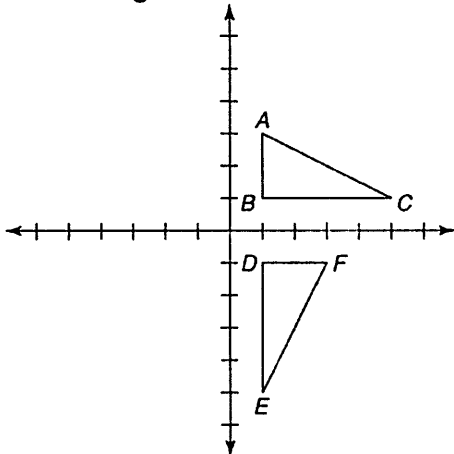


Transformations: Translations, Reflections, Rotations, Dilations

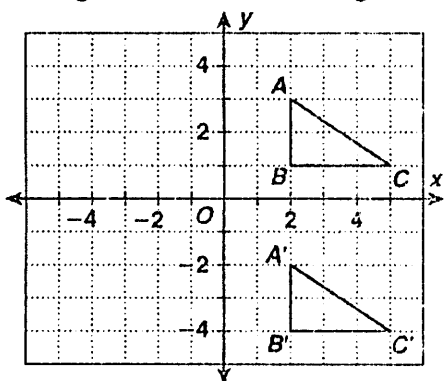
Multiple Choice

Identify the choice that best completes the statement or answers the question.

- _____ 1. How has figure DEF been transformed to form figure ABC ?

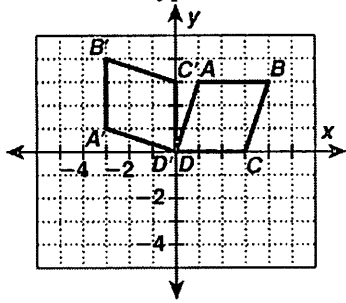


- a. reflection across x -axis
 b. 180° rotation around $(0,0)$
 c. 90° rotation around $(0,0)$
 d. translation 2 units down
- _____ 2. Which describes the transformation from the original to the image, and tells whether the two figures are similar or congruent?



- a. translation, similar
 b. translation, congruent
 c. reflection, congruent
 d. dilation, similar

3. What is the type of transformation?



- a. rotation 90° counterclockwise about point D
- b. reflection about the y -axis
- c. rotation 90° clockwise about point D
- d. reflection about the x -axis

4. Which diagram shows a reflection in the y -axis?

- a.
- b.
- c.
- d.

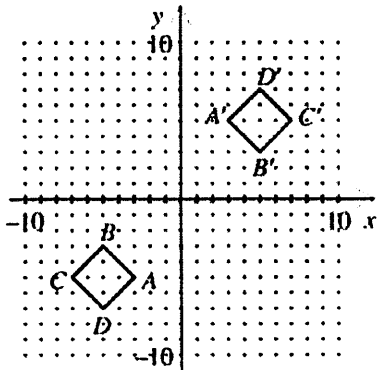
5. A circle is translated according to the rule $(x,y) \rightarrow (x + 10,y - 17)$. Which statement is true about the image of the circle after this translation?

- a. The diameter of the image is 10 times as long as the original diameter.
- b. The diameter of the image is the same length as the original diameter.
- c. The diameter of the image is 17 units shorter than the original diameter.
- d. The diameter of the image is 10 units longer than the original diameter.

6. What can be concluded from observing a 45° -degree angle reflected across the y -axis and then the x -axis?

- a. The measure of the angle doubles with each reflection.
- b. The measure of the angle increases 45 degrees with each reflection.
- c. The measure of the angle decreases by one-third with each reflection.
- d. The measure of the angle remains the same with each reflection.

_____ 7. Which of the following is the correct description of the graph shown?



- Figure $A'B'C'D'$ is the image of figure $ABCD$ under a rotation of 90° clockwise about the origin.
- Figure $A'B'C'D'$ is the image of figure $ABCD$ under a rotation of 90° counterclockwise about the origin.
- Figure $A'B'C'D'$ is the image of figure $ABCD$ under a rotation of 180° about the origin.
- Figure $A'B'C'D'$ is the image of figure $ABCD$ under a rotation of 45° counterclockwise about the origin.

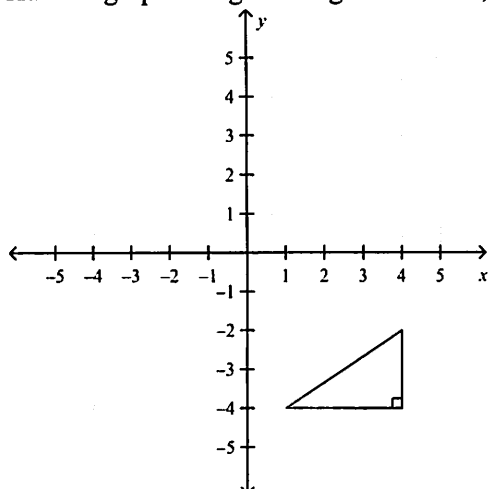
_____ 8. Which describes the transformation from the original to the image, and tells whether the two figures are similar or congruent?

- | | |
|---------------------------|--------------------------|
| a. translation, similar | c. reflection, congruent |
| b. translation, congruent | d. dilation, similar |

_____ 9. Which describes the transformation from the original to the image, and tells whether the two figures are similar or congruent?

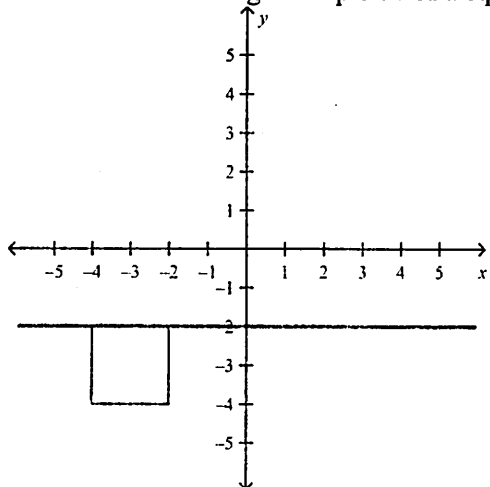
- | | |
|---------------------------|--------------------------|
| a. translation, similar | c. reflection, congruent |
| b. translation, congruent | d. dilation, similar |

- ___ 10. Hannah graphs a right triangle as shown, and then she applies the translation $(x - 6, y + 4)$.



What is the length of the horizontal base of the image?

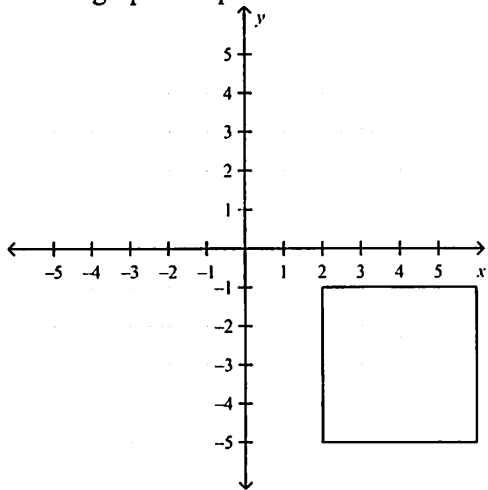
- a. 2 units
 - b. 12 units
 - c. 3 units
 - d. 11 units
- ___ 11. What happens to a horizontal line if you rotate it 90 degrees counterclockwise?
- a. It transforms into a ray, pointing to the left.
 - b. It transforms into a ray, pointing to the right.
 - c. It transforms into a vertical line.
 - d. It remains a horizontal line.
- ___ 12. A line is drawn along the top side of a square.



The square is reflected across the y -axis. What happens to the line?

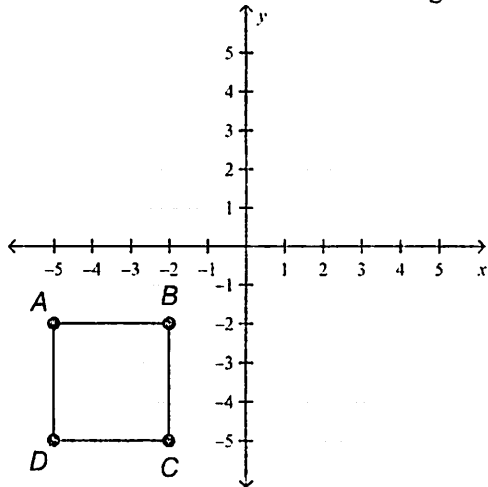
- a. The line changes to be vertical.
- b. The line goes up 4 units.
- c. The line is cut in half.
- d. The line does not change.

- _____ 13. Jalisco graphs a square.



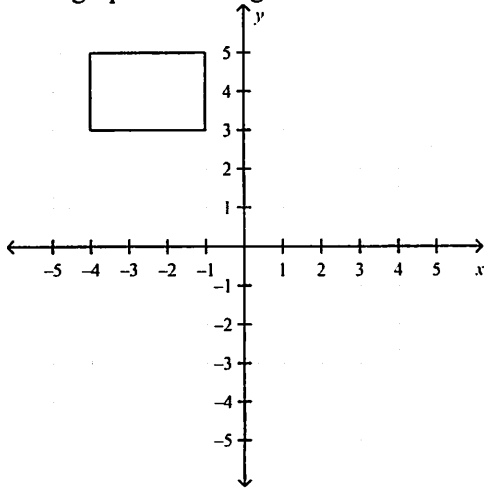
He translates the square so that one vertex is $(-3, 0)$. What are the other vertices of the image of the square?

- $(-3, 4), (1, 4), (1, 0)$
 - $(-3, 0), (1, 3), (1, 2)$
 - $(-2, 4), (0, 1), (1, 4)$
 - $(0, -3), (3, -3), (-3, -3)$
- _____ 14. What happens to a line as it rotates?
- The slope changes.
 - The line becomes shorter and then longer.
 - The line does not change.
 - The line curves.
- _____ 15. What are the coordinates of the image of $ABCD$ after a reflection over the y -axis?



- $A'(2, 2), B'(5, 2), C'(5, 5), D'(2, 5)$
- $A'(-5, 5), B'(-2, 5), C'(-2, 2), D'(-5, 2)$
- $A'(2, -2), B'(5, -2), C'(5, -5), D'(2, -5)$
- $A'(5, -2), B'(2, -2), C'(2, -5), D'(5, -5)$

_____ 16. Josef graphs a rectangle.



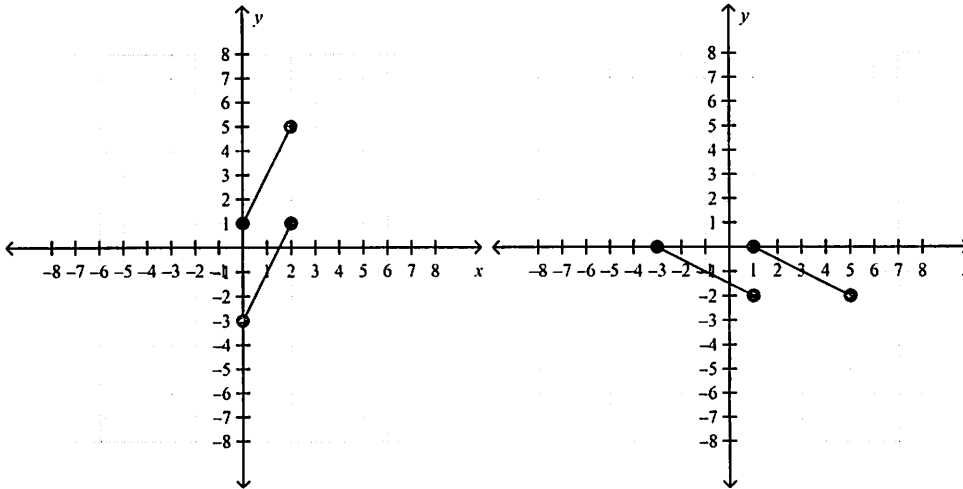
The rectangle is reflected across the x -axis. How do the angles in the image rectangle compare to the angles in the original rectangle?

- The measures of the angles are the same.
- The measures of the angles decrease by one-half.
- The measures of the angles double.
- Some of the angles increase in measure, and other angles decrease in measure.

_____ 17. Describe the result when a square in Quadrant III with two horizontal sides is reflected across the y -axis.

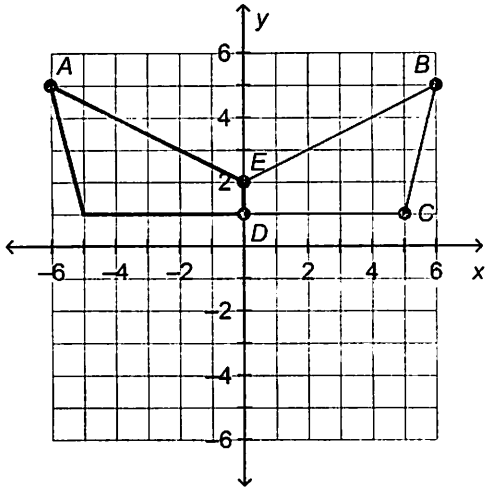
- The horizontal sides become vertical parallel line segments.
- The horizontal sides move up 4 units.
- The lengths of the horizontal sides are reduced by one-half.
- The horizontal sides move to Quadrant IV and remain horizontal.

18. Jo uses geometry software to rotate two parallel segments 90° clockwise about the origin. The resultant segments are shown at the right. Which statement is true?

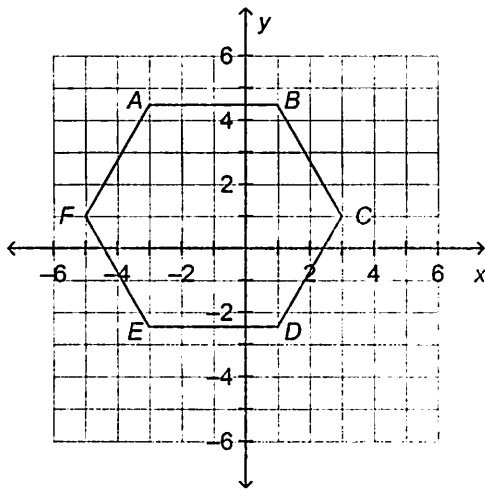


- The resultant segments are parallel.
 - Each resultant segment is parallel to its original segment.
 - The resultant segments are not parallel.
 - It cannot be determined whether the resultant segments are parallel.
19. Point A is located at $(5, -5)$, and point B is located at $(0, -5)$. \overline{AB} is rotated counterclockwise 90° about the origin. What are the coordinates of points A' and B' , the images of points A and B after the rotation?
- $A'(-5, 0)$; $B'(-5, -5)$
 - $A'(-5, -5)$; $B'(-5, 0)$
 - $A'(5, 5)$; $B'(5, 0)$
 - $A'(5, 0)$; $B'(5, 5)$

20. Seth is designing a symmetrical logo for his store. He draws half of the logo, which is shown in the second quadrant below. He then reflects that half of the logo across the y -axis to finish it. Which angle in the reflection has the same measure as $\angle A$?



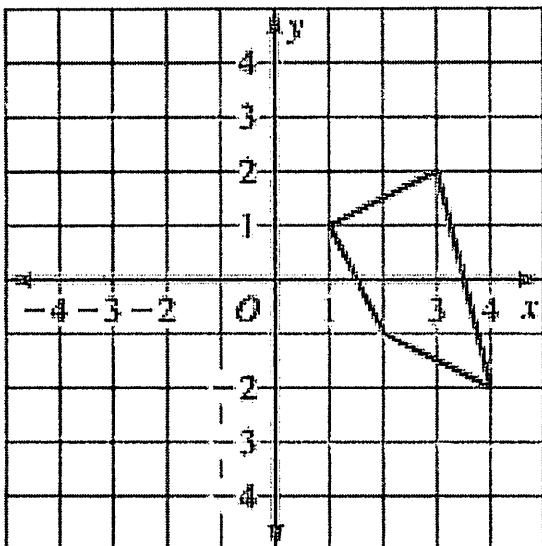
- a. $\angle B$
 - b. $\angle C$
 - c. $\angle D$
 - d. $\angle E$
21. In the regular hexagon shown, the images of which sides are NOT parallel after the hexagon is reflected across the y -axis?



- a. \overline{AB} and \overline{DE}
- b. \overline{EF} and \overline{BC}
- c. \overline{CD} and \overline{EF}
- d. \overline{AF} and \overline{CD}

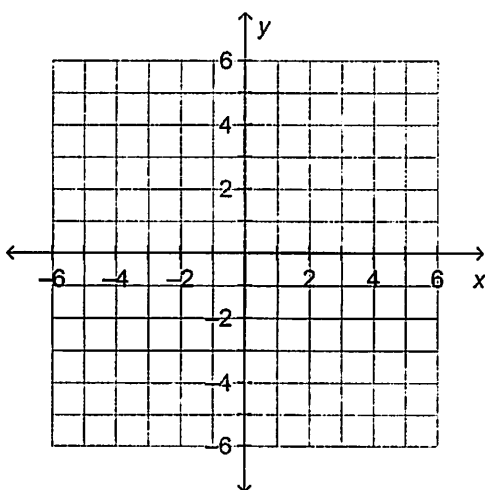
Short Answer

1. Graph the image after a translation of $(x, y) \rightarrow (x - 4, y + 2)$.



Problem

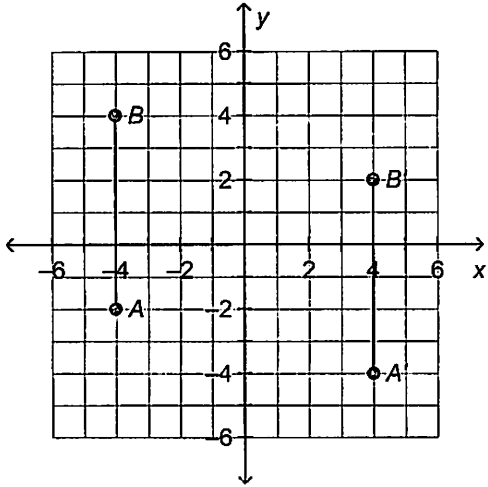
1. Point A has coordinates $(2, 3)$, and point B has coordinates $(-2, 3)$.
- Draw \overline{AB} on the coordinate plane.
 - What is the length of \overline{AB} ?
 - Draw the image $\overline{A'B'}$ resulting from a 180° rotation of \overline{AB} clockwise about the origin. What do you notice about the length of $\overline{A'B'}$?



Name: _____

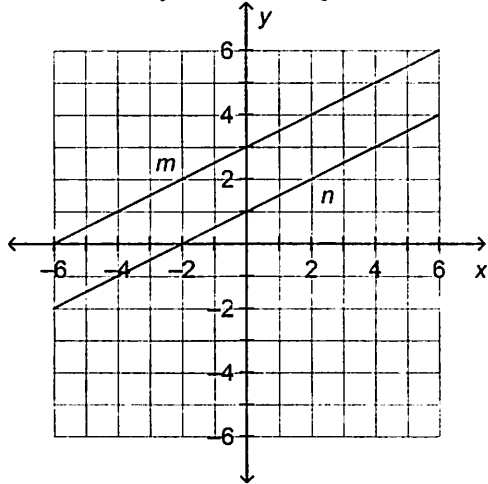
ID: A

2. The graph below shows \overline{AB} . Describe a series of transformations that could be performed to get from \overline{AB} to $\overline{A'B'}$.

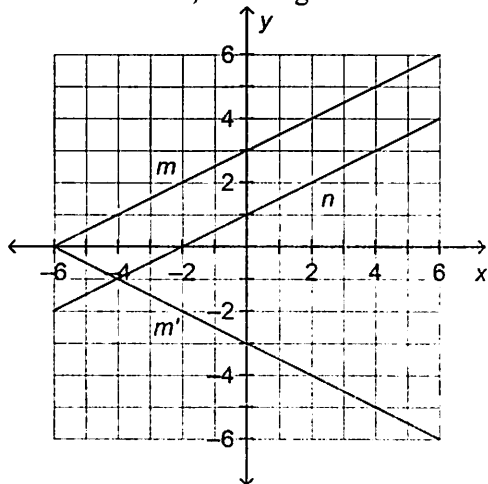


3. Lines m and n , shown below, are parallel. The equation of line m is $y = \frac{1}{2}x + 3$, and the equation of line n is $y = \frac{1}{2}x + 1$.

a. What is always true about parallel lines on a coordinate plane?



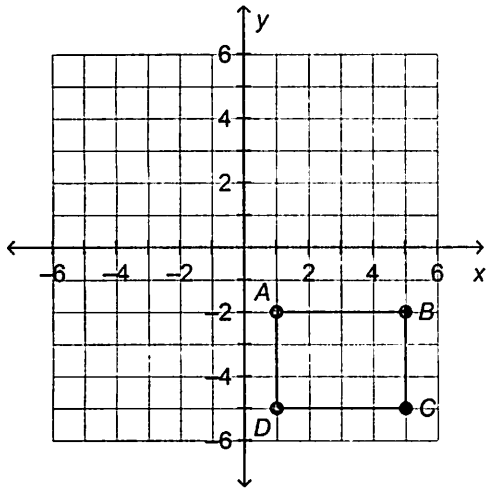
- b. Line m' is the image of line m after the transformation $(x, y) \rightarrow (x, -y)$, which is a reflection over the x -axis. Draw n' , the image of line n after the same transformation.



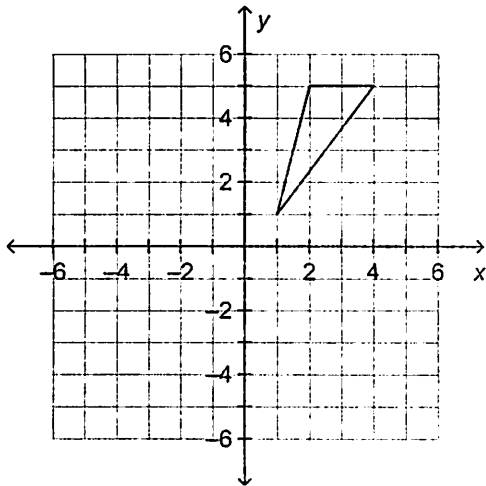
- c. What are the equations of line m' and line n' ?
 d. Are lines m' and n' parallel? Explain.

4. Rectangle $ABCD$ is shown.

- Which pairs of sides of the rectangle are parallel?
- The translation $(x, y) \rightarrow (x - 4, y + 7)$ is applied to $ABCD$. Draw the image of $ABCD$ and label it as $A'B'C'D'$.
- What pairs of sides from $A'B'C'D'$ are parallel? Explain.



5. The triangle shown is first translated left 5 units, then reflected across the x -axis, and finally translated up 3 units.



What are the coordinates of the final image? Is this triangle congruent to the original? Explain.

Transformations: Translations, Reflections, Rotations, Dilations

Answer Section

MULTIPLE CHOICE

1. ANS: C PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1
DOK: DOK 1
2. ANS: B PTS: 1
NAT: NT.CCSS.MTH.10.8.8.G.1 | NT.CCSS.MTH.10.8.8.G.1.a | NT.CCSS.MTH.10.8.8.G.1.b |
NT.CCSS.MTH.10.8.8.G.2 DOK: DOK 1
3. ANS: C PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1
DOK: DOK 1
4. ANS: D PTS: 1 REF: M3.08.EN.ST.08
NAT: NT.CCSS.MTH.10.8.8.G.1 KEY: transformation | reflection | y-axis
DOK: DOK 1
5. ANS: B PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1
DOK: DOK 2
6. ANS: D PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1
DOK: DOK 2
7. ANS: C PTS: 1 REF: BMGM0197 NAT: NT.CCSS.MTH.10.8.8.G.1
TOP: Translations and Rotations KEY: graph | rotation
DOK: DOK 2
8. ANS: A PTS: 1
NAT: NT.CCSS.MTH.10.8.8.G.1 | NT.CCSS.MTH.10.8.8.G.1.a | NT.CCSS.MTH.10.8.8.G.1.b |
NT.CCSS.MTH.10.8.8.G.1.c | NT.CCSS.MTH.10.8.8.G.2 DOK: DOK 1
9. ANS: A PTS: 1
NAT: NT.CCSS.MTH.10.8.8.G.1 | NT.CCSS.MTH.10.8.8.G.1.a | NT.CCSS.MTH.10.8.8.G.1.b |
NT.CCSS.MTH.10.8.8.G.1.c | NT.CCSS.MTH.10.8.8.G.2 DOK: DOK 1
10. ANS: C PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1.a
DOK: DOK 2
11. ANS: C PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1.a
DOK: DOK 3
12. ANS: D PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1.a
DOK: DOK 3
13. ANS: A PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1.a
DOK: DOK 3
14. ANS: A PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1.a
DOK: DOK 3
15. ANS: D PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1.b
DOK: DOK 2
16. ANS: A PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1.b
DOK: DOK 2
17. ANS: D PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1.c
DOK: DOK 2
18. ANS: A PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1.c
KEY: rotation | parallel lines DOK: DOK 2

19. ANS: C

Rotating \overline{AB} counterclockwise 90° around the origin will rotate point A from $(5, -5)$ to $(5, 5)$ and point B from $(0, -5)$ to $(5, 0)$. So, point A' is located at $(5, 5)$, and point B' is located at $(5, 0)$.

	Feedback
A	A 90° counterclockwise rotation about the origin takes a point (x, y) to the image point $(-y, x)$.
B	These are the coordinates of the images of A and B after a 90° clockwise rotation.
C	That's correct!
D	A 90° counterclockwise rotation about the origin takes a point (x, y) to the image point $(-y, x)$.

PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1.a

KEY: rotations in the coordinate plane | line segments

DOK: DOK 1

20. ANS: A

$\angle B$ in the image corresponds to $\angle A$ in the original figure. Since reflecting an angle does not change the measure of the angle, $m\angle A = m\angle B$.

	Feedback
A	That's correct!
B	$\angle C$ in the image does not correspond to $\angle A$ in the original figure.
C	$\angle D$ in the image does not correspond to $\angle A$ in the original figure.
D	$\angle E$ in the image does not correspond to $\angle A$ in the original figure.

PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1.b

KEY: reflections | angle measures

DOK: DOK 1

21. ANS: C

\overline{CD} and \overline{EF} are not parallel in the original hexagon, so the images of \overline{CD} and \overline{EF} will not be parallel.

	Feedback
A	\overline{AB} and \overline{DF} are parallel in the original hexagon.
B	\overline{EF} and \overline{BC} are parallel in the original hexagon.
C	That's correct!
D	\overline{AF} and \overline{CD} are parallel in the original hexagon.

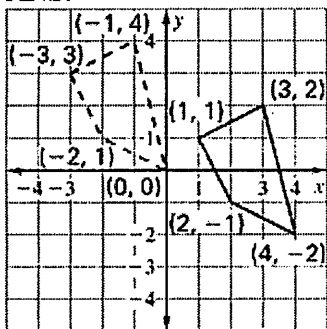
PTS: 1 NAT: NT.CCSS.MTH.10.8.8.G.1.c

KEY: reflections | parallel lines

DOK: DOK 1

SHORT ANSWER

1. ANS:



PTS: 1

REF: M3.08.EN.CTB.21

NAT: NT.CCSS.MTH.10.8.8.G.1 | NT.CCSS.MTH.10.8.8.G.1.a | NT.CCSS.MTH.10.8.8.G.1.b |

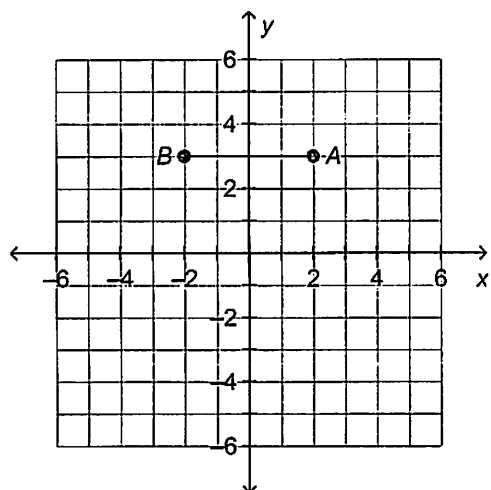
NT.CCSS.MTH.10.8.8.G.3 | NT.CCSS.MTH.10.9-12.G.CO.5 KEY: transformations | translations

DOK: DOK 2

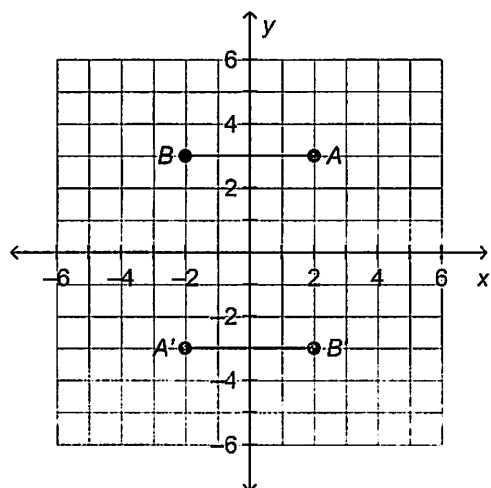
PROBLEM

1. ANS:

a.

b. The length of \overline{AB} is $|2 - (-2)| = 4$ units.

c.



The length of $\overline{A'B'}$ is $|2 - (-2)| = 4$, which is equal to the length of \overline{AB} .

Rubric

a. 1 point

b. 1 point

c. 1 point for rotation; 1 point for saying lengths are the same

PTS: 4

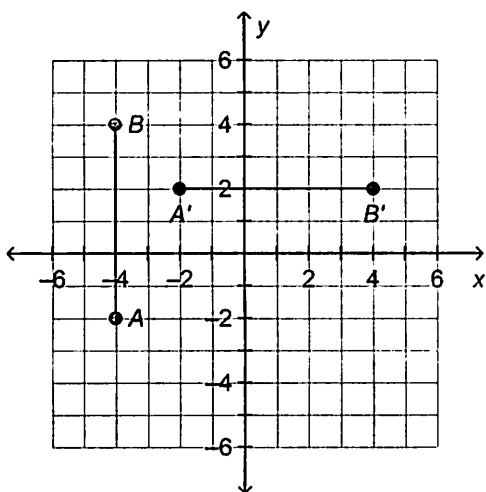
NAT: NT.CCSS.MTH.10.8.8.G.1.a

KEY: rotations in the coordinate plane | line segments

DOK: DOK 1

2. ANS:

No, Gale's work is not correct. He drew \overline{AB} reflected across the y -axis and translated 2 units down. The correct result is shown below.



The image segment is horizontal, while the original segment is vertical. The length of each line segment is the same, 6 units.

Rubric

1 point for answer; 1 point for saying Gale drew a reflection instead of a rotation; 1 point for correctly drawing the transformed segment; 1 point for saying the image segment is horizontal and the lengths are the same

PTS: 4

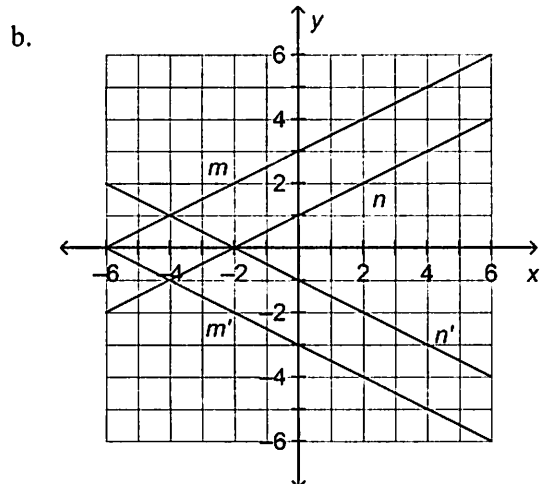
NAT: NT.CCSS.MTH.10.8.8.G.1.a | NT.CCSS.MTH.10.K-12.MP.3

KEY: reflections in the coordinate plane | rotations in the coordinate plane | line segments | error analysis

DOK: DOK 2

3. ANS:

- a. Having the same slope makes sense because it means that if you start at two corresponding points on the lines, such as $(0, 1)$ and $(0, 3)$, no matter how you move horizontally (change in x), the corresponding vertical movement (change in y) is the same for the two lines, which means that the lines will never intersect (that is, they will be parallel).



- c. Line m' has the equation $y = -\frac{1}{2}x - 3$.

Line n' has the equation $y = -\frac{1}{2}x - 1$.

- d. Yes, the lines are parallel because the slope of both lines is $-\frac{1}{2}$.

Rubric

- a. 1 point
 b. 1 point
 c. 0.5 point for each equation
 d. 1 point for answer; 1 point for explanation

PTS: 5

NAT: NT.CCSS.MTH.10.8.8.G.1.c | NT.CCSS.MTH.10.3.8.G.1.a | NT.CCSS.MTH.10.8.8.EE.6 |

NT.CCSS.MTH.10.K-12.MP.3

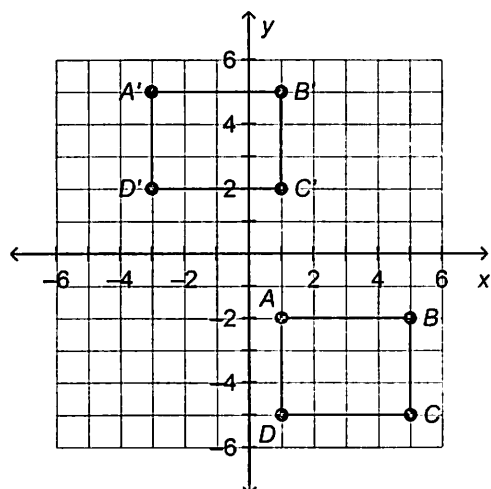
KEY: transformations | parallel lines | slope | equation of a line

DOK: DOK 3

4. ANS:

a. $\overline{AB} \parallel \overline{CD}$ and $\overline{AD} \parallel \overline{BC}$

b.

c. $\overline{A'B'} \parallel \overline{C'D'}$ and $\overline{A'D'} \parallel \overline{B'C'}$ because translations of figures preserve parallel sides.**Rubric**

- a. 0.5 point for each pair of parallel sides
- b. 1 point
- c. 0.5 point for each pair of parallel sides; 1 point for explanation

PTS: 4 NAT: NT.CCSS.MTH.10.8.8.G.1.c | NT.CCSS.MTH.10.8.8.G.1.a

KEY: translations | parallel lines DOK: DOK 2

5. ANS:

- a. $(x, y) \rightarrow (x - 5, y)$
- $(x, y) \rightarrow (x, -y)$
- $(x, y) \rightarrow (x, y + 3)$

b. $(-4, 2), (-3, -2), (-1, -2)$; yes, this triangle is congruent to the original triangle because it is the result of a sequence of translations and a reflection.**Rubric**

- a. 0.5 point for each transformation
- b. 0.5 point for coordinates; 1 point for saying congruent; 1 point for explanation

PTS: 4 NAT: NT.CCSS.MTH.10.8.8.G.2

KEY: congruence | sequence of transformations | translation | reflection

DOK: DOK 2