Answers - Reflection and translation

Year: Year 5

Answer to Question 1

a. Go across 2 and up 5: **(2, 5)**.
b. Across 6 and up 1: **(6, 1)**.
c. Across 4 and up 4: **(4, 4)**.
d. Count the steps along and up: A is 2 + 5 = 7 steps, B is 6 + 1 = 7 steps and C is 4 + 4 = 8 steps. So **A and B** are equally near and C is further.

Answer to Question 2

a. The fourth corner is above (1, 1), so it is **(1, 3)**.
b. Along the bottom from x = 1 to x = 5 is 4 squares. Up the side from y = 1 to y = 3 is 2 squares. The sides are **4 and 2**.
c. Perimeter: 2 × (4 + 2) = **12**. Area: 4 × 2 = **8 squares**.

Answer to Question 3

a. (2, 3): x = 2 + 4 = 6 and y = 3 + 2 = 5. The image is **(6, 5)**.
b. (7, 5): x = 7 − 3 = 4 and y = 5 − 4 = 1. The image is **(4, 1)**.
c. (1, 1): x = 1 + 6 = 7 and y = 1 + 0 = 1. The image is **(7, 1)**.
d. (4, 6): x = 4 − 2 = 2 and y = 6 − 5 = 1. The image is **(2, 1)**.

Answer to Question 4

a. **(6, 3), (8, 3), (6, 6)** (add 5 to x and 2 to y).
b. **(5, 1), (7, 1), (5, 4)** (add 4 to x, y stays the same).
c. **Yes**. A translation only slides the shape, so all sides and angles stay the same.

Answer to Question 5

a. (2, 3) is 3 squares from the line, so the image is 3 on the other side: **(8, 3)**.
b. (4, 5) is 1 square from the line, so the image is 1 on the other side: **(6, 5)**.
c. (1, 2) is 4 squares from the line, so the image is 4 on the other side: **(9, 2)**.
d. (5, 1) is 0 squares from the line, so the image is 0 on the other side: **(5, 1)**.

Answer to Question 6

a. (2, 1) is 3 squares from the line, so the image is 3 on the other side: **(2, 7)**.
b. (3, 2) is 2 squares from the line, so the image is 2 on the other side: **(3, 6)**.
c. (5, 4) is 0 squares from the line, so the image is 0 on the other side: **(5, 4)**. (It lies on the mirror line, so it does not move.)
d. (1, 6) is 2 squares from the line, so the image is 2 on the other side: **(1, 2)**.

Answer to Question 7

a. From (1, 1) to (4, 3): **3 right and 2 up**.
b. From (4, 3) to (7, 2): **3 right and 1 down**.
c. $(7 - 2, 2 + 3) =$ **(5, 5)**.
d. The **cave**.

Answer to Question 8

a. Start (2, 2). Right 4: **(6, 2)**. Up 3: **(6, 5)**. Left 2: **(4, 5)**. Down 1: **(4, 4)**.
b. The finish is (4, 4). $4 - 2 = 2$ and $4 - 2 = 2$, so **2 squares right and 2 squares up**.
c. The reverse: **2 squares left and 2 squares down**.
d. (4, 4) is 2 squares left of $x = 6$, so the image is 2 right: **(8, 4)**.

Answer to Question 9

a. $4 - 2 =$ **2 squares**.
b. 2 squares the other side: **(6, 1)**.
c. $(6 - 3, 5 - 2) =$ **(3, 3)**.
d. Tom's reflected counter is at (6, 1) and Zara's is at (3, 3). They are **not** in the same place.

Answer to Question 10

a. $7 - 4 =$ **3 squares**.
b. The top is 3 squares above the line, so the image is 3 below: $4 - 3 = 1$. The image is at **(4, 1)**.
c. The base is on the mirror line, so it does not move: **(4, 4)**.
d. $3 + 3 =$ **6 squares**.

Answer to Question 11

a. $6 - 3 =$ **3 squares**.
b. Using $6 - x$: (4, 2) → (2, 2); (6, 2) → (0, 2); (6, 5) → (0, 5); (4, 5) → (2, 5). The wing has corners **(2, 2), (0, 2), (0, 5), (2, 5)**.
c. (4, 2) and (4, 5) are both 1 square from the mirror line, and (6, 2) and (6, 5) are both 3 squares from it.

Answer to Question 12

a. (3, 4) and (5, 4) lie on $y = 4$, so they do not move.
b. (4, 6) is 2 above the line, so the image is 2 below: **(4, 2)**.
c. Top (4, 6), right (5, 4), bottom (4, 2), left (3, 4): **(4, 6), (5, 4), (4, 2), (3, 4)**.
d. From $y = 6$ down to $y = 2$ is **4 squares**.

Answer to Question 13

a. (7, 4), (9, 4), (9, 6), (7, 6).
b. Area $= 2 \times 2 =$ **4 squares**. It **does not change** because a translation keeps the size.
c. Using $18 - x$: (7, 4) → (11, 4); (9, 4) → (9, 4); (9, 6) → (9, 6); (7, 6) → (11, 6). The corners are **(11, 4), (9, 4), (9, 6), (11, 6)**.

Answer to Question 14

a. $6 - 0 =$ **6 squares**.
b. Reflected posts: (12, 3) and (12, 5).
c. From $x = 0$ to $x = 12$ is **12 squares**.
d. (1, 3) and (1, 5).

Answer to Question 15

a. Add 3 to x and 1 to y: A'(4, 3), B'(7, 3), C'(4, 6).
b. New $x = 16 - x$: (4, 3) → (12, 3); (7, 3) → (9, 3); (4, 6) → (12, 6). The corners are **(12, 3), (9, 3), (12, 6)**.
c. **Yes**. Translations and reflections keep all lengths and angles the same.
d. The translation **3 squares right and 1 square up**.
e. **No**. The reflection flips the triangle, so the right angle is now at the right-hand side instead of the left.

Answer to Question 16

a. x: 8 − 3 = 5 and y: 6 − 4 = 2. The translation is **5 squares right and 2 squares up**.
b. (9 − 4, 7 − 5) = **(5, 2)**.
c. The image is 3 squares right of the line (8 − 5 = 3), so the original was 3 left: 5 − 3 = 2. The original point is **(2, 2)**.
d. The image is 2 below the line (3 − 1 = 2), so the original is 2 above: 3 + 2 = 5. The original point is **(4, 5)**.
e. The translation is 4 right and 1 up. (4, 2) → **(8, 3)** and (3, 5) → **(7, 6)**.

Answer to Question 17

a. New x = 10 − x: (1, 1) → (9, 1); (4, 1) → (6, 1); (4, 2) → (6, 2); (2, 2) → (8, 2); (2, 4) → (8, 4); (1, 4) → (9, 4).
b. (4, 1) and (4, 2) are the closest: 5 − 4 = **1 square** away.
c. Subtract 1 from y: (9, 0), (6, 0), (6, 1), (8, 1), (8, 3), (9, 3).
d. Yes, before the translation the two tiles form a symmetrical pattern, since each point and its image are the same distance from x = 5.

Answer to Question 18

a. (8 − 2, 5 − 1) = **6 squares right and 4 squares up**.
b. From (2, 1), 3 right and 2 up gives (5, 3), which is the bench. The bench is at the **halfway point** of the path (half of 6 and 4), so **yes**.
c. 8 is 3 right of the line, so the image is 3 left: **(2, 5)**.
d. (8 − 2, 5 − 4) = **(6, 1)**.
e. **No**. (2, 5) and (6, 1) are different points.

Answer to Question 19

a. The sides are 3 and 2. Perimeter: 2 × (3 + 2) = **10**. Area: 3 × 2 = **6 squares**.
b. New x = 12 − x: (1, 1) → (11, 1); (4, 1) → (8, 1); (4, 3) → (8, 3); (1, 3) → (11, 3).
c. Add 2 to y: **(11, 3), (8, 3), (8, 5), (11, 5)**.
d. Perimeter **10** and area **6 squares**, the same as the original. Reflections and translations do not change size.
e. The corners (4, 1) and (4, 3) are nearest: 6 − 4 = **2 squares** from the line.

Answer to Question 20

a. P is 3 left of x = 5, so the image is 3 right: **(8, 3)**.

b. The point (8, 3) is on the line x = 8, so it does not move. The final image is **(8, 3)**.
c. From (2, 3) to (8, 3) is **6 squares right** (no vertical move).
d. The distance between the mirror lines is 8 − 5 = 3 squares, and the translation is 6 squares, which is **twice the distance between the lines**.