_{4,3} \circ R_{180^\circ}$$

PTS: 4

REF: 080231b

16 ANS:



PTS: 4

REF: 061029b