MATHEMATICS · GRADES 7-9

Transformations and Symmetry

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you move a shape without changing it, like sliding, flipping, or turning a logo or a tile pattern, and check whether it still balances the same way. A slide, a flip, or a turn keeps the shape exactly the same size and form, only its place or facing changes. After moving it, you can check whether it still lines up with itself, which is what symmetry means. That is how designers repeat a pattern, tilers lay a floor, and anyone checks whether a shape is balanced.



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Rule

Transformations: a translation slides a shape, a reflection flips it, and a rotation turns it. Each keeps the shape exactly the same size and form, only its place or facing changes.

Reflecting across the y-axis changes the sign of x only. Translating right adds to x, and translating down subtracts from y.

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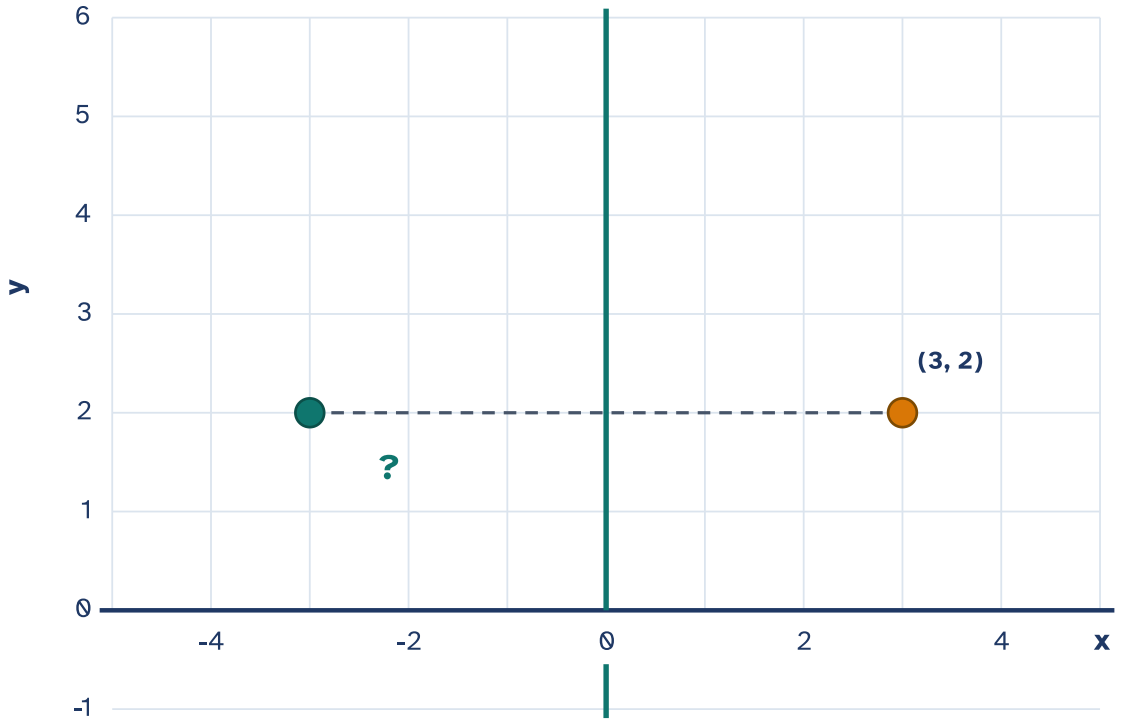
Worked examples

EXAMPLE 1

Q Where does the point (3, 2) land when it is reflected across the y-axis?



SOLUTION

Mirror the graph in the y-axis and only the x values change sign.

x = 3 becomes -3; y stays 2.

The image is (-3, 2).

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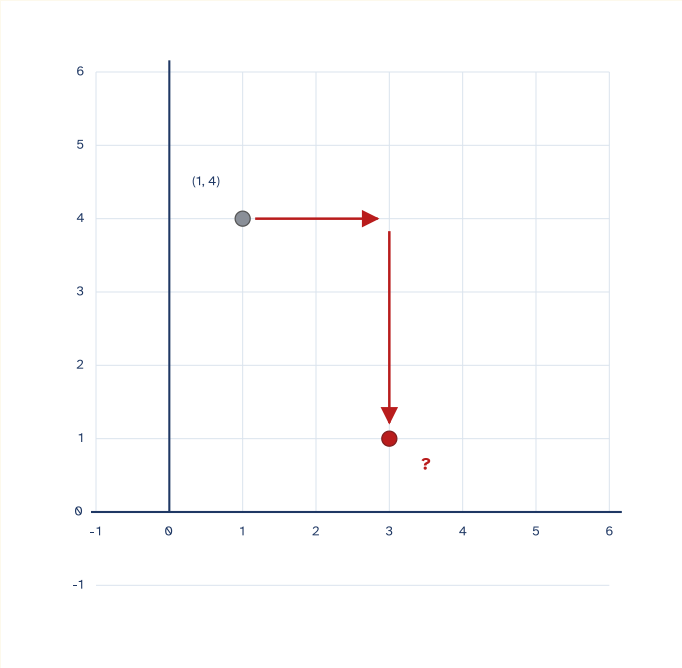
EXAMPLE 2

Q Where does the point (1, 4) land when it is translated 2 right and 3 down?



SOLUTION

Right adds to x: 1 + 2 = 3

Down subtracts from y: 4 - 3 = 1

The image is (3, 1).

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Practice questions

1 Reflect the point (4, 5) across the y-axis. Give the coordinates of the image.

- **A** (-4, 5)
- **B** (4, 5)
- **C** (-4, -5)
- **D** (4, -5)

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2 Translate the point (2, 5) by 3 right and 2 down. Give the coordinates of the image.

- **A** (5, 3)
- **B** (2, 3)
- **C** (5, 7)
- **D** (3, 5)

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3 Reflect the point (5, 1) across the y-axis. Give the coordinates of the image.

- A (-5, 1)
- B (5, 1)
- C (-5, -1)
- D (5, -1)

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4 Flip the point (5, 1) across the x-axis. Give the coordinates of the image.

- A (5, -1)
- B (5, 1)
- C (-5, -1)
- D (-5, 1)

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5 Translate the point (2, 3) by 4 right. Give the coordinates of the image.

- A (6, 3)
- B (2, 3)
- C (6, 7)
- D (2, 7)

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6 Translate the point (2, 3) by 1 up. Give the coordinates of the image.

- A (2, 4)
- B (2, 3)
- C (2, 2)
- D (3, 4)

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7 Slide the point (0, 0) by 3 left and 2 up. Give the coordinates of the image.

- A (-3, 2)
- B (3, 2)
- C (-3, -2)
- D (3, -2)

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8 Mirror the point (-4, 2) in the y-axis. Give the coordinates of the image.

- A (4, 2)
- B (-4, 2)
- C (4, -2)
- D (-4, -2)

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9 Move the point (5, 5) by 2 left and 1 down. Give the coordinates of the image.

- A (3, 4)
- B (5, 5)
- C (7, 4)
- D (3, 6)

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10 The point (0, 3) sits on the y-axis. Reflect it across the y-axis. Give the coordinates of the image.

- A (0, 3)
- B (0, -3)
- C (3, 0)
- D (-3, 0)

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ANSWER KEY

1. (-4, 5)

2. (5, 3)

3. (-5, 1)

4. (5, -1)

5. (6, 3)

6. (2, 4)

7. (-3, 2)

8. (4, 2)

9. (3, 4)

10. (0, 3)

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