

# Transformations on the Coordinate Plane

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Score: \_\_\_\_\_ / 24

## Q Quick Review

A **transformation** moves a point or shape to a new spot. A **translation** slides a point: moving right adds to  $x$ , left subtracts from  $x$ , up adds to  $y$ , and down subtracts from  $y$ . A **reflection** flips a point over a line, like a mirror. Reflecting over the  $x$ -axis keeps  $x$  the same and flips the sign of  $y$ :  $(x, y) \rightarrow (x, -y)$ . Reflecting over the  $y$ -axis keeps  $y$  the same and flips the sign of  $x$ :  $(x, y) \rightarrow (-x, y)$ . Take it one coordinate at a time and you will not get mixed up.

◇ **Example:** The point  $(3, 2)$  is translated 5 units right and 3 units up. What are its new coordinates?

⇒ Handle the  $x$ -coordinate first. Moving 5 units right means adding 5 to the  $x$ -value:  $3 + 5 = 8$ . Now the  $y$ -coordinate. Moving 3 units up means adding 3 to the  $y$ -value:  $2 + 3 = 5$ . Put the two new coordinates together to get the image point  $(8, 5)$ .

**Answer:**  $(8, 5)$

## PRACTICE

Find the new coordinates after each transformation. Write answers as ordered pairs.

- |                                      |       |   |       |
|--------------------------------------|-------|---|-------|
| 1. Translate $(1, 1)$ right 4        | _____ | 11. Reflect $(4, 2)$ over the $x$ -axis   | _____ |
| 2. Translate $(2, 3)$ up 5           | _____ | 12. Reflect $(3, 5)$ over the $x$ -axis   | _____ |
| 3. Translate $(6, 4)$ left 2         | _____ | 13. Reflect $(6, 1)$ over the $x$ -axis   | _____ |
| 4. Translate $(5, 7)$ down 3         | _____ | 14. Reflect $(2, -4)$ over the $x$ -axis  | _____ |
| 5. Translate $(2, 2)$ right 3 up 4   | _____ | 15. Reflect $(5, 2)$ over the $y$ -axis   | _____ |
| 6. Translate $(8, 5)$ left 5 down 2  | _____ | 16. Reflect $(3, 7)$ over the $y$ -axis   | _____ |
| 7. Translate $(0, 0)$ right 6 up 6   | _____ | 17. Reflect $(8, 4)$ over the $y$ -axis   | _____ |
| 8. Translate $(4, 9)$ left 4 down 9  | _____ | 18. Reflect $(-6, 3)$ over the $y$ -axis  | _____ |
| 9. Translate $(3, 1)$ right 7 down 1 | _____ | 19. Reflect $(7, -2)$ over the $x$ -axis  | _____ |
| 10. Translate $(10, 2)$ left 3 up 5  | _____ | 20. Reflect $(-4, -5)$ over the $y$ -axis | _____ |

## ◆ Word Problems

21. On a game board, a player's piece is at  $(4, 3)$ . The player moves it 6 spaces right and 2 spaces up. What is the piece's new position? \_\_\_\_\_
22. A drone is at the point  $(7, 5)$  on a map grid. It flies 3 units left and 5 units down. Where is the drone now? \_\_\_\_\_
23. A designer places a logo at  $(6, 4)$  and wants its mirror image across the  $y$ -axis for the opposite page. What are the coordinates of the reflected logo? \_\_\_\_\_
24. A boat marker is at  $(5, 8)$  on a chart. The chart is flipped over the  $x$ -axis to show the view from below. What are the new coordinates of the marker? \_\_\_\_\_



## Answer Keys

1.  $(5, 1)$

2.  $(2, 8)$

3.  $(4, 4)$

4.  $(5, 4)$

5.  $(5, 6)$

6.  $(3, 3)$

7.  $(6, 6)$

8.  $(0, 0)$

9.  $(10, 0)$

10.  $(7, 7)$

11.  $(4, -2)$

12.  $(3, -5)$

13.  $(6, -1)$

14.  $(2, 4)$

15.  $(-5, 2)$

16.  $(-3, 7)$

17.  $(-8, 4)$

18.  $(6, 3)$

19.  $(7, 2)$

20.  $(4, -5)$

21.  $(10, 5)$

22.  $(4, 0)$

23.  $(-6, 4)$

24.  $(5, -8)$

### Step-by-Step Explanations

1. Moving right adds to  $x$ :  $1 + 4 = 5$ . The  $y$ -value stays 1.

2. Moving up adds to  $y$ :  $3 + 5 = 8$ . The  $x$ -value stays 2.

3. Moving left subtracts from  $x$ :  $6 - 2 = 4$ . The  $y$ -value stays 4.

4. Moving down subtracts from  $y$ :  $7 - 3 = 4$ . The  $x$ -value stays 5.

5. Add to both:  $2 + 3 = 5$  and  $2 + 4 = 6$ .

6. Subtract from both:  $8 - 5 = 3$  and  $5 - 2 = 3$ .

7. Add to both:  $0 + 6 = 6$  and  $0 + 6 = 6$ .

8. Subtract from both:  $4 - 4 = 0$  and  $9 - 9 = 0$ .

9. Add to  $x$ :  $3 + 7 = 10$ . Subtract from  $y$ :  $1 - 1 = 0$ .

10. Subtract from  $x$ :  $10 - 3 = 7$ . Add to  $y$ :  $2 + 5 = 7$ .

11. Reflecting over the  $x$ -axis keeps  $x$  and flips  $y$ :  $(4, -2)$ .

12. Keep  $x$ , flip the sign of  $y$ :  $(3, -5)$ .

13. Keep  $x$ , flip the sign of  $y$ :  $(6, -1)$ .

14. Keep  $x$ , flip the sign of  $y$ :  $-4$  becomes 4, giving  $(2, 4)$ .

15. Reflecting over the  $y$ -axis keeps  $y$  and flips  $x$ :  $(-5, 2)$ .

16. Keep  $y$ , flip the sign of  $x$ :  $(-3, 7)$ .

17. Keep  $y$ , flip the sign of  $x$ :  $(-8, 4)$ .

18. Keep  $y$ , flip the sign of  $x$ :  $-6$  becomes 6, giving  $(6, 3)$ .

19. Keep  $x$ , flip the sign of  $y$ :  $-2$  becomes 2, giving  $(7, 2)$ .

20. Keep  $y$ , flip the sign of  $x$ :  $-4$  becomes 4, giving  $(4, -5)$ .

21. Moving right adds to  $x$ :  $4 + 6 = 10$ . Moving up adds to  $y$ :  $3 + 2 = 5$ . The new position is  $(10, 5)$ .

22. Moving left subtracts from  $x$ :  $7 - 3 = 4$ . Moving down subtracts from  $y$ :  $5 - 5 = 0$ . The drone is at  $(4, 0)$ .

23. Reflecting over the  $y$ -axis keeps  $y$  the same and flips the sign of  $x$ : 6 becomes  $-6$ , giving  $(-6, 4)$ .

24. Reflecting over the  $x$ -axis keeps  $x$  the same and flips the sign of  $y$ : 8 becomes  $-8$ , giving  $(5, -8)$ .



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