

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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