Transformations

Transformations: CLASSWORK

Tell whether the transformation appears to be a rigid motion. Explain.

1.  

2.  

3. Identify the type of transformation. What is the image of segment $FG$?

4. Identify the type of transformation. What is the image of angle $J$?
Transformations: HOMEWORK

Tell whether the transformation appears to be a rigid motion. Explain.

1. 

Preimage  Image

2. 

Preimage  Image

3. Identify the type of transformation. What is the image of segment $QR$?

4. Identify the type of transformation. What is the image of angle $T$?
Translations: CLASSWORK

Graph the image of each figure under the given translation.

1. \( T_{-1, 4} : (\triangle ABC) \)

2. \( T_{3, -3} : (JKLM) \)

3. Write a rule to describe the translation.

4. If \( T_{10, 7} : (QRST) = Q'R'S'T' \), what translation maps 'Q'R'S'T' onto QRST?
5. ΔXYZ has coordinates X(2, 3), Y(1, 4), and Z(8, 9). A translation maps X to X'(4, 8). What are the coordinates for Y' and Z' for this translation?

6. Write three different translation rules for which the image of ΔABC has a vertex at the origin.

Translantions: Homework

Graph the image of each figure under the given translation.
1. \( T_{<3, -2>} : (ΔDEF) \)

   \( T_{<4, 0>} : (WXYZ) \)
3. Write a rule to describe the translation.

4. If $T_{<4, 9>}: (\triangle LMN) = \triangle L'M'N'$, what translation maps $\triangle L'M'N'$ onto $\triangle LMN$?

5. $\triangle ABC$ has coordinates $A(2, 3)$, $B(4, -2)$, and $C(3, 0)$. After a translation the coordinates of $A'$ are $(6, -2)$. What are the coordinates of $B'$ and $C'$?

6. Write three different translation rules for which the image of $\triangle BCD$ has a vertex at the origin.
Reflections: CLASSWORK

For numbers 1-6 find the coordinates of each image.

1. $R_{x}\text{-axis} \; (A)$

2. $R_{y}\text{-axis} \; (B)$

3. $R_{y} = x \; (C)$

4. $R_{x} = 2 \; (D)$

5. $R_{y} = -1 \; (E)$

6. $R_{x} = -3 \; (F)$

7. Given points $A(3, 3), B(5, -2), \text{ and } C(4, 4)$, graph $\Delta ABC$ and its reflection image as indicated.
   
   a. $R_{y}\text{-axis} \; (\Delta ABC)$
   
   b. $R_{x}\text{-axis} \; (\Delta ABC)$
c. $R_x = 1(\Delta ABC)$

d. $R_y = -2(\Delta ABC)$

Draw the line of reflection you can use to map one figure onto the other.

8. [Diagram]

9. [Diagram]

10. Find the image of $J(-2, 1)$ after two reflections, first across line $\ell_1$, and then across line $\ell_2$.

   a. $\ell_1 : x = 2$, $\ell_2 : y$-axis
   b. $\ell_1 : y = -1$, $\ell_2 : y$-axis
   c. $\ell_1 : y = 2$, $\ell_2 : x$-axis
   d. $\ell_1 : x = -1$, $\ell_2 : y = -3$

11. Give an example of a place you may see a geometric reflection in everyday life. Explain.
PARCC-type question:
12. Quadrilateral ABCD is graphed in the coordinate plane with the vertices A(3, 2), B(4, 0), C(7, -2), and D(6, 5) as shown in the figure.

Part A:
Quadrilateral ABCD will be reflected across the line \( x = 2 \) to form quadrilateral A'B'C'D'. List all quadrants of the xy-coordinate plane that will contain at least one vertex of quadrilateral A'B'C'D'.

Part B:
Quadrilateral ABCD will be reflected across the line \( x = 2 \) to form quadrilateral A'B'C'D'. What are the coordinates of C'?

Reflections: HOMEWORK
For numbers 1-6 find the coordinates of each image.

1. \( R_{x-axis} \) (A)
2. \( R_{y-axis} \) (B)
3. \( R_{y=x} \) (C)
4. \( R_{x=3} \) (D)
5. \( R_{y=2} \) (E)
6. \( R_{x=-1} \) (F)
7. Given points \(D(-2, 1), E(1, 3),\) and \(F(2, -2),\) graph \(\triangle DEF\) and its reflection image as indicated.

a. \(R_y\)-axis (\(\triangle DEF\))

b. \(R_x\)-axis (\(\triangle DEF\))

c. \(R_x = 2(\triangle DEF)\)

d. \(R_y = -1(\triangle DEF)\)
Draw the line of reflection you can use to map one figure onto the other.

8. 

9. 

10. Find the image of $K(4, -3)$ after two reflections, first across line $\ell_1$, and then across line $\ell_2$.
    a. $\ell_1 : x = 2, \ell_2 : y$-axis
    b. $\ell_1 : y = -1, \ell_2 : y$-axis
    c. $\ell_1 : y = 2, \ell_2 : x$-axis
    d. $\ell_1 : x = -1, \ell_2 : y = -3$

11. Give an example of a place you may see a geometric reflection in everyday life (Different than your classwork answer). Explain

PARCC-type question:
12. Triangle EFG is graphed in the coordinate plane with the vertices $E(-3, -7)$, $F(0, -4)$, and $G(4, -6)$ as shown in the figure.

Part A:
Triangle EFG will be reflected across the line $y = -1$ to form $\Delta E'F'G'$. List all quadrants of the $xy$-coordinate plane that will contain at least one vertex of $\Delta E'F'G$.

Part B:
Triangle EFG will be reflected across the line $y = -1$ to form $\Delta E'F'G$. What are the coordinates of $G'$?
Rotations: CLASSWORK

Draw the image of each figure for the given rotation about $P$. Use prime notation to label the vertices of the image.

1. $r_{60^\circ}, P(\triangle ABC)$

2. $r_{85^\circ}, P(\triangle ABC)$

3. Point $O$ is the center of regular pentagon $JKLMN$. Find the image of the given point or segment for the given rotation. (counterclockwise)
   
   a. $r_{144^\circ}, O(K)$
   
   b. $r_{72^\circ}, O(N)$
   
   c. $r_{216^\circ}, O(ML)$
   
   d. $r_{360^\circ}, O(JN)$
   
   e. $r_{288^\circ}, O(JO)$
4. ΔABC has vertices A(2, 2), B(3, −2), and C(−1, 3).
   a. Graph \( r_{270^\circ}, O(\Delta ABC) \).
   b. Graph \( r_{180^\circ}, O(\Delta ABC) \).
   c. Graph \( r_{90^\circ}, O(\Delta ABC) \).

5. The vertices of \( ABCD \) have coordinates \( A(2, 6), B(-3, 4), C(-3, -5), \) and \( D(4, -2) \). What are the coordinates of the vertices of \( r_{180^\circ}, O(ABCD) \)?
6. The vertices of $r(270^\circ, O) \,(DEFG)$ have coordinates $D'(4, 5), E'(4, -3), F'(-2, -3)$, and $G'(-2, 5)$. What are the coordinates of the vertices of $DEFG$?

7. $ABCD$ has vertices $A(4, 2), B(-2, 2), C(-4, -2)$, and $D(2, -2)$. Which of the following quadrilaterals is $r(180^\circ, O)(ABCD)$?

   a. $ABCD$  
   b. $BCDA$  
   c. $CDAB$  
   d. $DABC$

8. $\triangle FGH$ has vertices $F(-1, 2), G(0, 0)$, and $H(3, -1)$. What are the coordinates of the vertices of $r(-270^\circ, G)(\triangle FGH)$?

**PARCC-type Question**

9. Triangle $ABC$ is shown in the $xy$-coordinate plane. Triangle $ABC$ is rotated $90^\circ$ counterclockwise around the point $(-6, 2)$. Indicate whether each of the listed figures of the image will or will not be the same as the corresponding feature in the original triangle.

<table>
<thead>
<tr>
<th>The coordinates of $A'$</th>
<th>The coordinates of $C'$</th>
<th>The perimeter of $\triangle A'B'C'$</th>
<th>The area of $\triangle A'B'C'$</th>
<th>The measure of $B'$</th>
<th>The slope of $A'C'$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will be the same</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will not be the same</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Rotations: HOMEWORK

Draw the image of each figure for the given rotation about $P$. Use prime notation to label the vertices of the image.

1. $r_{90^\circ}, P(\Delta ABC)$

![Diagram of ΔABC rotated 90° clockwise around P](image1)

2. $r_{110^\circ}, P(\Delta ABC)$

![Diagram of ΔABC rotated 110° clockwise around P](image2)

3. Point $O$ is the center of regular hexagon $ABCDEF$. Find the image of the given point or segment for the given rotation. (counterclockwise)
   
   a. $r_{120^\circ}, O(F)$
   
   b. $r_{180^\circ}, O(B)$
   
   c. $r_{300^\circ}, O(BC)$
   
   d. $r_{360^\circ}, O(FE)$
   
   e. $r_{60^\circ}, O(E)$
   
   f. $r_{240^\circ}, O(AB)$

![Diagram of regular hexagon ABCDEF with rotation points labeled](image3)
4. Quadrilateral $DEFG$ has vertices $D(2, 3)$, $E(4, -2)$, $F(7, -2)$, and $G(5, 2)$.
   a. Graph $r_{270^\circ, O}(DEFG)$.
   b. Graph $r_{180^\circ, O}(DEFG)$.
   c. Graph $r_{90^\circ, O}(\Delta DEFG)$.

5. The vertices of $PQRS$ have coordinates $P(-1, 5)$, $Q(3, 4)$, $R(2, -4)$, and $S(-3, -2)$. What are the coordinates of the vertices of $r_{90^\circ, O}(PQRS)$?

6. The vertices of $r_{270^\circ, O}(KLMN)$ have coordinates $K'(-3, 2)$, $L'(2, 3)$, $M'(4, -2)$, and $N'(-2, -4)$. What are the coordinates of the vertices of $KLMN$?
7. The vertices of quadrilateral $ABCD$ have coordinates $A(4, 3)$, $B(-3, 4)$, $C(-4, -3)$, and $D(3, -4)$. Explain how the transformation $r_{(90°, O)}(ABCD) = BCDA$ can be used to show that the quadrilateral is square.

8. $\Delta RST$ has vertices at $R(0, 3)$, $S(4, 0)$, and $T(0, 0)$. What are the coordinates of the vertices of $r_{(-270°, T)}(\Delta RST)$?

PARCC-type Question
9. Triangle $ABC$ is shown in the xy-coordinate plane. Triangle $ABC$ is rotated $180°$ around the point $(-2, -1)$. Indicate whether each of the listed figures of the image will or will not be the same as the corresponding feature in the original triangle.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Will be the same</th>
<th>Will not be the same</th>
</tr>
</thead>
<tbody>
<tr>
<td>The coordinates of $A'$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The coordinates of $C'$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The perimeter of $\Delta A'B'C'$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The area of $\Delta A'B'C'$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The measure of $B'$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The slope of $A'C'$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Geometry – Transformations

~16~

NJCTL.org
Identifying Symmetry with Transformations: CLASSWORK

Identify all of the lines of symmetry for the given shape.

1. [Circle]
2. [Square]
3. [Triangular Prism]

4. [Rectangle]
5. [Not A Circle]
6. [Star]

Do the following figures have rotational symmetry? If yes, what are the degree(s) of rotational symmetry?

7. [Rectangle]
8. [Square]
9. [Not A Circle]

10. Construct an equilateral triangle using a compass, straightedge, and the segment below.

11. Construct a regular hexagon using a compass, straightedge, and the segment below.
PARCC-type Question

12. The figure shows two perpendicular lines $j$ and $k$ intersecting at point $Q$ in the interior of an equilateral triangle. Line $j$ bisects the base of the equilateral triangle.

Which transformation will always carry the figure onto itself? Select all that apply.

- a. a reflection across line $j$
- b. a reflection across line $k$
- c. a rotation of $90^\circ$ clockwise about point $Q$
- d. a rotation of $120^\circ$ clockwise about point $Q$
- e. a rotation of $180^\circ$ clockwise about point $Q$
- f. a rotation of $240^\circ$ clockwise about point $Q$

Identifying Symmetry with Transformations: HOMEWORK

Identify all of the lines of symmetry for the given shape.

1. 
2. 
3. 
4. 
5. 
6. 

Do the following figures have rotational symmetry? If yes, what are the degree(s) of rotational symmetry?

7. 
8. 
9.
10. Construct an equilateral triangle using a compass, straightedge, and the segment below.

11. Construct a regular hexagon using a compass, straightedge, and the segment below.

12. Construct a square using a compass, straightedge, and the segment below.

PARCC-type Question
13. The figure shows two perpendicular lines m and n intersecting at point R in the interior of a rhombus.

Which transformation will always carry the figure onto itself? Select all that apply.
   a. a reflection across line m
   b. a reflection across line n
   c. a rotation of 90° clockwise about point R
   d. a rotation of 120° clockwise about point R
   e. a rotation of 180° clockwise about point R
   f. a rotation of 240° clockwise about point R
Composition of Transformations: CLASSWORK

Find the image of each letter after the transformation $R_m \circ R_l$. Is the resulting transformation a translation or a rotation? For a translation, describe the distance and direction. For a rotation, tell the center of rotation and the angle of rotation.

1. $R_m \circ R_l$

For numbers 3 – 6 Graph $\triangle ABC$ and its glide reflection image. $A(-3, 3)$, $B(0, 1)$ and $C(-1,-4)$

3. $R_y \circ T_{<3, 0>}: (\triangle ABC)$

4. $R_y \circ T_{<-1, 0>}: (\triangle ABC)$

5. $R_x = 2 \circ T_{<0, 1>}: (\triangle ABC)$

6. $R_y = 1 \circ T_{<x3, 3>}: (\triangle ABC)$

Geometry – Transformations
7. Lines \( \ell \) and \( m \) intersect at point \( P \) and are perpendicular. If a point \( Q \) is reflected across \( \ell \) and then across \( m \), what transformation rule describes this composition?

8. Graph \( AB \) and its image \( A'B' \) after a reflection first across \( \ell_1 \) and then across \( \ell_2 \). Is the resulting transformation a translation or a rotation? For a translation, describe the direction and distance. For a rotation, tell the center of rotation and the angle of rotation.

\[ A(-3, 4), B(-1, 0); \]
\[ \ell_1 : x = 1; \]
\[ \ell_2 : y = -1 \]

9. \( P \) maps to \( P'(2, 3) \) by the given glide reflection. What are the coordinates of \( P? \)

\[ R_{x-axis} \circ T_{<2, 1>}: (P) \]
PARCC-type Questions

10. Quadrilateral ABCD has vertices at A(2, 4), B(3, 2), C(6, 0), and D(5, 7) in the coordinate plane. The quadrilateral will be reflected over the y-axis and then rotated 90° counterclockwise about the origin to form quadrilateral A’B’C’D’. What are the vertices of quadrilateral A’B’C’D’?
   a. A’(-2, -4), B’(-3, -2), C’(-6, 0), D’(-5, -7)
   b. A’(-2, 4), B’(-3, 2), C’(-6, 0), D’(-5, 7)
   c. A’(-4, 2), B’(-2, 3), C’(0, 6), D’(-7, 5)
   d. A’(-4, -2), B’(-2, -3), C’(0, -6), D’(-7, -5)

11. Triangles EFG and HIJ are shown in the coordinate plane.

Part A:
Triangle HIJ is the image of ΔEFG after a transformation or a sequence of transformations. Which could be the transformation or sequence of transformations? Select all that apply.
   a. a translation 4 units up followed by a reflection across the y-axis
   b. a reflection across the line y = x.
   c. a rotation of 180° about the origin.
   d. a translation left 5 units and up 4 units followed by a reflection across the x-axis
   e. a reflection across the y-axis followed by a reflection across the x-axis

Part B:
Triangle EFG will be reflected about the y-axis and then rotated 90° clockwise about the origin to create ΔE’F’G’. What will be the y-coordinate of G’?

Composition of Transformations: HOMEWORK

Find the image of each letter after the transformation $R_m \circ R_l$. Is the resulting transformation a translation or a rotation? For a translation, describe the distance and direction. For a rotation, tell the center of rotation and the angle of rotation.

For numbers 3 – 6 Graph ΔDEF and its glide reflection image. D(0, 2), E(2, 4) and F(4,0)
3. $R_{x\text{-axis}} \circ T_{<2,1}> : (\Delta DEF)$
4. $R_{y\text{-axis}} \circ T_{<3,1}> : (\Delta DEF)$

5. $R_{x=1} \circ T_{<0,-2}> : (\Delta DEF)$
6. $R_{y=x} \circ T_{<2,3}> : (\Delta DEF)$

7. A triangle is reflected across line $\ell$ and then across line $m$. If this composition of reflections is a translation, what is true about $m$ and $\ell$?
8. Graph AB and its image A'B' after a reflection first across ℓ₁ and then across ℓ₂. Is the resulting transformation a translation or a rotation? For a translation, describe the direction and distance. For a rotation, tell the center of rotation and the angle of rotation.

\[A(-5, 2), B(-3, 6);\]
\[\ell_1: x = -2;\]
\[\ell_2: x = 3\]

9. P maps to \(P'(2, 3)\) by the given glide reflection. What are the coordinates of \(P\)?

\[R_y = x, T <3, 3>: (P)\]

PARCC-type Questions

10. Triangle JKL has vertices at J(2, 1), K(5, -3), and L(3, -4) in the coordinate plane. The triangle will be reflected over the line \(y = x\) and then rotated 180° about the origin to form \(\Delta J'K'L'\). What are the vertices of \(\Delta J'K'L'\)?
   a. \(J'(1, 2), K'(-3, 5), L'(-4, 3)\)
   b. \(J'(-2, -1), K'(-5, 3), L'(-3, 4)\)
   c. \(J'(-1, -2), K'(3, -5), L'(4, -3)\)
   d. \(J'(2, -1), K'(5, 3), L'(3, 4)\)
11. Quadrilaterals ABCD and EFGH are shown in the coordinate plane.

**Part A:**
Quadrilateral EFGH is the image of quadrilateral ABCD after a transformation or a sequence of transformations. Which could be the transformation or sequence of transformations? Select all that apply.

- a translation 4 units left followed by a reflection across the line \( x = -2 \)
- a reflection across the y-axis
- a rotation of \( 180^\circ \) about the origin
- a reflection across the line \( y = -x \) followed by a rotation of \( 90^\circ \) clockwise
- a translation 8 units left

**Part B:**
Quadrilateral ABCD will be reflected about the x-axis and then rotated \( 180^\circ \) about the origin to create Quadrilateral A'B'C'D'. What will be the x-coordinate of \( C' \)?

**Congruence Transformations: CLASSWORK**
\( \Delta ABC \) \( \rightarrow \) \( \Delta DEF \). What is a congruence transformation that maps \( \Delta ABC \) to \( \Delta DEF \)?

1. Identify a pair of congruent figures. Then determine a congruence transformation that maps the preimage to the congruent image.

3. 4.
Congruence Transformations: HOMEWORK

ΔABC  ΔDEF. What is a congruence transformation that maps ΔABC to ΔDEF?
1. 

Identify a pair of congruent figures. Then determine a congruence transformation that maps the preimage to the congruent image.
3. 

4. 

Dilations: CLASSWORK

A dilation has center (0, 0). Find the image of each point for the given scale factor.

1.  \(A(3, 4); D_7(A)\)
2.  \(B(0, 4); D_{3.4}(B)\)
3.  \(C(5, -6); D_{5/3}(C)\)

4. A square has 16-cm sides. Describe its image for a dilation with center at one of the vertices and scale factor 0.8.

5. Graph quadrilateral \(ABCD\) and its image \(A'B'C'D'\) for a dilation with center (0, 0) and a scale factor of 2. The vertices of \(ABCD\) are: \(A(2, 3), B(-2, 4), C(-3, -2), D(3, -3)\).
The solid-line figure is a dilation of the dashed-line figure. The labeled point is the center of dilation. Tell whether the dilation is an enlargement or a reduction. Then find the scale factor of the dilation.

6. The solid-line figure is a dilation of the dashed-line figure. The labeled point is the center of dilation. Tell whether the dilation is an enlargement or a reduction. Then find the scale factor of the dilation.

7. The solid-line figure is a dilation of the dashed-line figure. The labeled point is the center of dilation. Tell whether the dilation is an enlargement or a reduction. Then find the scale factor of the dilation.

8. \( D_{(2, \, -1)}(\triangle ABC) \)

9. \( \triangle ABC \) is dilated in the coordinate plane with center \((2, \, -1)\) and scale factor 0.5. If \( A(6, \, 3) \) what is the y-coordinate of \( A' \)?
PARCC-type Questions

10. In the coordinate plane, \( \triangle ABC \) has vertices at \( A(-3, 1) \), \( B(1, 5) \), and \( C(2, 2) \); and \( \triangle DEF \) has vertices at \( D(-4, 2) \), \( E(2, 8) \), and \( F(3.5, 3.5) \). Select an answer from each group of choices to correctly complete the sentence.

   The triangles are similar because \( \triangle DEF \) is the image of \( \triangle ABC \) under a dilation with center ________ and scale factor ____________.

   a. \((0, 0)\)    d. 0.5
   b. \((-1, -1)\)   e. 2
   c. \((1, -1)\)    f. 1.5

11. The figure shows \( \overline{AB} \) and \( \overline{CD} \) intersecting at point \( E \). \( A'B' \) and \( C'D' \) will be the images of \( \overline{AB} \) and \( \overline{CD} \), respectively, under a dilation with center \( A \) and scale factor 3. Use answer choices given in the “Answer Bank” to complete the sentence.

   Line \( A'B' \) will be ________________ \( \overline{AB} \) and

   \( C'D' \) will be ________________ \( \overline{CD} \).

   Answer Bank:
   “parallel to”
   “perpendicular to”
   “the same line as”

12. In the coordinate plane shown, \( \triangle BCD \) has vertices \( B(-3, 6) \), \( C(5, 2) \), and \( D(1, -6) \).

   What are the scale factor and the center of dilation that will carry \( \triangle BCD \) to \( \triangle EFG \)? Write your answers in the blank spaces provided.

   The scale factor is _____________ and the

   center of dilation is (____, ____).
13. In the coordinate plane, line m has a slope of \(\frac{1}{4}\) and a y-intercept of (0, -3). Line n is the result of dilating line m by a scale factor of 2 with a center of (0, -1). What are the slope and y-intercept of line n?
   a. Line n has a slope of \(\frac{1}{4}\) and a y-intercept of (0, -3).
   b. Line n has a slope of \(\frac{1}{4}\) and a y-intercept of (0, -5).
   c. Line n has a slope of \(\frac{3}{4}\) and a y-intercept of (0, -2).
   d. Line n has a slope of 2.25 and a y-intercept of (0, -6).

14. Line segment CD with endpoints C(-4, 16) and D(-20, 4) lies in the coordinate plane. The segment will be dilated with a scale factor of \(\frac{1}{4}\) and a center at the origin to create \(\overline{C'D'}\). What will be the length of \(\overline{C'D'}\)?
   a. 15
   b. 12
   c. 5
   d. 4

**Dilations: HOMEWORK**

A dilation has center (0, 0). Find the image of each point for the given scale factor.

1. \(P(-3, 5); D_{1.2}(P)\)

2. \(O(-2, -1); D_4(O)\)

3. \(M(4, 2); D_{3/2}(M)\)

4. A square has 12-cm sides. Describe its image for a dilation with center at one of the vertices and scale factor 0.8.
5. Graph pentagon $JKLMN$ and its image $JKLM'$ for a dilation with center $(0, 0)$ and a scale factor of 1.5. The vertices of $JKLMN$ are: $J(0, 3), K(3, 3), L(3, 0), M(0, -3), N(-1, 0)$.

The dashed-line figure is a dilation of the solid-line figure. The labeled point is the center of dilation. Tell whether the dilation is an enlargement or a reduction. Then find the scale factor of the dilation.

6.

7.

8. $D_{(3, A)}(\triangle ABC)$

Geometry – Transformations

NJCTL.org
9. $\triangle DEF$ is dilated in the coordinate plane with center (-5, 2) and scale factor 2. If D(-5, 4) what is the y-coordinate of D’?

PARCC-type Questions

10. In the coordinate plane, $\triangle ABC$ has vertices at A(-3, 1), B(1, 5), and C(2, 2); and $\triangle DEF$ has vertices at D(-9, 1), E(-1, 9), and F(1, 3).
Select an answer from each group of choices to correctly complete the sentence.

The triangles are similar because $\triangle DEF$ is the image of $\triangle ABC$ under a dilation with center _______ and scale factor _______.

| a. (0, 0) | d. 0.5 |
| b. (-1, 1) | e. 2 |
| c. (3, 1) | f. 4 |

11. The figure shows $\overline{GH}$ and $\overline{IJ}$ intersecting at point F. $G'H'$ and $I'J'$ will be the images of $\overline{GH}$ and $\overline{IJ}$, respectively, under a dilation with center F and scale factor 1.5. Use the answer choices given in the “Answer Bank” to complete the sentence.

Line $G'H'$ will be __________________________ $\overline{GH}$ and $I'J'$ will be __________________________ $\overline{IJ}$.

Answer Bank:
“parallel to”
“perpendicular to”
“the same line as”

12. In the coordinate plane shown, $\triangle ABC$ has vertices A(-4, -1), B(2, -3), and C(0, 3).

What are the scale factor and the center of dilation that will carry $\triangle ABC$ to $\triangle JKL$? Write your answers in the blank spaces provided.

The scale factor is ___________ and the center of dilation is (____, ____).
13. In the coordinate plane, line \( m \) has a slope of 2 and a \( y \)-intercept of (0, -5). Line \( n \) is the result of dilating line \( m \) by a scale factor of 4 with a center of (0, -2). What are the slope and \( y \)-intercept of line \( n \)?
   a. Line \( n \) has a slope of \( \frac{1}{2} \) and a \( y \)-intercept of (0, -3).
   b. Line \( n \) has a slope of 2 and a \( y \)-intercept of (0, -5).
   c. Line \( n \) has a slope of 2 and a \( y \)-intercept of (0, -14).
   d. Line \( n \) has a slope of 8 and a \( y \)-intercept of (0, -14).

14. Line segment CD with endpoints C(-5, 16) and D(-20, -4) lies in the coordinate plane. The segment will be dilated with a scale factor of \( \frac{2}{5} \) and a center at the origin to create \( C'D' \). What will be the length of \( C'D' \)?
   a. 10
   b. 8
   c. 5
   d. 4

15. A dilation centered at point \( P \) with a scale factor of \( k \), where \( k > 0 \), can be defined as follows:
   1. The image of point \( P \) is itself. That is \( P' = P \).
   2. Any point \( Q \) other than \( P \), the point \( Q' \) is on \( \overline{PQ} \) and \( P'Q' = k \times PQ \).

   Use this definition and the diagram shown to prove the following theorem.
   If \( L'M' \) is the image of \( LM \) after a dilation centered at point \( P \) with a scale factor of \( k \), where \( k > 0 \), then \( L'M' = k \times LM \).

   Be sure to explain how you would use the diagram to prove the theorem, and show justifications for each statement in your proof.
Similarity Transformations: CLASSWORK

\( \triangle JKM \) has vertices \( J(0, 4), K(4, 4) \) and \( M(0, 3) \). Draw the image for each similarity transformation.

1. \( D_{2} \circ R_{x-axis}: (\triangle JKM) \)

2. \( T_{<3,-2>} \circ D_{1.5}: (\triangle JKM) \)

3. \( D_{0.5} \circ r_{(270^\circ, O)}: (\triangle JKM) \)
4. For the graph, describe the composition of transformations that maps ΔDEF to ΔLMN.

5. Show that ΔABC ~ ΔFGH by finding a similarity transformation that maps one triangle to the other.

6. Determine if there is a similarity transformation that maps one figure onto the other. If so, identify the similarity transformation and write a similarity statement. If not, explain.

7. Do the compositions $T_{<4,-2>}$ $\circ$ $D_2$ and $D_2$ $\circ$ $T_{<2,-1>}$ describe the same similarity transformation? Explain.
PARCC-type Question
8. Triangle ABC is the pre-image of ΔA'B'C' before a transformation. Determine if these two figures are similar.

Select an answer from each group of choices to correctly complete the sentence.

Triangle ABC _______________ similar to ΔA'B'C', which we can determine by a
   a. is
   b. is not
   c. dilation of scale factor 2 centered at the point (0.5, 2.5)
   d. dilation of scale factor 1.5 centered at the point (0, 6)
   e. dilation of scale factor 1 centered at the point (-2, 3)
   f. translation 2.5 units right and 4.5 units down
   g. translation 5 units right and 9 units down
Similarity Transformations: HOMEWORK

ΔJKM has vertices J(-2, 2), K(2, 0) and M(1, -2). Draw the image for each similarity transformation.

1. $D_2 \circ R_{y-axis}: (ΔJKM)$

2. $D_{0.5} \circ T_{<2,-2>}: (ΔJKM)$

3. $r_{(90^\circ, O)} \circ D_{1.5}: (ΔJKM)$

4. For the graph, describe the composition of transformations that maps ΔDEF to ΔLMN.
5. Show that $\triangle ABC \sim \triangle FGH$ by finding a similarity transformation that maps one triangle to the other.

6. Determine if there is a similarity transformation that maps one figure onto the other. If so, identify the similarity transformation and write a similarity statement. If not, explain.

7. A similarity transformation is described by the composition $T_{<2,1>} \circ D_3$. If the order of the composition is changed to be $D_3 \circ T_{<2,1>}$, does that describe the same transformation? Explain.
8. Triangle ABC is the pre-image of \( \triangle A'B'C' \) before a transformation. Determine if these two figures are similar.

Select an answer from each group of choices to correctly complete the sentence.

Triangle ABC _______________ similar to \( \triangle A'B'C' \), which we can determine by a

- a. is
- b. is not
- c. dilation of scale factor 2 centered at the origin
- d. dilation of scale factor 1.5 centered at the origin
- e. dilation of scale factor 1 centered at the origin
- f. translation 2 units left and 3 units up
- g. translation 3 units right and 2 units down
Transformations Unit Review

1. For each transformation in the table below, indicate which properties are true by placing a check mark in every appropriate box.

<table>
<thead>
<tr>
<th>Transformation</th>
<th>The image and preimage are congruent</th>
<th>The image and preimage are similar but not congruent</th>
<th>Lengths of segments are preserved</th>
<th>Measures of angles are preserved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glide Reflection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dilation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. A transformation is demonstrated in the figure below.

Part A:
Determine the type of transformation that occurs. Select all that apply.

a. Translation
b. Reflection
c. Rotation
d. Dilation
e. Rigid Motion
f. Congruence Transformation
g. Similarity Transformation

Part B:
What is the image of angle B?

Part C:
What is the preimage of $\overline{B'C'}$?
3. A transformation is demonstrated in the figure below.

**Part A:**
Determine the type of transformation that occurs. Select **all** that apply.
- Translation
- Reflection
- Rotation
- Dilation
- Rigid Motion
- Congruence Transformation
- Similarity Transformation

**Part B:**
What is the image of $\overline{FG}$?

**Part C:**
Which rule describes the transformation?
- $R_{FG} (EFG) = EF'G'$
- $r_{180^\circ, E} (EFG) = EF'G'$
- $D_{3/4, E} (EFG) = EF'G'$
- $T_{<16, 0>} : (EFG) = EF'G'$

4. Which rule describes the translation in the figure below?

- $T_{<6, 3>} : (ABCD) = A'B'C'D'$
- $T_{<6, -3>} : (ABCD) = A'B'C'D'$
- $T_{<3, -6>} : (ABCD) = A'B'C'D'$
- $T_{<3, 6>} : (ABCD) = A'B'C'D'$

5. $\triangle EFG$ has coordinates $E(2, 5)$, $F(1, 3)$, and $G(6, 4)$. A translation maps $E$ to $E'(-3, 4)$. What are the coordinates for $F'$ and $G'$ for this translation?
- $F'(6, 4)$ and $G'(11, 5)$
- $F'(6, 2)$ and $G'(11, 3)$
- $F'(-4, 4)$ and $G'(1, 5)$
- $F'(-4, 2)$ and $G'(1, 3)$
6. Triangle EFG is graphed in the coordinate plane with the vertices E(-3, -7), F(0, -4), and G(4, -6) as shown in the figure.

**Part A:**
Triangle EFG will be reflected across the line $y = -x$ to form $\Delta E'F'G'$. Choose **all** quadrants of the xy-coordinate plane that will contain at least one vertex of $\Delta E'F'G'$.

   a. I  
   b. II  
   c. III  
   d. IV  

**Part B:**
Triangle EFG will be reflected across the line $y = -x$ to form $\Delta E'F'G'$. What are the coordinates of G’?

7. Triangle ABC is shown in the xy-coordinate plane. Triangle ABC is rotated 90° clockwise around the point (3, -2). Indicate whether each of the listed figures of the image will or will not be the same as the corresponding feature in the original triangle.

<table>
<thead>
<tr>
<th></th>
<th>The coordinates of $A'$</th>
<th>The coordinates of $C'$</th>
<th>The perimeter of $A'B'C'$</th>
<th>The area of $A'B'C'$</th>
<th>The measure of $B'$</th>
<th>The slope of $A'C'$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will be the same</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will not be the same</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Geometry – Transformations

~41~
8. The vertices of quadrilateral $PQRS$ have coordinates $P(-3, 4)$, $Q(2, 3)$, $R(2, -4)$, and $S(-3, -1)$. What are the coordinates of the vertices of quadrilateral $P'Q'R'S'$ after a $90^\circ$ counterclockwise rotation about the origin?
   a. $P'(3, -4)$, $Q'(-2, -3)$, $R'(-2, 4)$, and $S'(3, 1)$
   b. $P'(4, -3)$, $Q'(3, 2)$, $R'(-4, 2)$, and $S'(-1, -3)$
   c. $P'(-3, -4)$, $Q'(2, -3)$, $R'(2, 4)$, and $S'(-3, 1)$
   d. $P'(-4, -3)$, $Q'(-3, 2)$, $R'(4, 2)$, and $S'(1, -3)$

9. Does the figure have line symmetry? If so draw the line(s) of symmetry. Does the figure have rotational symmetry? If so state the degree(s) of rotation.

10. The figure shows two perpendicular lines $j$ and $k$ intersecting at point D in the interior of a kite.

Which transformation will always carry the figure onto itself? Select all that apply.
   a. a reflection across line $j$
   b. a reflection across line $k$
   c. a rotation of $90^\circ$ clockwise about point D
   d. a rotation of $180^\circ$ clockwise about point D
   e. a rotation of $270^\circ$ clockwise about point D
   f. no rotational symmetry exists

11. The vertices of quadrilateral $PQRS$ have coordinates $P(-3, 4)$, $Q(2, 3)$, $R(2, -4)$, and $S(-3, -1)$. What are the coordinates of the vertices of quadrilateral $P'Q'R'S'$ after a $180^\circ$ rotation about the origin followed by a translation 3 units left and 4 units up?
   a. $P'(6, -8)$, $Q'(1, -7)$, $R'(1, 0)$, and $S'(6, -3)$
   b. $P'(1, 1)$, $Q'(0, 6)$, $R'(-7, 6)$, and $S'(-2, 1)$
   c. $P'(0, 0)$, $Q'(-5, 1)$, $R'(-5, 8)$, and $S'(0, 3)$
   d. $P'(-7, 1)$, $Q'(-6, 6)$, $R'(1, 6)$, and $S'(-2, 1)$

12. Line segment $CD$ with endpoints $C(-5, 16)$ and $D(-20, -4)$ lies in the coordinate plane. The segment will be dilated with a scale factor of $4/5$ and a center at the origin to create $C'D'$. What will be the length of $C'D'$?
   a. 20
   b. 16
   c. 5
   d. 4
13. The coordinates of quadrilateral EFGH are E(-7, 2), F(-7, 6), G(-3, 7), and H(-4, 1). Graph quadrilateral EFGH and its image after each given transformation.

a. $T_{<2, -5>}(EFGH)$

b. $R_{x = 1}(EFGH)$

c. $r(90^\circ, O)(EFGH)$

d. $D_{(0.5, 0)}(EFGH)$

e. $(R_y = 1 \circ r(270^\circ, 0))(EFGH)$

f. $(R_x = 2 \circ T_{<2, -3>})(EFGH)$
14. Point \( K \) is the center of regular quadrilateral \( ABCD \). Find the image of the given point or segment for the given rotation. (counterclockwise)

\[ \text{a. } \mathbf{r}_{90^\circ}, K(A) \]
\[ \text{b. } \mathbf{r}_{270^\circ}, K(D) \]
\[ \text{c. } \mathbf{r}_{180^\circ}, K(DC) \]
\[ \text{d. } \mathbf{r}_{360^\circ}, K(KB) \]
\[ \text{e. } \mathbf{r}_{90^\circ}, K(BC) \]

15. Quadrilaterals \( ABCD \) and \( EFGH \) are shown in the coordinate plane.

**Part A:**

Quadrilateral \( ABCD \) is the image of quadrilateral \( EFGH \) after a transformation or a sequence of transformations. Which could be the transformation or sequence of transformations? Select all that apply.

\[ \text{a. } \text{a translation 2 units up followed by a reflection across the line } y = 1 \]
\[ \text{b. } \text{a reflection across the x-axis} \]
\[ \text{c. } \text{a rotation of } 180^\circ \text{ about the origin} \]
\[ \text{d. } \text{a reflection across the line } y = x \text{ followed by a rotation of } 90^\circ \text{ clockwise} \]
\[ \text{e. } \text{a translation 7 units up} \]

**Part B:**

Quadrilateral \( ABCD \) will be reflected about the x-axis and then translated 4 units left and 5 units down to create Quadrilateral \( A'B'C'D' \). What will be the x-coordinate of \( C' \)?

16. The letter \( J \) is reflected across line \( m \) and then line \( n \). Describe the resulting transformation.
17. In the coordinate plane shown, \( \triangle ABC \) has vertices \( A(-3, 3), B(3, 5) \), and \( C(5, 1) \).

What are the scale factor and the center of dilation that will carry \( \triangle ABC \) to \( \triangle DEF \)? Write your answers in the blank spaces provided.

The scale factor is ____________ and the center of dilation is

\((__, __)\).

18. Parallelogram ABCD is the pre-image of parallelogram A'B'C'D' before a transformation. Determine if these two figures are similar.

Select an answer from each group of choices to correctly complete the sentence.

Parallelogram ABCD ____________ similar to parallelogram A'B'C'D', which we can
determine by a ________________________________.

a. is
b. is not
c. translation 3 units right and 3 units down
d. dilation of scale factor -1.5 centered at the origin
e. dilation of scale factor -1 centered at the origin
f. reflection about the y-axis followed by a reflection about the x-axis
g. reflection about the line \( y = x \)
**Extended Constructed Response** – Solve the problem, showing all work. Partial credit may be given.

19. Using the xy-coordinate plane below, answer each question.

![XY-coordinate plane](image)

a) Given $A(-5, 2), B(-3, 6)$, graph $\overline{AB}$ in the xy-coordinate plane.

b) Reflect $\overline{AB}$ across the line $x = -2$ to create $\overline{A'B'}$.

c) Reflect $\overline{A'B'}$ across the line $y = -1$ to create $\overline{A''B''}$.

d) Write a rule or describe the transformation that could be used to directly map $\overline{AB}$ to $\overline{A''B''}$.

e) Was the transformation found in part d) considered to be an isometry? Explain your answer.

20. Draw the image of the figure for the given rotation about $P$. Use prime notation to label the vertices of the image.

$r_{260^\circ, P}(\triangle ABC)$

![Rotation](image)
ANSWER KEY

Transformations: CLASSWORK
1. Yes, distances and angle measures are preserved.
2. No, distances are not preserved.
3. Rotation; F’G’
4. Dilation; angle J’

Transformations: HOMEWORK
1. No, distances are not preserved.
2. Yes, distances and angle measures are preserved.
3. Reflection; segment G’R’
4. Translation; angle T’

Translations: CLASSWORK
1. T<10, -7>: (Q’R’S’T) = QRST
2. Y’(3, 9); Z’(10, 14)
3. T<2, -2>: (ΔABC); T<2, 6>: (ΔABC); T<5, -3>: (ΔABC)

Translations: HOMEWORK
1. 

2. 

3. T<4, 10>: (ΔIJK)
4. T<4, -9>: (ΔL’M’N’) = ΔLMN
5. B’(8, -7); C’(7, -5)
6. T<4, -2>: (ΔBCD); T<4, -9>: (ΔBCD); T<8, -6>: (ΔBCD)

Reflections: CLASSWORK
1. A’(1, -3)
2. B’(-5, 5)
3. C’(-1, 3)
4. D’(7, 1)
5. E’(-2, 1)
6. F’(-3, 4)
7. a. $A'(3, -7), B'(5, -2), C'(4, -8)$

b. $A'(3, -3), B'(5, 2), C'(4, -4)$

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

d. $A'(-3, 3), B'(-5, -2), C'(-4, 4)$

8. 

9. 

10. a. $J'(-6, 1)$
    b. $J'(2, -3)$
c. $J'(-2, 1)$
d. $J'(0, -7)$

11. Answers may vary. Sample answer:
Patterns in tiles, wallpaper, etc.

12.

Part A: Quadrants I, II, and III
Part B: $C'(-3, -2)$

Reflections: HOMEWORK
1. $A'(5, -1)$
2. $B'(-3, 2)$
3. $C'(-2, 1)$
4. $D'(12, 1)$
5. $E'(-1, 4)$
6. $F'(0, -5)$

7. a. $D'(2, 1), E'(-1, 3), F'(-2, -2)$
10. a. \( K'(0, -3) \)  
b. \( K'(-4, 1) \)  
c. \( K'(4, -7) \)  
d. \( K'(-6, -3) \)  

11. Answers may vary. Sample answer: Patterns in tiles, wallpaper, etc.

12.
b. $A'(-2, -2), B'(-3, 2), C'(1, -3)$

c. $A'(2, -2), B'(-2, -3), C'(3, 1)$

5. $A'(-2, 6), B'(3, -4), C'(3, 5), D'(-4, 2)$

6. $D'(-5, -4), E'(-3, -4), F'(-3, 2), G'(5, 2)$

7. $C$

8. $F'(-2, -1), G'(0, 0), H'(1, 3)$

9. | The coordinates of $A'$ | The coordinates of $C'$ | The perimeter of $\Delta A'B'C'$ |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Will be the same</td>
<td>$X$</td>
<td>$X$</td>
</tr>
<tr>
<td>Will not be the same</td>
<td></td>
<td>$X$</td>
</tr>
</tbody>
</table>

Rotations: HOMEWORK

1.
2.

3.  
   a. $D$
   b. $E$
   c. $DC$
   d. $FE$
   e. $D$
   f. $DC$

4.  
   a. $D'(-3, 2)$, $E'(2, 4)$, $F'(2, 7)$, $G'(-2, 5)$

5.  
   a. $D'(-2, -3)$, $E'(-4, 2)$, $F'(-7, 2)$, $G'(-5, -2)$

6.  
   a. $D'(3, -2)$, $E'(-2, -4)$, $F'(-2, -7)$, $G'(2, -5)$

7. Answers may vary. Sample: A rotation is a rigid motion therefore distances and angle measures are preserved. $AB = BC = CD = AD$ and $m<A = m<B = m<C = m<D$. If all angles of a quadrilateral are equal then they each must measure 90 degrees. By definition the quadrilateral is a square.

8. $R'(-3, 0)$, $S'(0, 4)$, $T'(0, 0)$
9. The coordinates of $A'$
   The coordinates of $C'$
   The perimeter of $\triangle A'B'C'$

| Will be the same | X | X |
| Will not be the same | X |   |

| The area of $\triangle A'B'C'$ | The measure of $B'$ | The slope of $A'C'$ |
| Will be the same | X | X | X |
| Will not be the same | | | |

**Identifying Symmetry with Transformations**

**CLASSWORK**

1. 

2. 

7. Yes, $180^\circ$
8. Yes, $90^\circ$, $180^\circ$, and $270^\circ$
9. Yes, $180^\circ$
10. See student work. It should resemble the figure below.
11. See student work. It should resemble the figure below.

12. a, d, and f

**Identifying Symmetry with Transformations**

**HOMEWORK**

1. 

2. 

3. 

4. 

5. 

6. 

7. Yes, 45°, 90°, 135°, 180°, 225°, 270°, 315°


9. Yes, 180°

10. See student work. It should resemble the figure below.

11. See student work. It should resemble the figure below.
12. See student work. It should resemble the figure below. ABCD is the square.

13. a, b, and e

**Compositions of Transformations:**

**CLASSWORK**
1. translation, down and to the right, twice the distance between lines $l$ and $m$
2. rotation, about point $P$, $120^\circ$ clockwise
3. $A'(0, 3), B'(-3, 1), C'(-2, -4)$
4. $A'(-4, -1), B'(-1, 1), C'(-2, 6)$
5. $A'(7, 4), B'(4, 2), C'(5, -3)$
6. \( A'(6, 0), B'(4, 3), C'(-1, 2) \)

7. 180° rotation

8. A rotation, about point (1, -1), 180° clockwise

9. \( P(0, -4) \)

10. D

11. Part A: C and E
    Part B: \( G'(-5, 3) \)

**Compositions of Transformations:**

**HOMEWORK**

1. rotation, about point K, 180° counterclockwise

2. translation, directly down, twice the distance between lines \( l \) and \( m \)
6. $D'(5, 2), E'(7, 4), F'(3, 6)$

7. $m \parallel l$

8. A translation, 10 units to the right

9. $P(0, -1)$

10. C

11. Part A: A, B, D
    Part B: C'(-2, 2)

Congruence Transformations: CLASSWORK
1. Check student work.
   Sample Answer: $T_{<1, 0>}, R_y$-axis $\circ r_{(270^\circ, O)}$: $(\triangle ABC) = \triangle DEF$

2. Check student work.
   Sample Answer: $T_{<2, 0>}, R_y$-axis $\circ r_{(180^\circ, O)}$: $(\triangle ABC) = \triangle DEF$

3. $\triangle ABC \cong \triangle GHI$: Check student work.
   Sample Answer: $r_{(180^\circ, O)}$: $(\triangle ABC) = \triangle GHI$

4. $\triangle ABC \cong \triangle DEFG$: Check student work.
   Sample Answer: $T_{<5, 4>}$

Congruence Transformations: HOMEWORK
1. Check student work.
   Sample Answer: $R_{x-axis}$ $\circ T_{<5, 0>}$

2. Check student work.
   Sample Answer: $r_{(90^\circ, O)}$ $\circ R_y$-axis

3. $CD \cong EF$: Check student work.
   Sample Answer: $R_y$-axis $(\triangle ABC) = \triangle DEF$

4. $\triangle ABC \cong \triangle DEFG$: Check student work.
   Sample Answer: $R_y = 2 \circ T_{<6, 0>}$

Dilations: CLASSWORK
1. $A'(21, 28)$
2. $B'(0, 13.6)$
3. $C'(25/3, -10)$
4. A square with 12.8 cm sides.
5. $A'(4, 6), B'(-4, 8), C'(-6, -4), D'(6, -6)$
6. scale factor: 3; enlargement
7. scale factor: 1/4; reduction
9. 1
10. B & F
11. 1st blank: “the same as”
2nd blank: “parallel to”
12. scale factor = \( \frac{3}{4} \)
center (1, 0)
13. B
14. C

**Dilations: HOMEWORK**
1. \( A'(-3.6, 6.0) \)
2. \( B'(-8, -4) \)
3. \( C'(6, 3) \)
4. A square with 9.6 cm sides.
5. \( J'(0, 4.5), K'(4.5, 4.5), L'(4.5, 0), M'(0, -4.5), N'(-1.5, 0) \)

6. scale factor: 9/5; enlargement
7. scale factor: 1/3; reduction

---

8. \[ L'M' = k \times LM \]

9. 6
10. C & E
11. 1st blank: “the same as”
2nd blank: “the same as”
12. scale factor = 2
center (-1, 2)
13. C
14. A
15. Given: \( L'M' \) is the image of \( LM \) after a dilation centered at point \( P \) with a scale factor of \( k \), where \( k > 0 \)
Prove: \( L'M' = k \times LM \)

<table>
<thead>
<tr>
<th>Statements</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( L'M' ) is the image of ( LM ) after a dilation centered at point ( P ) with a scale factor of ( k ), where ( k &gt; 0 )</td>
<td>1. Given</td>
</tr>
<tr>
<td>2. ( PL' = k \times PL ); ( PM' = k \times PM )</td>
<td>2. Definition of a Dilation</td>
</tr>
<tr>
<td>3. ( \frac{PL'}{PL} = k ); ( \frac{PM'}{PM} = k )</td>
<td>3. Division Property of Equality</td>
</tr>
<tr>
<td>4. ( \frac{PL'}{PL} = \frac{PM'}{PM} )</td>
<td>4. Transitive or Substitution Property of Equality</td>
</tr>
<tr>
<td>5. ( P ); ( P )</td>
<td>5. Reflexive Property of Congruence</td>
</tr>
<tr>
<td>6. ( \triangle PLM \sim \triangle PL'M' )</td>
<td>6. SAS</td>
</tr>
<tr>
<td>7. ( \frac{PL'}{PL} = \frac{PM'}{PM} = \frac{L'M'}{LM} )</td>
<td>7. Definition of Similar Polygons</td>
</tr>
<tr>
<td>8. ( \frac{L'M'}{LM} = k )</td>
<td>8. Substitution or Transitive Property of Equality</td>
</tr>
<tr>
<td>9. ( L'M' = k \times LM )</td>
<td>9. Multiplication Property of Equality</td>
</tr>
</tbody>
</table>

---

Geometry – Transformations
Similarity Transformations: CLASSWORK
1. \(J'(0, -8), K'(8, -8), M'(0,6)\)

2. \(J'(-3, 4), K'(3, 4), M'(-3, 2.5)\)

3. \(J'(-2, 0), K'(-2, 2), M'(-1.5, 0)\)

4. Answers may vary.
   Sample: \(D_{0.5} T_{180^\circ}, O): (\Delta DEF) = \Delta LMN\)

5. Answers may vary.
   Sample: \(T_{<4, -10> D_3}: (\Delta ABC) = \Delta FGH\)

6. No, the corresponding sides are not proportional.

7. Yes. For a point \((x, y)\), the first transformation will transform \((x, y)\) to \((2x + 4, 2y-2)\) while the second transformation will transform it to \((2(x+2), 2(y-1))\) which = \((2x + 4, 2y-2)\)

8. A & F

Similarity Transformations: HOMEWORK
1. \(J'(4, 4), K'(-4, 0), M'(-2, -4)\)

2. \(J'(0, 0), K'(2, -1), M'(1.5, -2)\)
3. $J'(\text{-}3, -3)$, $K'(0, 3)$, $M'(3, 1.5)$

4. Answers may vary.
   Sample: $R_{x\text{-axis}} \circ D_2: (\triangle DEF) = \triangle LMN$

5. Answers may vary.
   Sample: $r_{(90^\circ, O)} \circ D_{1.5}: (\triangle ABC) = \triangle FGH$

6. Yes. A reflection followed by a dilation with a scale factor of 0.5. $\triangle ABC \sim \triangle EDC$

7. No. For a point $(x, y)$, the first transformation will transform $(x, y)$ to $(3x + 2, 3y + 1)$ while the second transformation will transform it to $(3(x + 2), 3(y + 1))$.

8. A & C
Transformations Unit Review

1. For each transformation in the table below, indicate which properties are true by placing a check mark in every appropriate box.

<table>
<thead>
<tr>
<th>Transformation</th>
<th>The image and preimage are congruent</th>
<th>The image and preimage are similar but not congruent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translation</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Reflection</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Rotation</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Glide Reflection</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Dilation</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transformation</th>
<th>Lengths of segments are preserved</th>
<th>Measures of angles are preserved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Translation</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Reflection</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Rotation</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Glide Reflection</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Dilation</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

7. The coordinates of A', The coordinates of C', The perimeter of ΔA'B'C'

<table>
<thead>
<tr>
<th></th>
<th>Will be the same</th>
<th>Will not be the same</th>
</tr>
</thead>
<tbody>
<tr>
<td>The coordinates of A'</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The coordinates of C'</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The perimeter of ΔA'B'C'</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Will be the same</th>
<th>Will not be the same</th>
</tr>
</thead>
<tbody>
<tr>
<td>The area of ΔA'B'C'</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The measure of B'</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The slope of A'C'</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

8. D

9. 180° rotational symmetry

10. B and F
11. C
12. A
13. a)

b)

c)

d)

e)

f)
14. a) point D  
b) point A  
c) $\overline{AB}$  
d) $\overline{KB}$  
e) $\overline{AB}$  
15. Part A: A, B, and D  
Part B: C’(-1, 1)  
16. 150° rotation clockwise  
17. scale factor = 5/2 or 2.5  
center of dilation = (2, 3)  
18. A and G  
19. a) – c) See figure below  
d) Rotation 180° about the point (-2, -1) or $f_{(180^\circ, (-2, -1))}(AB) = A''B''$  
e) Yes, a rotation is an isometry because all of the measurements (lengths/angles) are preserved.  

20. See diagram below