Transformations topic test

15 questions | 41 marks | 45 minutes

A hand-written review of coordinates, rigid movements, transformation order and invariants.

Equivalent correct methods earn the corresponding marks.

1. Translate $P(2, -1)$ 3 units left and 4 units up. [2 marks]

$2 - 3 = -1$ and $-1 + 4 = 3$.

Answer: $P'(-1, 3)$

2. Reflect $A(-5, 2)$ in the x-axis. [1 mark]

Keep x and change the sign of y.

Answer: $A'(-5, -2)$

3. Reflect $B(0, -4)$ in the y-axis. [1 mark]

B lies on the y-axis and stays fixed.

Answer: $B'(0, -4)$

4. The mapping sends $A(-2, -1)$ to $(1, 3)$ and $B(0, 1)$ to $(3, 5)$. Describe the translation and check both points. [2 marks]

A changes by $(3, 4)$.

B also changes by $(3, 4)$.

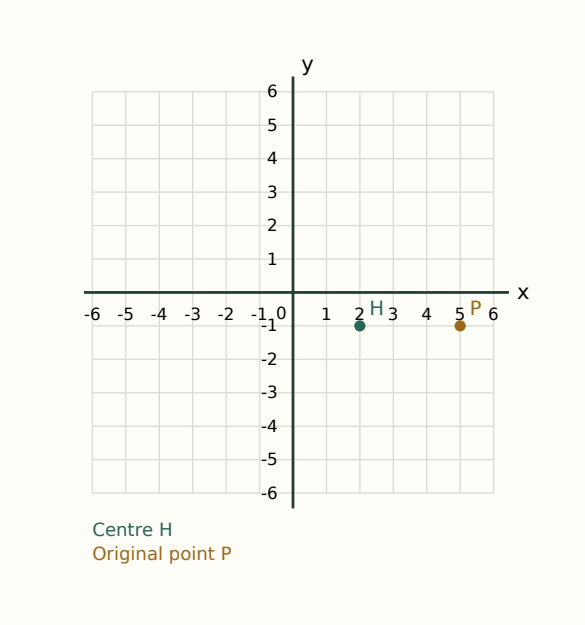
Answer: 3 units right and 4 units up.

5. Rotate $C(-2, 3)$ 90° clockwise about the origin. [2 marks]

Use $(x, y) \mapsto (y, -x)$.

Answer: $C'(3, 2)$

6. Rotate $P(5, -1)$ 180° about $H(2, -1)$. [2 marks]

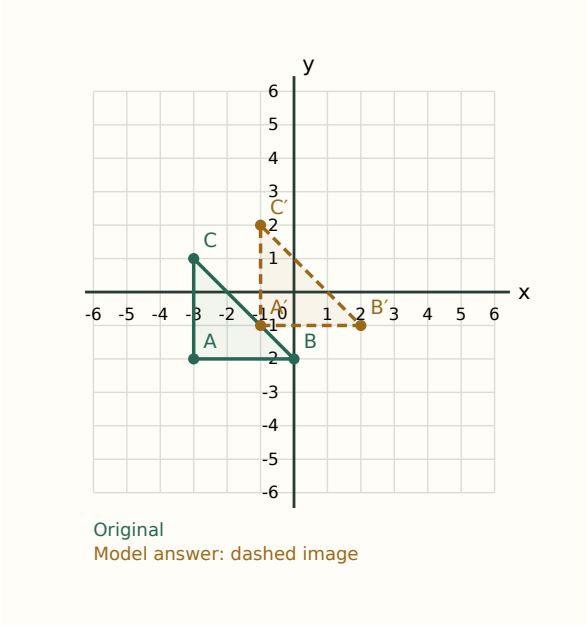


P is 3 units right of H.

A half-turn places the image 3 units left of H.

Answer: $P'(-1, -1)$

7. Translate triangle ABC 2 units right and 1 unit up. Give all three image coordinates. Draw and label the image on the supplied grid. [3 marks]

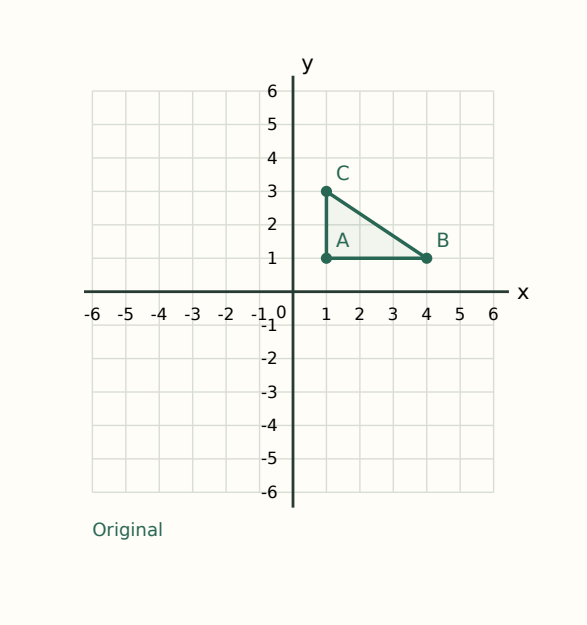


The vertices are $A(-3, -2), B(0, -2), C(-3, 1)$.

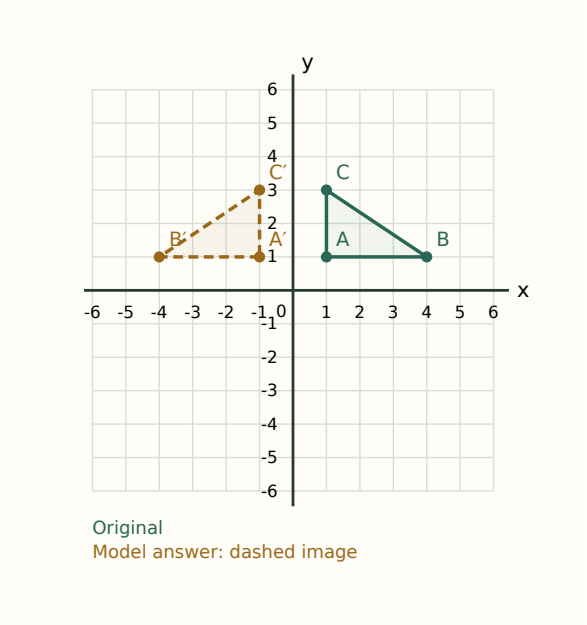
Add 2 to x and 1 to y for each vertex.

Answer: $A'(-1, -1), B'(2, -1), C'(-1, 2)$

8. Triangle ABC has $A(1,1)$, $B(4,1)$ and $C(1,3)$. Reflect it in the y-axis. [4 marks]



(a) Give the image coordinates of all three vertices. Draw and label the image on the supplied grid. [3 marks]

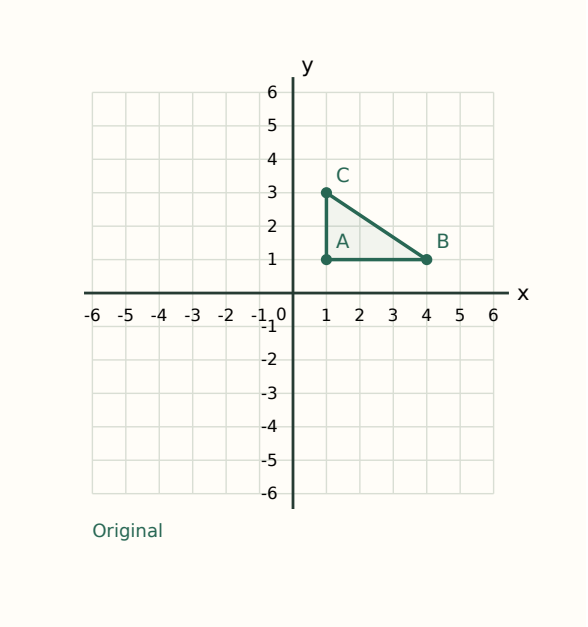


Change the sign of each x-coordinate and keep each y-coordinate.

Answer: $A'(-1,1), B'(-4,1), C'(-1,3)$

Question 8 (continued)

Triangle ABC has $A(1, 1)$, $B(4, 1)$ and $C(1, 3)$. Reflect it in the y-axis.



(b) State whether the clockwise/anticlockwise vertex order is preserved or reversed. [1 mark]

Reflection reverses orientation.

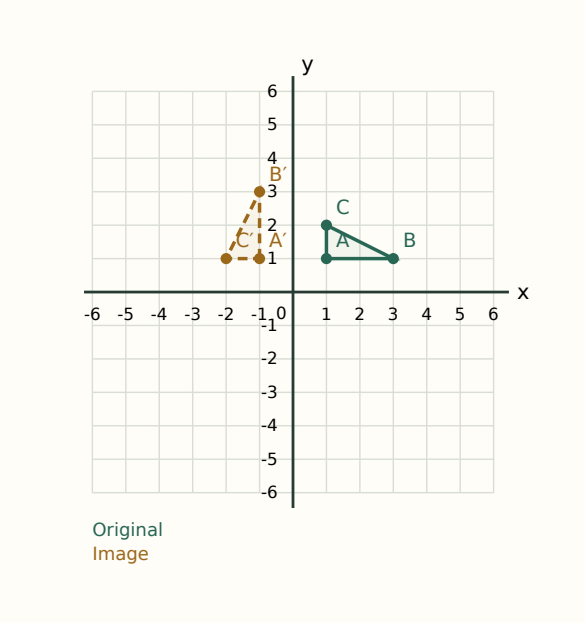
Answer: Reversed.

9. A reflection maps $X(3, 2)$ to $(3, -2)$ and $Y(-1, 4)$ to $(-1, -4)$. Name the mirror line and explain. [2 marks]

Both mappings keep x unchanged and reverse the sign of y.

Answer: The x-axis.

10. A triangle maps $A(1,1)$ to $A'(-1,1)$, $B(3,1)$ to $B'(-1,3)$ and $C(1,2)$ to $C'(-2,1)$. Describe the rotation, including centre and direction. [3 marks]



Every pair follows $(x, y) \mapsto (-y, x)$.

The distances from the origin are preserved.

Answer: 90° anticlockwise about the origin.

11. Reflect $P(-1, 2)$ in the y-axis, then move the image 4 units right and 3 units down. Show the intermediate point. [3 marks]

The reflection gives $(1, 2)$.

The translation gives $(1 + 4, 2 - 3) = (5, -1)$.

Answer: Intermediate $(1, 2)$; final $(5, -1)$.

12. Start at $P(2, 3)$ and compare the two orders below. [4 marks]

(a) Move 1 right and 2 down, then reflect in the x-axis. [2 marks]

Translate to $(3, 1)$, then reflect to $(3, -1)$.

Answer: $(3, -1)$

(b) Reflect in the x-axis first, then move 1 right and 2 down. [2 marks]

Reflect to $(2, -3)$, then translate to $(3, -5)$.

Answer: $(3, -5)$

13. A student says a 90° rotation doubles a shape's perimeter. Explain why this is wrong. [2 marks]

Perimeter is the sum of side lengths.

A rigid turn changes the position, not any length.

Answer: Rotation preserves every side length, so the perimeter is unchanged.

14. A robot starts at $(-4, -2)$ on a floor grid. One unit is 1 metre. [4 marks]

(a) It walks 3 m east and 5 m north. Find its new coordinates. [2 marks]

East adds 3 to x; north adds 5 to y.

$(-4 + 3, -2 + 5) = (-1, 3)$.

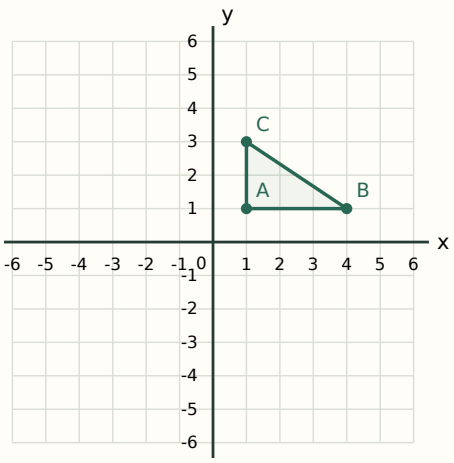
Answer: $(-1, 3)$

(b) On the map, rotate the robot's new position 180° about the origin. Give the image coordinates. [2 marks]

A half-turn reverses both coordinate signs.

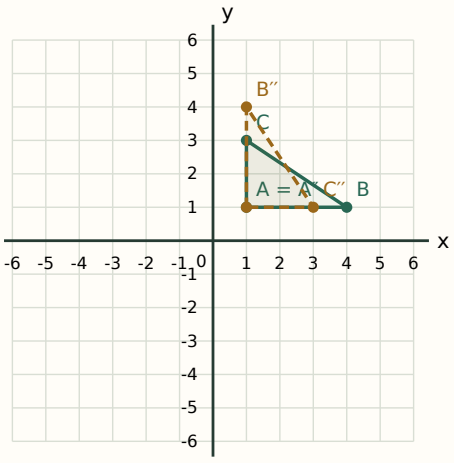
Answer: $(1, -3)$

15. Triangle ABC has $A(1, 1)$, $B(4, 1)$ and $C(1, 3)$. Reflect in the x-axis, then rotate 90° anticlockwise about the origin. [6 marks]



Original

(a) Find the three final vertex coordinates. Draw and label the final image on the supplied grid. [3 marks]



Original
Model answer: dashed image

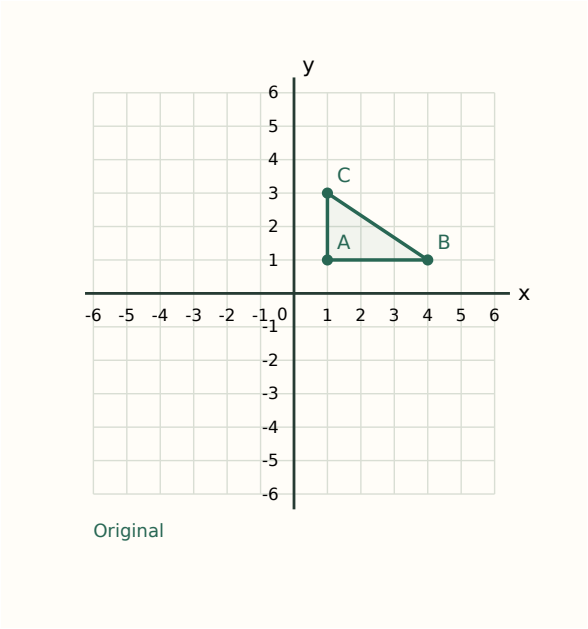
The reflection gives $(1, -1), (4, -1), (1, -3)$.

Then apply $(x, y) \mapsto (-y, x)$ to each reflected point.

Answer: $A''(1, 1), B''(1, 4), C''(3, 1)$

Question 15 (continued)

Triangle ABC has $A(1, 1)$, $B(4, 1)$ and $C(1, 3)$. Reflect in the x-axis, then rotate 90° anticlockwise about the origin.



(b) Find the image area and explain whether it is congruent to the original. [3 marks]

The original perpendicular sides are 3 and 2 units.

$A = \frac{1}{2} \times 3 \times 2 = 3$.

Both transformations preserve lengths and angles, so the final triangle is congruent.

Answer: 3 square units; congruent.