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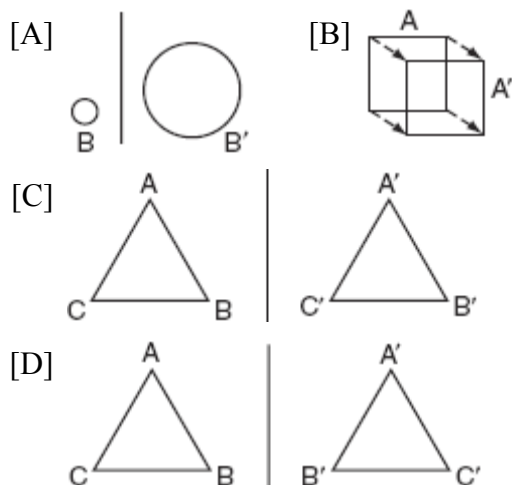
1. 080418a, P.I. G.G.54

What is the image of point $(-3, -1)$ under a reflection in the origin?

- [A] $(1, 3)$ [B] $(3, 1)$
[C] $(-1, -3)$ [D] $(-3, 1)$

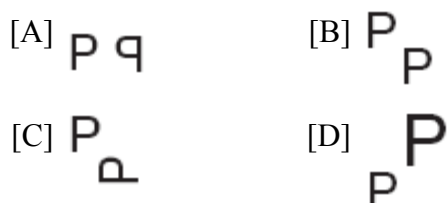
2. 010602a

Ms. Brewer's art class is drawing reflected images. She wants her students to draw images reflected in a line. Which diagram represents a correctly drawn image?



3. 010701a

Which image represents a line reflection?



4. 060905ge, P.I. G.G.54

Point A is located at $(4, -7)$. The point is reflected in the x -axis. Its image is located at

- [A] $(7, -4)$ [B] $(-4, -7)$
[C] $(-4, 7)$ [D] $(4, 7)$

5. 010007a, P.I. G.G.54

When the point $(2, -5)$ is reflected in the x -axis, what are the coordinates of its image?

- [A] $(-2, 5)$ [B] $(2, 5)$
[C] $(5, 2)$ [D] $(-5, 2)$

6. 010918a, P.I. G.G.54

What is the image of point $(-3, 7)$ after a reflection in the x -axis?

- [A] $(-3, -7)$ [B] $(7, -3)$
[C] $(3, 7)$ [D] $(3, -7)$

7. 080713a, P.I. G.G.54

What are the coordinates of point $(2, -3)$ after it is reflected over the x -axis?

- [A] $(-3, 2)$ [B] $(-2, 3)$
[C] $(2, 3)$ [D] $(-2, -3)$

8. 060825a, P.I. G.G.54

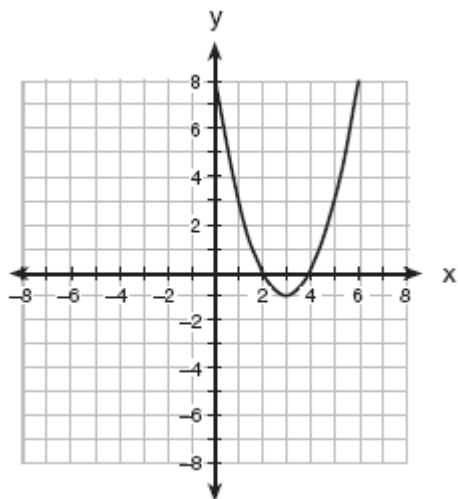
Point $(-2, 3)$ is reflected in the x -axis. In which quadrant does its image lie?

- [A] III [B] I [C] IV [D] II

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9. 010901b, P.I. G.G.54

The parabola shown in the accompanying diagram undergoes a reflection in the y -axis.



What will be the coordinates of the turning point after the reflection?

- [A] (3,1) [B] (3,-1)
[C] (-3,-1) [D] (-3,1)

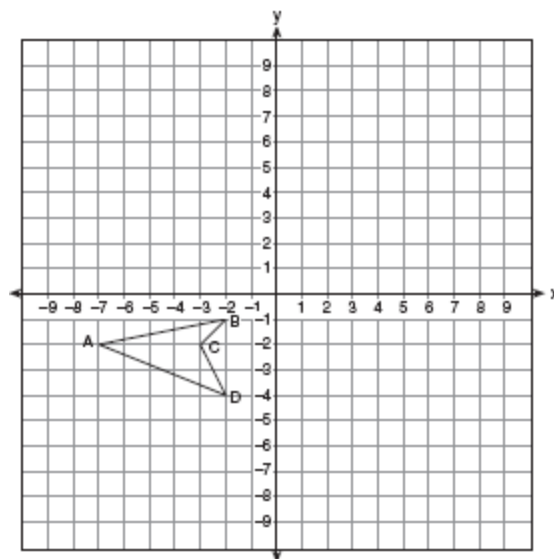
10. 060908b, P.I. G.G.54

Point $A(1,0)$ is a point on the graph of the equation $y = x^2 - 4x + 3$. When point A is reflected across the axis of symmetry, what are the coordinates of its image, point A' ?

- [A] (0,3) [B] (3,0)
[C] (2,-1) [D] (-1,2)

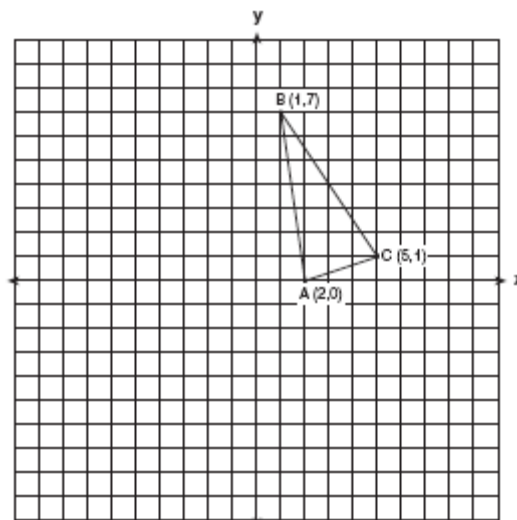
11. 060537a

On the accompanying set of axes, draw the reflection of $ABCD$ in the y -axis. Label and state the coordinates of the reflected figure.



12. 080637a

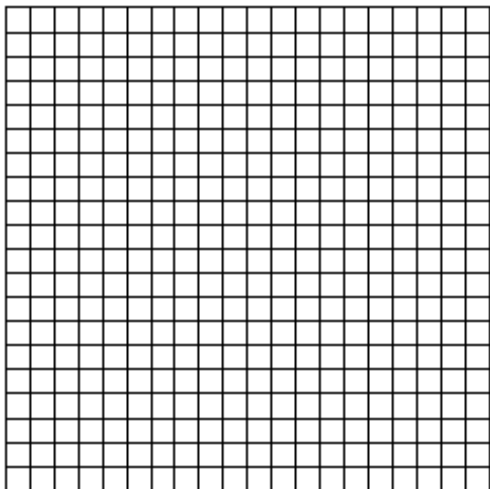
Triangle ABC has coordinates $A(2,0)$, $B(1,7)$, and $C(5,1)$. On the accompanying set of axes, graph, label, and state the coordinates of $\triangle A'B'C'$, the reflection of $\triangle ABC$ in the y -axis.



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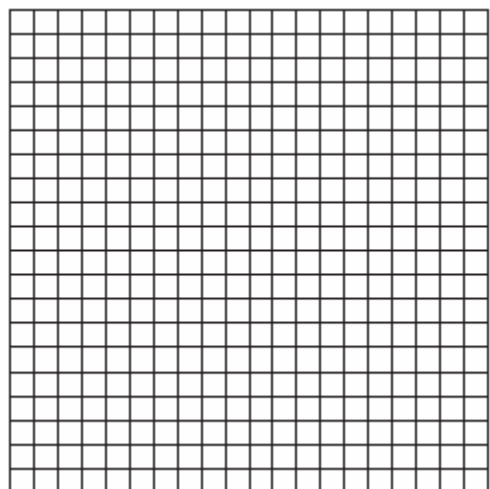
13. 010124a

The coordinates of the endpoints of \overline{AB} are $A(0,2)$ and $B(4,6)$. Graph and state the coordinates of A' and B' , the images of A and B after \overline{AB} is reflected in the x -axis.



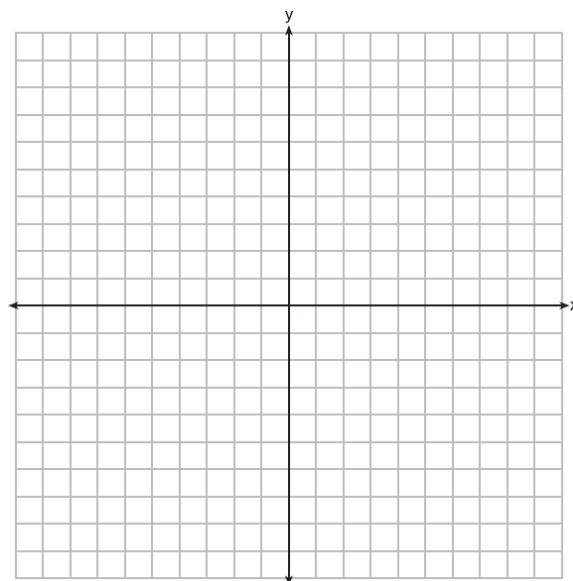
14. 060135a

Triangle SUN has coordinates $S(0,6)$, $U(3,5)$, and $N(3,0)$. On the accompanying grid, draw and label $\triangle SUN$. Then, graph and state the coordinates of $\triangle S'U'N'$, the image of $\triangle SUN$ after a reflection in the y -axis.



15. 060739a

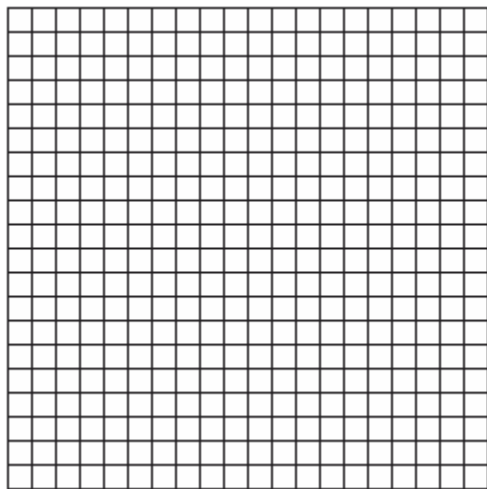
Carson is a decorator. He often sketches his room designs on the coordinate plane. He has graphed a square table on his grid so that its corners are at the coordinates $A(2,6)$, $B(7,8)$, $C(9,3)$, and $D(4,1)$. To graph a second identical table, he reflects $ABCD$ over the y -axis. On the accompanying set of coordinate axes, sketch and label $ABCD$ and its image $A'B'C'D'$, which show the locations of the two tables. Then find the number of square units in the area of $ABCD$.



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16. 010333a, P.I. G.G.54

On the accompanying grid, draw and label quadrilateral $ABCD$ with points $A(1,2)$, $B(6,1)$, $C(7,6)$, and $D(3,7)$. On the same set of axes, plot and label quadrilateral $A'B'C'D'$, the reflection of quadrilateral $ABCD$ in the y -axis. Determine the area, in square units, of quadrilateral $A'B'C'D'$.



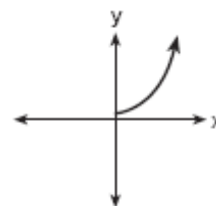
17. 060710b

A function, f , is defined by the set $\{(2,3)$, $(4,7)$, $(-1,5)\}$. If f is reflected in the line $y = x$, which point will be in the reflection?

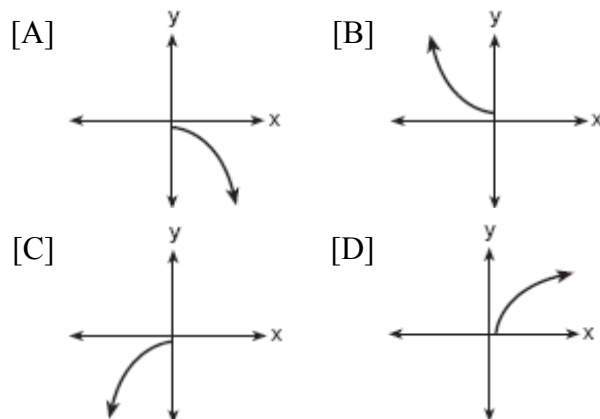
- [A] $(1,-5)$ [B] $(5,-1)$
[C] $(-1,5)$ [D] $(-5,1)$

18. 080820b

The accompanying graph shows the relationship between kinetic energy, y , and velocity, x .



The reflection of this graph in the line $y = x$ is



19. 060306b, P.I. G.G.54

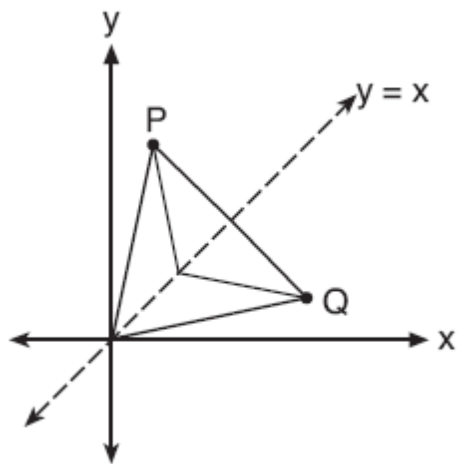
What are the coordinates of point P , the image of point $(3,-4)$ after a reflection in the line $y = x$?

- [A] $(-4,3)$ [B] $(3,4)$
[C] $(4,-3)$ [D] $(-3,4)$

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20. 010804b, P.I. G.G.56

Matthew is a fan of the Air Force's Thunderbirds flying team and is designing a jacket patch for the team, as shown in the accompanying diagram.

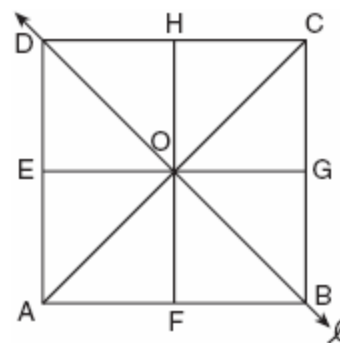


If P has the coordinates (a,b) , what are the coordinates of Q , the reflection of P in the line $y = x$?

- | | |
|-------------|--------------|
| [A] (y,x) | [B] (b,a) |
| [C] (a,b) | [D] $(-a,b)$ |

21. 060424b, P.I. G.G.56

In the accompanying diagram of square $ABCD$, F is the midpoint of \overline{AB} , G is the midpoint of \overline{BC} , H is the midpoint of \overline{CD} , and E is the midpoint of \overline{DA} .



Find the image of $\triangle EOA$ after it is reflected in line ℓ . Is this isometry direct or opposite? Explain your answer.

- [1] B _____
- [2] D _____
- [3] A _____
- [4] D _____
- [5] B _____
- [6] A _____
- [7] C _____
- [8] A _____
- [9] C _____
- [10] B _____

[3] The figure is drawn accurately and the new coordinates are labeled and stated as $J'(7,-2)$, $B'(2,-1)$, $C'(3,-2)$, and $D'(2,-4)$.

[2] One error is made in drawing the figure, such as misplotting one point, but the new coordinates are labeled and stated appropriately, based on that figure.

or [2] The figure is drawn and labeled accurately, but the new coordinates are not stated or are stated incorrectly.

or [2] The new coordinates are labeled and stated correctly, but the figure is not drawn.

[1] Two errors are made in drawing the reflected figure, but the new coordinates are labeled and stated appropriately, based on that figure.

or [1] Appropriate work is shown, but one conceptual error is made, such as reflecting the figure in the x-axis or the origin.

or [1] Correct points are plotted and labeled, but the figure is not drawn, and the coordinates are not stated.

or [1] The figure is drawn correctly, but the new coordinates are not labeled or stated.

[0] An appropriate reflection in the x-axis is drawn, and the coordinates are not labeled or stated.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[11] obviously incorrect procedure.

- [3] $A'(-2,0)$, $B'(-1,7)$, and $C'(-5,1)$ are graphed, labeled, and stated correctly.
 [2] Appropriate work is shown, but one graphing or labeling error is made.
 or [2] $A'(-2,0)$, $B'(-1,7)$, and $C'(-5,1)$, but no graph is drawn.
 [1] Appropriate work is shown, but two or more graphing or labeling errors are made.
 or [1] Appropriate work is shown, but one conceptual error is made, such as reflecting over the x -axis.
 or [1] The three points are plotted correctly, but the coordinates A' , B' , and C' are not stated.
 [0] $(-2,0)$, $(-1,7)$, and $(-5,1)$, but no further correct work is shown.
 or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [12] [2] $A'(0,-2)$ and $B'(4,-6)$ are stated, and an appropriate graph is drawn.
 [1] Only one endpoint, A' or B' , is graphed and stated correctly.
 or [1] Both endpoints are reflected in other than the x -axis, and the coordinates are graphed and stated correctly, such as:
 y -axis $A'(0,2)$ and $B'(-4,6)$
 $y = x$ $A'(2,0)$ and $B'(6,4)$
 Origin $A'(0,-2)$ and $B'(-4,-6)$
 or [1] Both points A' and B' are stated correctly, but no graph is drawn.
 or [1] An appropriate graph is drawn, but no coordinates or incorrect coordinates are labeled.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-
- [13] incorrect procedure.
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- [4] $S'(0,6)$, $U'(-3,5)$, $N'(-3,0)$, and the correct graphs of both triangles are shown.
 [3] The correct graphs of both triangles are shown, but the coordinates of $\triangle S'U'N'$ are not stated correctly.
 or [3] $\triangle SUN$ is graphed and labeled correctly, and the coordinates of $\triangle S'U'N'$ are stated correctly but not graphed correctly.
 or [3] The coordinates of $\triangle S'U'N'$ are graphed and stated correctly, but $\triangle SUN$ is not graphed or labeled.
 or [3] $\triangle SUN$ is graphed incorrectly, but the graph and the coordinates of $\triangle S'U'N'$ are appropriate, based on that error.
 [2] $\triangle S'U'N'$ is graphed correctly, but the coordinates of $\triangle S'U'N'$ are not stated, and $\triangle SUN$ is not graphed.
 or [2] $\triangle SUN$ is graphed and labeled correctly, but $\triangle S'U'N'$ is reflected in the x -axis, and the coordinates $S'(0,-6)$, $U'(3,-5)$, $N'(3,0)$ are stated.
 or [2] $\triangle SUN$ is graphed incorrectly, but $\triangle S'U'N'$ is graphed appropriately, based on that error, but the coordinates of $\triangle S'U'N'$ are not stated.
 [1] $\triangle SUN$ is graphed and labeled correctly, but no other work or completely incorrect work for $\triangle S'U'N'$ is shown.
 or [1] $\triangle S'U'N'$ is graphed correctly, but the coordinates of $\triangle S'U'N'$ are not stated, and $\triangle SUN$ is not graphed or is graphed incorrectly.
 or [1] $S'(0,6)$, $U'(-3,5)$, $N'(-3,0)$, but no work or graph is shown.
 [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
-
- [14] incorrect procedure.
-

- [4] $ABCD$ and its image $A'B'C'D'$ are graphed and labeled correctly and 29, and appropriate work is shown.
- [3] Appropriate work is shown, but one computational or graphing error is made.
 or [3] $A'B'C'D'$ is graphed and labeled correctly and 29, but $ABCD$ is not graphed.
 or [3] $ABCD$ is graphed incorrectly, but an appropriate image is graphed and labeled, and an appropriate area is found.
 or [3] $ABCD$ and $A'B'C'D'$ are graphed correctly and 29, but neither quadrilateral is labeled.
- [2] Appropriate work is shown, but two or more computational or graphing errors are made.
 or [2] Appropriate work is shown, but one conceptual error is made, such as an incorrect transformation, but the graphs are labeled, and an appropriate area is found.
 or [2] Both $ABCD$ and $A'B'C'D'$ are graphed and labeled correctly, but the area is not found.
- or [2] 29, and appropriate work is shown, such as using the distance formula and finding the area, but neither $ABCD$ nor $A'B'C'D'$ is graphed.
- [1] Appropriate work is shown, but one conceptual error and one computational or graphing error are made.
 or [1] Either $ABCD$ or $A'B'C'D'$ is graphed and labeled correctly, but no further correct work is shown.
 or [1] 29, but no work is shown and no graph is drawn.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [15]

- [4] Quadrilaterals $ABCD$ and $A'B'C'D'$ are drawn and labeled correctly and 24 is found as the area, and appropriate work is shown.
- [3] One graphing error is made in the transformation, but an appropriate area of $A'B'C'D'$ is found.
 or [3] Correct quadrilaterals are drawn and labeled, but one computational error is made in determining the area.
 or [3] Quadrilaterals $ABCD$ and $A'B'C'D'$ are drawn correctly and 24 is found as the area, but the vertices are not labeled.
- [2] Correct quadrilaterals are drawn and labeled, but no further correct work is shown.
 or [2] One conceptual error is made, such as reflecting in the x -axis, but the correct area is found.
- [1] 24, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [16]
- [17] B _____
- [18] D _____
- [19] A _____
- [20] B _____
- [2] Δ HOC and opposite, and an appropriate explanation is written.
- [1] The image of Δ EOA is identified incorrectly, but the type of isometry is appropriate, and an appropriate explanation is written.
 or [1] The difference between a direct and opposite isometry is explained correctly, but no further correct work is shown.
- or [1] Δ HOC, but no explanation or an incorrect explanation is written.
- [0] Opposite, but no further correct work is shown.
 or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [21]