

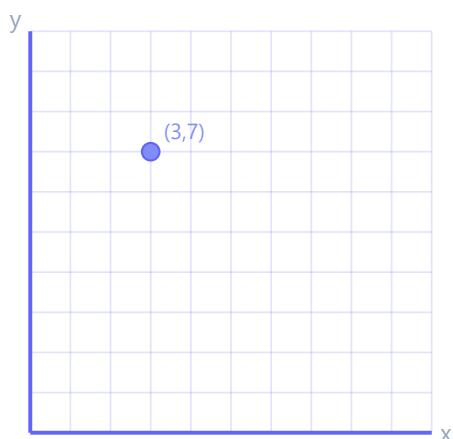
Rigid Transformations

Geometry · Grade 8

★ Hard · 14 Questions

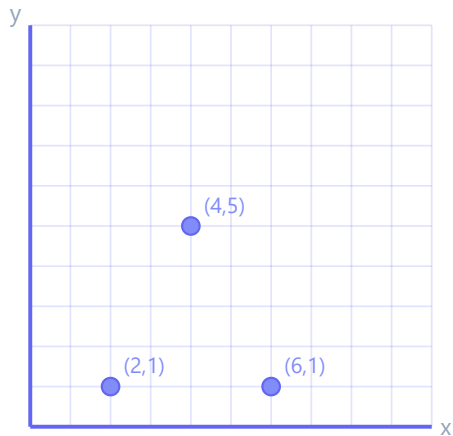
Solve each problem. Show your work in the space provided. Write your answer on the line.

1. Reflect point $(3, 7)$ first across $y=x$, then rotate 90° CW about the origin.



Answer: _____

2. Triangle T has vertices $(2,1)$, $(6,1)$, $(4,5)$. It is reflected across $y=3$. Give the new vertices.

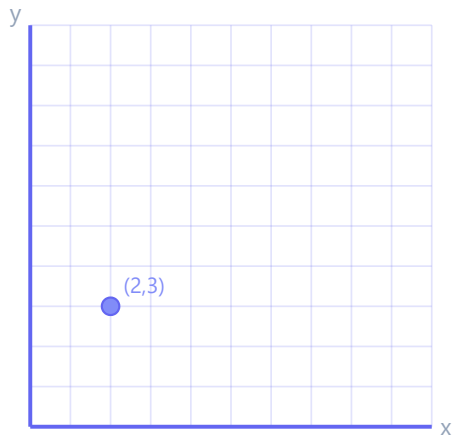


Answer: _____

3. Find the image of $(-2, 5)$ after reflection across the line $y = x + 1$.

Answer: _____

4. A point P undergoes a glide reflection: translate $(x+4, y)$ then reflect across the x-axis. Find the image of P(2,3).

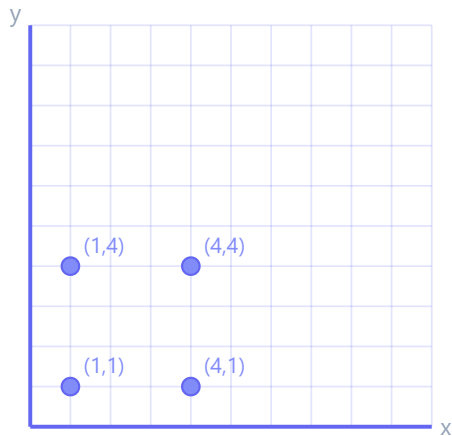


Answer: _____

5. Prove that the composition of two reflections across parallel lines is a translation. If the lines are $x=1$ and $x=4$, what translation results?

Answer: _____

6. Square ABCD: A(1,1), B(4,1), C(4,4), D(1,4). After rotating 90° CCW about the center (2.5, 2.5), give the new vertices.

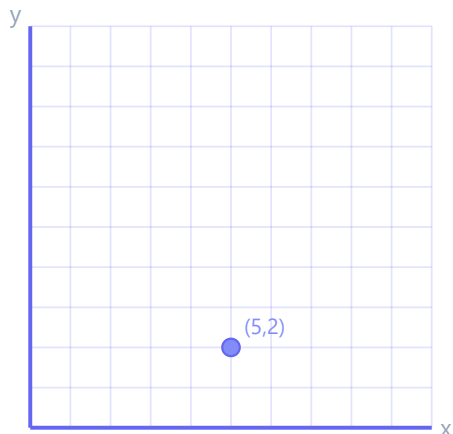


Answer: _____

7. A figure has exactly 2 lines of symmetry and 180° rotational symmetry. Name a shape that fits this description.

Answer: _____

8. Point R(5, 2) is reflected across the line $y = -x + 6$. Find R'.

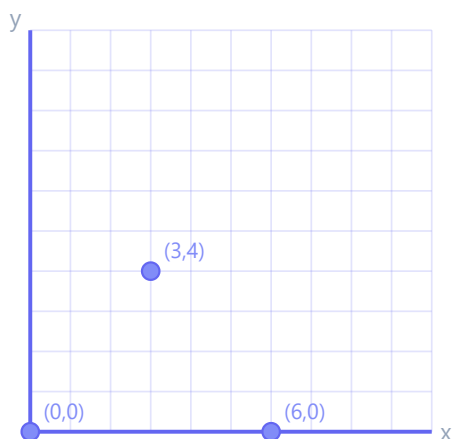


Answer: _____

9. A shape undergoes two reflections across lines that meet at 45° . What transformation is equivalent?

Answer: _____

10. Triangle A(0,0), B(6,0), C(3,4). Find the image after reflecting across the y-axis then translating $(x+2, y+3)$.

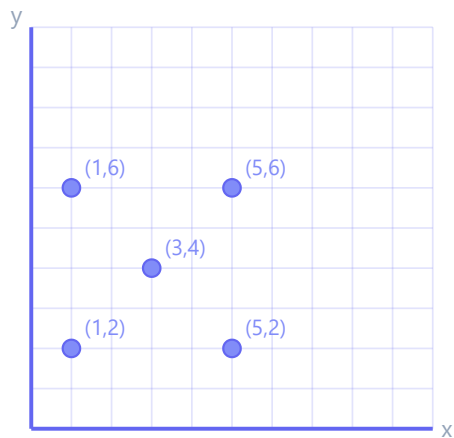


Answer: _____

11. Is the composition of a rotation and a reflection always a reflection? Explain.

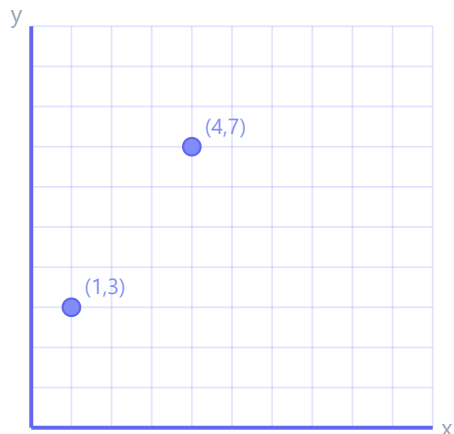
Answer: _____

12. Quadrilateral PQRS has $P(1,2)$, $Q(5,2)$, $R(5,6)$, $S(1,6)$. After 180° rotation about $(3,4)$, give the new vertices.



Answer: _____

- 13.** A translation T maps $A \rightarrow A'$ and $B \rightarrow B'$. If $A=(1,3)$, $A'=(4,7)$, $B=(-2,5)$, find B' .



Answer: _____

- 14.** Describe all symmetries of an equilateral triangle.

Answer: _____

Answer Key

Rigid Transformations — Hard

1. Final point: (3, -7)

Step1: $y=x$ reflection: $(3,7) \rightarrow (7,3)$. Step2: 90° CW: $(x,y) \rightarrow (y,-x)$: $(7,3) \rightarrow (3,-7)$.

2. (2,5), (6,5), (4,1)

Across $y=3$: $y \rightarrow 2(3)-y=6-y$. $(2,1) \rightarrow (2,5)$. $(6,1) \rightarrow (6,5)$. $(4,5) \rightarrow (4,1)$.

3. (4, -1)

Reflection across $y=x+1$: shift by -1 in $y \rightarrow y=x$. Apply $(x,y) \rightarrow (y,x)$. Then shift back. $(-2,5)$: shift y : $(-2,4)$. Swap: $(4,-2)$. Shift y back: $(4,-1)$.

4. (6, -3)

Translate: $(2+4,3)=(6,3)$. Reflect across x -axis: $(6,-3)$.

5. Translation of 6 units in the x-direction.

Distance between lines=3. Translation distance= $2 \times 3=6$ units to the right (away from first line).

6. A'(4,1), B'(4,4), C'(1,4), D'(1,1)

90° CCW about $(2.5,2.5)$: $(x,y) \rightarrow (5-y,x)$. $A(1,1) \rightarrow (4,1)$. $B(4,1) \rightarrow (4,4)$. $C(4,4) \rightarrow (1,4)$. $D(1,4) \rightarrow (1,1)$.

7. Rectangle (non-square)

A rectangle has 2 lines of symmetry (horizontal and vertical midlines) and 180° rotational symmetry.

8. (4, 1)

Line $y=-x+6$ has slope -1 , y -int 6. Foot of perpendicular from $(5,2)$: $x+y=5+2-6$? Use formula: $R'=(6-y, 6-x)=(4,1)$.

9. A rotation of 90° ($= 2 \times 45^\circ$) about the intersection point.

Two reflections across lines meeting at angle $\theta \rightarrow$ rotation of 2θ about the intersection.

10. $A''(2,3)$, $B''(-4,3)$, $C''(-1,7)$

Reflect y -axis: $A(0,0) \rightarrow (0,0)$, $B(6,0) \rightarrow (-6,0)$, $C(3,4) \rightarrow (-3,4)$. Then translate: $(0+2,0+3)=(2,3)$, $(-6+2,0+3)=(-4,3)$, $(-3+2,4+3)=(-1,7)$.

11. Yes — the composition of any rigid transformation with a reflection is a glide reflection or a simple reflection.

Composing an even number of reflections gives a rotation/translation; odd number gives a reflection/glide reflection. $\text{Rotation}(\text{even}) + \text{reflection}(\text{odd}) = \text{odd} \rightarrow \text{reflection}$.

12. $P'(5,6)$, $Q'(1,6)$, $R'(1,2)$, $S'(5,2)$

180° about $(3,4)$: $(x,y) \rightarrow (6-x, 8-y)$. $P(1,2) \rightarrow (5,6)$. $Q(5,2) \rightarrow (1,6)$. $R(5,6) \rightarrow (1,2)$. $S(1,6) \rightarrow (5,2)$.

13. $B'=(1, 9)$

Translation: $x+3$, $y+4$. $B'=(-2+3, 5+4)=(1,9)$.

14. 3 lines of reflective symmetry (through each vertex and midpoint of opposite side); rotational symmetry of 120° and 240° .

3 reflection axes + identity; rotations by 120° and 240° map it onto itself.
