Answers - Four-quadrant coordinates and transformations

Year: Year 6

Answer to Question 1

a. x is negative and y is positive, so A is in the top left: **quadrant 2**.
b. Right is positive and down is negative, so P is at **(4, −3)**.
c. Go **5 squares left** along the x-axis, then **2 squares down**. (Remember: along first, then up or down.)
d. For example (2, 5) is in quadrant 1 and (−4, −1) is in quadrant 3. Any answer with both coordinates positive (quadrant 1) or both negative (quadrant 3) is correct.

Answer to Question 2

a. The fourth corner D is above A and level with C: **(1, 4)**.
b. The fourth corner is above (−2, −2) and level with (2, 2): **(−2, 2)**. The side length is 4, which is true in both directions.
c. From (0, 0) to (4, 0) is 4 to the right. So the fourth corner is 4 to the left of (6, 3): **(2, 3)**.

Answer to Question 3

a. x: 2 + 4 = 6. y: 3 − 5 = −2. The image is **(6, −2)**.
b. x: −3 − 2 = −5. y: 1 + 4 = 5. The image is **(−5, 5)**.
c. x: −4 + 5 = 1. y: −1 + 3 = 2. The image is **(1, 2)**.
d. x goes from 2 to −1, which is 3 to the left. y goes from 5 to 3, which is 2 down. The translation is **3 left and 2 down**.

Answer to Question 4

a. Add 3 to each x and subtract 2 from each y: **A′(4, −1), B′(6, −1), C′(4, 2)**.
b. No. A translation moves every point by the same amount, so the size and shape stay the same. Only the position changes.
c. The base is 2 and the height is 3, so the area is $\frac{1}{2} \times 2 \times 3 =$ **3 square units**. The image has the same area, **3 square units**.

Answer to Question 5

a. The y-axis is the mirror, so x changes sign: **(−3, 2)**.
b. The x-axis is the mirror, so y changes sign: **(3, −2)**.
c. y changes sign: **(−4, 1)**.
d. x changes sign: **(4, −1)**.
e. The x-coordinate stays the same and y changes sign, so it was reflected in the **x-axis**.

Answer to Question 6

a. The y-coordinates are the same, so the points are in a horizontal line. From −4 to 2 is 4 + 2 = **6 units**.
b. The x-coordinates are the same. From −2 to 4 is 2 + 4 = **6 units**.
c. From −3 to 2 is 3 + 2 = **5 units**.
d. From −6 to 5 is 6 + 5 = **11 units**.

Answer to Question 7

a. x: −2 + 5 = 3. y: −3 + 6 = 3. You are at **(3, 3)**.
b. x: 3 − 4 = −1. y: 3 − 7 = −4. You are at **(−1, −4)**.
c. To go from (−1, −4) to (−2, −3), move **1 square left and 1 square up**.
d. From x = −2 to x = −1 is 1 square, and from y = −3 to y = −4 is 1 square. That is 2 squares in total, so **20 m**.

Answer to Question 8

a. The y-coordinates are the same. From −4 to 2 is 6 units, so 6 × 5 = **30 m**.
b. From y = 2 to y = −3 is 5 units, so 5 × 5 = **25 m**.
c. The fourth corner is level with S and below L (which is at x = −4): **(−4, −3)**.
d. The rectangle is 30 m by 25 m. Perimeter = 2 × (30 + 25) = **110 m**.

Answer to Question 9

a. Width: from −3 to 2 is 5 units. Height: from −1 to 3 is 4 units.
b. Width = 5 × 2 = **10 m**. Height = 4 × 2 = **8 m**.
c. Perimeter = 2 × (10 + 8) = **36 m**. Cost = 36 × £7.50 = **£270**.
d. Area = 10 × 8 = **80 m²**.

Answer to Question 10

a. After move 1: (6, 4). After move 2: (6 − 9, 4 − 3) = (−3, 1). After move 3: (−3 + 2, 1 − 5) = **(−1, −4)**.
b. At the end it is 1 unit to the left and 4 units below the start.
c. **1 right and 4 up**.
d. Steps: 6 + 4 + 9 + 3 + 2 + 5 = 29 units, so 29 × 10 = **290 m**.

Answer to Question 11

a. None of the ships is at (3, 2). It is a **miss**. (The ship at (3, −2) has a different y-coordinate.)
b. (−2, −1) is not where a ship is, so it is a **miss**. It is the reflection of the ship at **(−2, 1)** in the x-axis.
c. Reflecting (3, −2) in the y-axis changes x: **(−3, −2)**. There is no ship there, so it is a **miss**.
d. y: 4 − 7 = −3. x: 0 − 3 = −3. The ship is now at **(−3, −3)**.

Answer to Question 12

a. From x = −4 to x = 2 is 6 units, so **600 m**.
b. From y = 2 to y = −3 is 5 units, so **500 m**.
c. The rectangle is 600 m by 500 m. Perimeter = 2 × (600 + 500) = **2 200 m**.
d. School to library 600 m, library to park 500 m, park to swimming pool 600 m. Total = 600 + 500 + 600 = **1 700 m**.

Answer to Question 13

a. Change the sign of each x-coordinate: **(−1, 1), (−4, 2), (−3, 5) and (−1, 3)**.
b. The y-coordinates are **the same**: a reflection in the y-axis only changes the sign of x.
c. Change the sign of each y-coordinate of the first wing: **(1, −1), (4, −2), (3, −5) and (1, −3)**.
d. 2 wings at the top and 2 at the bottom, so **4 wings** in total.

Answer to Question 14

a. x: −5 + 6 − 4 = −3. y: −4 + 3 + 5 = 4. It ends at **(−3, 4)**.
b. The distance from y = 4 to the wall at y = 6 is 2 units, so **yes**.
c. From (−5, −4) to (−3, 4): **2 right and 8 up**.
d. Steps: 6 + 3 + 4 + 5 = 18 units. 18 × 50 = 900 cm = **9 m**.

Answer to Question 15

a. Change the sign of x: **(−1, 2), (−3, 2) and (−3, 5)**.
b. Add 6 to each x-coordinate: **(5, 2), (3, 2) and (3, 5)**.
c. Base 2, height 3, area $\frac{1}{2} \times 2 \times 3 = 3$. The area of S is also **3**, because reflections and translations do not change the area.
d. S has corners (5, 2), (3, 2) and (3, 5). T has corners (1, 2), (3, 2) and (3, 5). The point (3, 2) and (3, 5) are the same in both triangles, so the triangles are mirror images of each other in the line **x = 3**: the x-coordinates 1 and 5 are each 2 from 3 on opposite sides.

Answer to Question 16

a. AC goes from x = −2 to x = 2, so AC = **4 units**. BD goes from y = 3 to y = −2, so BD = 3 + 2 = **5 units**.
b. Area = $\frac{1}{2} \times 4 \times 5 =$ **10 square units**.
c. Change the sign of each y: **A′(−2, 0), B′(0, −3), C′(2, 0), D′(0, 2)**.
d. Add 5 to each x and 1 to each y: **(3, 1), (5, 4), (7, 1), (5, −1)**.
e. Yes, they overlap. The kite goes from y = −2 to y = 3 and its reflection from y = −3 to y = 2, so the shapes share a region around the x-axis.

Answer to Question 17

a. A is in quadrant **1**, B in quadrant **2**, C in quadrant **3**, D in quadrant **4**.
b. A: 3 + 4 = **7 km**. B: 2 + 5 = **7 km**. C: 4 + 3 = **7 km**. D: 2 + 4 = **6 km**.
c. Shop to A: 7. A to B: 5 + 1 = 6. B to C: 2 + 8 = 10. C to D: 6 + 1 = 7. D to shop: 6. Total = 7 + 6 + 10 + 7 + 6 = **36 km**.
d. 36 ÷ 8 = **4.5 litres**.

Answer to Question 18

a. Every x-coordinate has changed sign, y is the same. It is a **reflection in the y-axis**.
b. Every y-coordinate has changed sign, x is the same. It is a **reflection in the x-axis**.
c. Every point moves 3 right and 1 down: **translation 3 right, 1 down**.
d. Every point moves 3 left and 1 up: **translation 3 left, 1 up**.
e. A translation does not turn or flip the shape. R and S are translations, so **R and S** are in the same orientation as T. P and Q are mirror images.

Answer to Question 19

a. AB goes from x = −3 to x = 1, so AB = **4 units**. The height is from y = −2 to y = 1, which is 2 + 1 = **3 units**.
b. Area = base × height = 4 × 3 = **12 square units**.
c. Add 4 to x and 3 to y: **A′(1, 1), B′(5, 1), C′(6, 4), D′(2, 4)**.
d. Change the sign of y: **A″(−3, 2), B″(1, 2), C″(2, −1), D″(−2, −1)**.
e. No. Translations and reflections do not change the size of a shape, so the area is still **12 square units**.

Answer to Question 20

a. After reflection in the y-axis: (−1, 2), (−3, 2), (−3, 5). After translating 6 right: **(5, 2), (3, 2), (3, 5)**.
b. The mid-points between matching x-values are (1 + 5) ÷ 2 = 3 and (3 + 3) ÷ 2 = 3. The mirror line is the vertical line **x = 3**. Aisha is **right**.
c. Change the sign of y: **(5, −2), (3, −2), (3, −5)**.
d. Triangle T has x-coordinates 1, 3, 3 and S has 5, 3, 3. The coordinates **3 and 3** match, so **two** points of S have the same x as a point of T.