

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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