Transformations on the Coordinate Plane

Name: _____	Date: _____	Score: _____ / 24

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: $(x, y) \to (x, -y)$. Reflecting over the y**-axis** keeps y the same and flips the sign of x: $(x, y) \to (-x, y)$. 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 _____
2. Translate $(2, 3)$ up 5 _____
3. Translate $(6, 4)$ left 2 _____
4. Translate $(5, 7)$ down 3 _____
5. Translate $(2, 2)$ right 3 up 4 _____
6. Translate $(8, 5)$ left 5 down 2 _____
7. Translate $(0, 0)$ right 6 up 6 _____
8. Translate $(4, 9)$ left 4 down 9 _____
9. Translate $(3, 1)$ right 7 down 1 _____
10. Translate $(10, 2)$ left 3 up 5 _____
11. Reflect $(4, 2)$ over the x-axis _____
12. Reflect $(3, 5)$ over the x-axis _____
13. Reflect $(6, 1)$ over the x-axis _____
14. Reflect $(2, -4)$ over the x-axis _____
15. Reflect $(5, 2)$ over the y-axis _____
16. Reflect $(3, 7)$ over the y-axis _____
17. Reflect $(8, 4)$ over the y-axis _____
18. Reflect $(-6, 3)$ over the y-axis _____
19. Reflect $(7, -2)$ over the x-axis _____
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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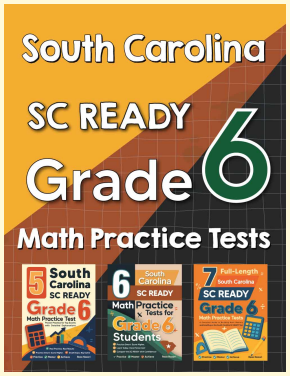

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