Using Mapping Notation to Represent a Transformation Practice

1. When y = f(x) is transformed into g(x) = 4f(-8x) – 7, the mapping notation representing these transformations would be

   A) $(x, y) \longrightarrow (-8x, 4y - 7)$
   B) $(x, y) \longrightarrow (-8x, \frac{1}{4}y - 7)$
   C) $(x, y) \longrightarrow (-\frac{1}{8}x, 4y - 7)$
   D) $(x, y) \longrightarrow (-\frac{1}{8}x, \frac{1}{4}y - 7)$

Use the following information to answer the next question.

When y = f(x) is transformed into $g(x) + 3 = -\frac{1}{2}f\big(4(x+5)\big)$, the mapping notation representing these changes is $(x, y) \longrightarrow (mx + c, ky + p)$

Consider the following statements.

Statement 1	k > 0
Statement 2	p = 5
Statement 3	m < 1
Statement 4	c = 3

2. The correct statement is

   A) 1 B) 2 C) 3 D) 4

3. The mapping notation to represent the transformations given by $g(x) = 6f\left(\frac{1}{3}(x-9)\right) + 11$, is (mx + c, ky + p). The **sum** of *m* and *c* is _____.

Use the following information to answer the next question.

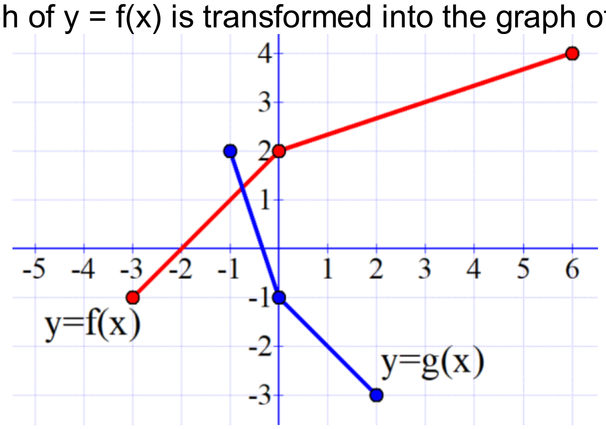
The graph of y = f(x) is stretched vertically by a factor of $\frac{1}{13}$ about the x-axis, stretched horizontally by a factor of $\frac{1}{6}$ about the y-axis and then translated 4 units down. These transformations can be described by the mapping notation (x, y) $\longrightarrow$ (mx, ny + p). Possible values for m, n, and p are listed below.

Reference Number	Possible Values of m, n, and p
1	4
2	-4
3	$\frac{1}{13}$
4	$\frac{1}{6}$
5	13
6	6

4. The reference numbers for the values of **m**, **n**, and **p** are, respectively, ____, ____, and ____.

Use the following information to answer the next question.

The graph of y = f(x) is transformed into the graph of y = g(x).



The transformations can be described by the equation g(x) = -f(mx) + 1, or by the mapping notation, (x, y) $\longrightarrow (\frac{1}{m}x, -y + 1)$

5. The value of **m** is _____.

Use the following information to answer the next question.

The mapping notation (x, y) $\longrightarrow$ (x – 1, -y + 6) is used to describe the transformation of the function y = f(x) into the function y = g(x).

6. In correct order, the transformations that would transform y = f(x) into y = g(x) are

   A) Translation 1 unit left, translation 6 units down, reflection in the x-axis.
   B) Translation 1 unit right, translation 6 units down, reflection in the x-axis.
   C) Translation 1 unit left, translation 6 units down, reflection in the y-axis.
   D) Translation 1 unit right, translation 6 units down, reflection in the y-axis.

Use the following information to answer the next question.

The function f(x) = (x – 4) (x + 6) is transformed into a new function y = g(x) using the mapping notation, (x, y) $\longrightarrow \left(\frac{1}{2}x - 1, y\right)$.

7. The zeros of y = g(x) are

   A) -13 and 9 B) -11 and 7 C) -2 and 3 D) -4 and 1

8. The point (-3,9) is moved to (-1,-4). This transformation can be described by

   A) (x,y) $\longrightarrow \left(\frac{1}{3}x, -y + 5\right)$
   B) (x,y) $\longrightarrow (3x, -y + 5)$
   C) (x,y) $\longrightarrow \left(\frac{1}{3}x, y - 5\right)$
   D) (x,y) $\longrightarrow (3x, y - 5)$

Using Mapping Notation to Represent a Transformation Practice Solutions

1. When y = f(x) is transformed into g(x) = 4f(-8x) – 7, the mapping notation representing these transformations would be

   A) $(x, y) \longrightarrow (-8x, 4y - 7)$
   B) $(x, y) \longrightarrow (-8x, \frac{1}{4}y - 7)$
   C) $(x, y) \longrightarrow (-\frac{1}{8}x, 4y - 7)$
   D) $(x, y) \longrightarrow (-\frac{1}{8}x, \frac{1}{4}y - 7)$

Solution

There is a vertical stretch by a factor of 4 about the x-axis, a reflection in the y-axis, a horizontal stretch by a factor of $\frac{1}{8}$ and a translation 7 units down.

When using mapping notation, the x and y coordinates are multiplied by the **factor** values.

The correct answer is C.

Use the following information to answer the next question.

When y = f(x) is transformed into $g(x) + 3 = -\frac{1}{2}f\left(4(x + 5)\right)$, the mapping notation representing these changes is $(x, y) \longrightarrow (mx + c, ky + p)$

Consider the following statements.

Statement 1	k > 0
Statement 2	p = 5
Statement 3	m < 1
Statement 4	c = 3

2. The correct statement is

A) 1 B) 2 C) 3 D) 4

Solution

There is a reflection in the x-axis, a vertical stretch by a factor of ½ about the x-axis, a horizontal stretch by a factor of $\frac{1}{4}$ about the y-axis, a translation 5 units left and a translation 3 units down.

The mapping notation representing these changes is (x, y) $\longrightarrow$ ($\frac{1}{4}$x - 5, $-\frac{1}{2}$y - 3)

As such, m = $\frac{1}{4}$, c = -5, k = $-\frac{1}{2}$, and p = -3.

Statement 1 is false because k < 0.

Statement 2 is false because p = -3.

Statement 3 is **true** because m < 1.

Statement 4 is false because c = -5.

The correct answer is C.

3. The mapping notation to represent the transformations given by $g(x) = 6f\left(\frac{1}{3}(x-9)\right) + 11$, is (mx + c, ky + p). The **sum** of *m* and *c* is __12__.

Solution

There is a vertical stretch by a factor of 6 about the x-axis, a horizontal stretch by a factor of 3 about the y-axis, a translation 9 units right, and a translation 11 units up.

Thus, m = 3, c = 9, k = 6 and p = 11.

The sum of m and c is 12.

Use the following information to answer the next question.

The graph of y = f(x) is stretched vertically by a factor of $\frac{1}{13}$ about the x-axis, stretched horizontally by a factor of $\frac{1}{6}$ about the y-axis and then translated 4 units down. These transformations can be described by the mapping notation $(x, y) \longrightarrow (mx, ny + p)$.
Possible values for m, n, and p are listed below.

Reference Number	Possible Values of m, n, and p
1	4
2	-4
3	$\frac{1}{13}$
4	$\frac{1}{6}$
5	13
6	6

4. The reference numbers for the values of **m**, **n**, and **p** are, respectively, _4_, __3_, and _2__.

Solution

Given a horizontal stretch by a factor of $\frac{1}{6}$, we know that m = $\frac{1}{6}$.

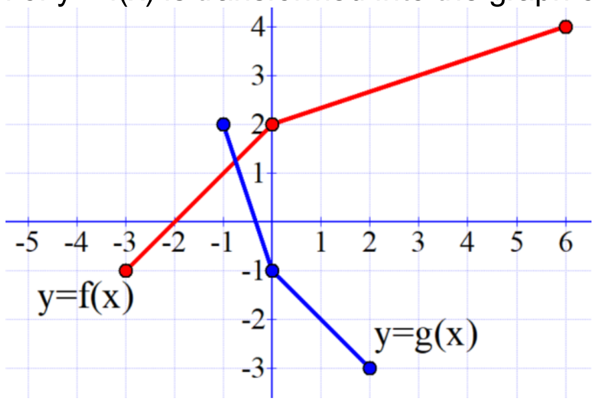
Given a vertical stretch by a factor of $\frac{1}{13}$, we know that n = $\frac{1}{13}$.

Given a translation 4 units down, we know that p = -4.

The reference numbers are 4, 3, and 2.

Use the following information to answer the next question.

The graph of y = f(x) is transformed into the graph of y = g(x).



The transformations can be described by the equation g(x) = -f(mx) + 1, or by the mapping notation, (x, y) $\longrightarrow (\frac{1}{m}x, -y + 1)$

5. The value of **m** is __3__.

Solution

From the mapping notation and the image on the graph, we can deduce that there is a reflection in the x-axis and a horizontal stretch by a factor of $\frac{1}{m}$.

The furthest x-coordinate to the left on y = f(x) is -3, and the furthest x-coordinate to the right on y = f(x) is 6. The horizontal distance between these two x-coordinates is 9 units.

By contrast, the furthest x-coordinate to the left on y = g(x) is -1, and the furthest x-coordinate to the right on y = g(x) is 2. The horizontal distance between these two x-coordinates is 3 units.

This tells us that all the x-coordinates from y = f(x) have moved closer to the y-axis by a factor of $\frac{1}{3}$. Since the factor value and the replacement value in the equation are reciprocals of each other, *m* must be equal to 3.

The value of m is 3.

Use the following information to answer the next question.

The mapping notation (x, y) $\rightarrow$ (x – 1, -y + 6) is used to describe the transformation of the function y = f(x) into the function y = g(x).

6. In correct order, the transformations that would transform y = f(x) into y = g(x) are

   A) Translation 1 unit left, translation 6 units down, reflection in the x-axis.
   B) Translation 1 unit right, translation 6 units down, reflection in the x-axis.
   C) Translation 1 unit left, translation 6 units down, reflection in the y-axis.
   D) Translation 1 unit right, translation 6 units down, reflection in the y-axis.

Solution

With a mapping notation for *x* as (x – 1), all values of *x* are getting smaller. From a descriptive perspective, the values of *x* are moving to the left. Thus, options B and D above are eliminated.

With the mapping notation for *y* as (-y + 6), all values of *y* are reflected in the x-axis.

The correct answer is A.

Use the following information to answer the next question.

The function f(x) = (x – 4) (x + 6) is transformed into a new function y = g(x) using the mapping notation, (x, y) $\rightarrow \left(\frac{1}{2}x - 1, y\right)$.

7. The zeros of y = g(x) are

   A) -13 and 9 B) -11 and 7 C) -2 and 3 D) -4 and 1

Solution

The x-intercepts, or zeros, of y = f(x) are 4 and -6.

The mapping notation tells us to multiply each value of *x* by ½ , and then subtract 1 (which would move the x-coordinate to the left).

$$\left(\frac{1}{2}\right)(4) - 1 = 1$$

$$\left(\frac{1}{2}\right)(-6) - 1 = -4$$

The correct answer is D.

8. The point (-3,9) is moved to (-1,-4). This transformation can be described by

   A) (x,y) $\rightarrow \left(\frac{1}{3}x, -y+5\right)$
   B) (x,y) $\rightarrow (3x, -y+5)$
   C) (x,y) $\rightarrow \left(\frac{1}{3}x, y-5\right)$
   D) (x,y) $\rightarrow (3x, y-5)$

Solution

When the original x-coordinate of -3 is multiplied by $\frac{1}{3}$, the x-coordinate of the transformed point is -1. Thus, we eliminate options B and D as possible answers.

When the original y-coordinate of 9 is reflected in the x-axis by (-y) and then moved 5 units up, we arrive at the new y-coordinate of the transformed point, -4.

The correct answer is A.