

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

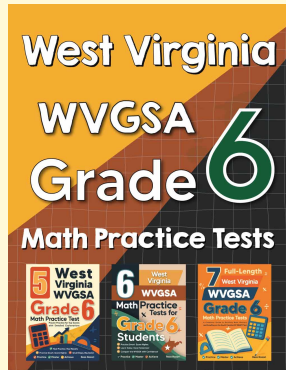
- | | |
|--|--|
| 1. <input type="text" value="(5, 1)"/> | 13. <input type="text" value="(6, -1)"/> |
| 2. <input type="text" value="(2, 8)"/> | 14. <input type="text" value="(2, 4)"/> |
| 3. <input type="text" value="(4, 4)"/> | 15. <input type="text" value="(-5, 2)"/> |
| 4. <input type="text" value="(5, 4)"/> | 16. <input type="text" value="(-3, 7)"/> |
| 5. <input type="text" value="(5, 6)"/> | 17. <input type="text" value="(-8, 4)"/> |
| 6. <input type="text" value="(3, 3)"/> | 18. <input type="text" value="(6, 3)"/> |
| 7. <input type="text" value="(6, 6)"/> | 19. <input type="text" value="(7, 2)"/> |
| 8. <input type="text" value="(0, 0)"/> | 20. <input type="text" value="(4, -5)"/> |
| 9. <input type="text" value="(10, 0)"/> | 21. <input type="text" value="(10, 5)"/> |
| 10. <input type="text" value="(7, 7)"/> | 22. <input type="text" value="(4, 0)"/> |
| 11. <input type="text" value="(4, -2)"/> | 23. <input type="text" value="(-6, 4)"/> |
| 12. <input type="text" value="(3, -5)"/> | 24. <input type="text" value="(5, -8)"/> |

Step-by-Step Explanations

- | | |
|---|---|
| <p>1. Moving right adds to x: $1 + 4 = 5$. The y-value stays 1.</p> <p>2. Moving up adds to y: $3 + 5 = 8$. The x-value stays 2.</p> <p>3. Moving left subtracts from x: $6 - 2 = 4$. The y-value stays 4.</p> <p>4. Moving down subtracts from y: $7 - 3 = 4$. The x-value stays 5.</p> <p>5. Add to both: $2 + 3 = 5$ and $2 + 4 = 6$.</p> <p>6. Subtract from both: $8 - 5 = 3$ and $5 - 2 = 3$.</p> <p>7. Add to both: $0 + 6 = 6$ and $0 + 6 = 6$.</p> <p>8. Subtract from both: $4 - 4 = 0$ and $9 - 9 = 0$.</p> <p>9. Add to x: $3 + 7 = 10$. Subtract from y: $1 - 1 = 0$.</p> <p>10. Subtract from x: $10 - 3 = 7$. Add to y: $2 + 5 = 7$.</p> <p>11. Reflecting over the x-axis keeps x and flips y: $(4, -2)$.</p> <p>12. Keep x, flip the sign of y: $(3, -5)$.</p> <p>13. Keep x, flip the sign of y: $(6, -1)$.</p> <p>14. Keep x, flip the sign of y: -4 becomes 4, giving $(2, 4)$.</p> | <p>15. Reflecting over the y-axis keeps y and flips x: $(-5, 2)$.</p> <p>16. Keep y, flip the sign of x: $(-3, 7)$.</p> <p>17. Keep y, flip the sign of x: $(-8, 4)$.</p> <p>18. Keep y, flip the sign of x: -6 becomes 6, giving $(6, 3)$.</p> <p>19. Keep x, flip the sign of y: -2 becomes 2, giving $(7, 2)$.</p> <p>20. Keep y, flip the sign of x: -4 becomes 4, giving $(4, -5)$.</p> <p>21. Moving right adds to x: $4 + 6 = 10$. Moving up adds to y: $3 + 2 = 5$. The new position is $(10, 5)$.</p> <p>22. Moving left subtracts from x: $7 - 3 = 4$. Moving down subtracts from y: $5 - 5 = 0$. The drone is at $(4, 0)$.</p> <p>23. Reflecting over the y-axis keeps y the same and flips the sign of x: 6 becomes -6, giving $(-6, 4)$.</p> <p>24. Reflecting over the x-axis keeps x the same and flips the sign of y: 8 becomes -8, giving $(5, -8)$.</p> |
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