Test answers - Transformations

Year: Year 11 · Duration: 45 minutes · /20

Answer to Question 1 (4 marks)

a. $(-2, 1)$, $(-5, 1)$, $(-2, 4)$ (2: 1 for two correct) Reflecting in the y-axis changes the sign of each x-coordinate and keeps y the same.
b. $(1, 2)$, $(1, 5)$, $(4, 2)$ (2: 1 for two correct) Reflecting in the line $y = x$ swaps the x- and y-coordinates of each vertex.

In (a), a common error is to change the sign of y, which reflects in the x-axis instead. In (b), the vertex $(2, 1)$ becomes $(1, 2)$, and a vertex on the line $y = x$ would not move.

Answer to Question 2 (4 marks)

a.  (1); clockwise $(x, y) \to (y, -x)$ gives $(2, -4)$ (1); image $= (3, -3)$ (1)

Find the vector from the centre to P, turn it with the clockwise rule, then add it back to the centre: $(1 + 2, 1 - 4)$.
b. Both distances $\sqrt{16 + 4} = \sqrt{20}$ (1) A rotation does not change the distance from the centre: both vectors have length $\sqrt{20}$.

An anticlockwise rotation would give $(-1, 5)$ instead, a common error.

Answer to Question 3 (4 marks)

a. $A' = (1, 1) + 2(1, 1) = (3, 3)$; $B' = (1, 1) + 2(3, 1) = (7, 3)$; $C' = (1, 1) + 2(1, 4) = (3, 9)$ (1 each) For each vertex, find the vector from the centre $(1, 1)$, double it, and add it to the centre. The image is twice as far from the centre as the original.
b. $3 \times 4 =$ **12** (1) The area scale factor is the square of the length scale factor, $2^2 = 4$.

In (a), a common error is to double the coordinates directly, which uses the origin as the centre.

Answer to Question 4 (4 marks)

a. Rotation (1), 180° (1), about the origin (1) Every coordinate changes sign, which is a half turn: rotation of 180° about $(0, 0)$. A full description must give the type, the angle and the centre.
b. Enlargement with scale factor -1 and centre the origin (1) An enlargement with

scale factor -1 about the origin also changes the sign of every coordinate, so it gives the same image.

Answer to Question 5 (4 marks)

a. $(-9, -3)$ (2) With centre the origin, multiply both coordinates by -3: $3 \times (-3) = -9$ and $1 \times (-3) = -3$. The image is on the opposite side of the origin.

b. $10 \times (-3)^2 =$ **90 cm²** (2) The area scale factor is the square of the scale factor, and $(-3)^2 = 9$ is positive, so the area becomes 90 cm².

A negative scale factor also turns the shape upside down, like a rotation of 180° combined with an enlargement of scale factor 3.