

GCSE MATHS

Transformations and enlargement

Worked Solutions

Q1

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$$(3, 2) \mapsto (-3, 2)$$

Reverse the x -coordinate.

Q2

*

$$(-4, 1) \mapsto (-4, -1)$$

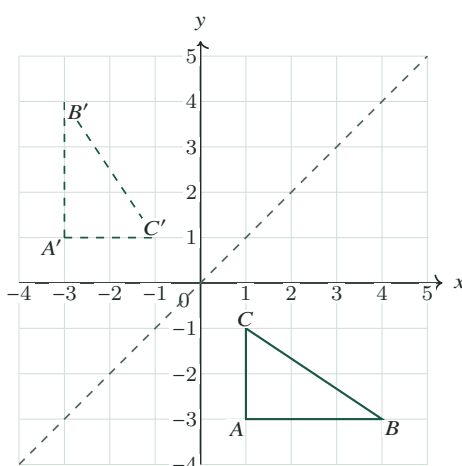
Reverse the y -coordinate.

Q3

**

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

Swap the coordinates of each vertex.

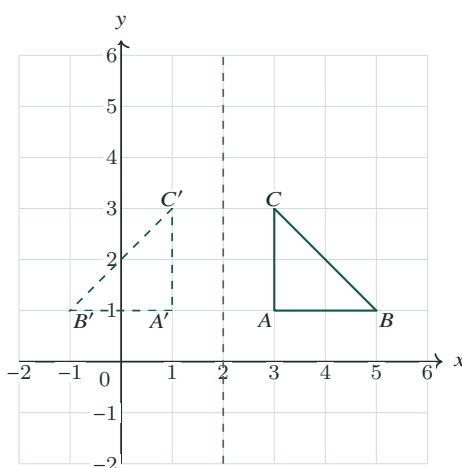


Q4

**

$$A' = (1, 1), B' = (-1, 1), C' = (1, 3)$$

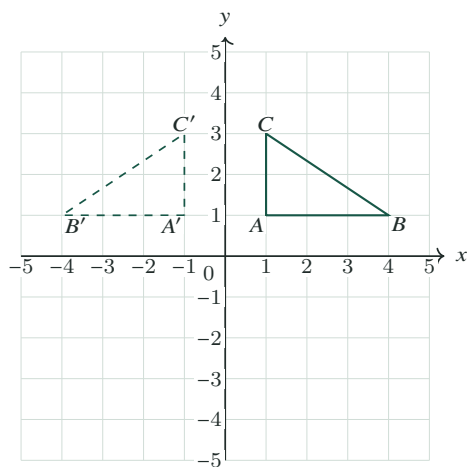
Put each image vertex the same horizontal distance from the mirror line, on the other side.



Q5

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

Reverse the x -coordinate of each vertex.

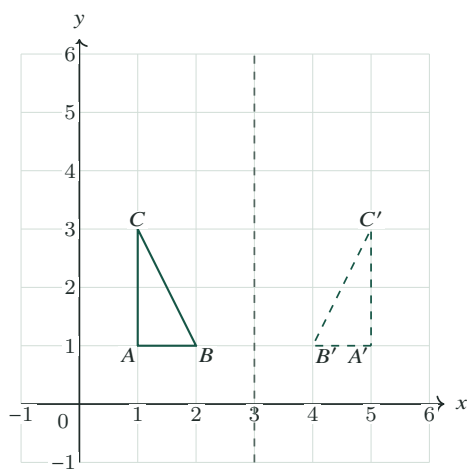
Q6

$$x = (1 + 5)/2 = (2 + 4)/2 = 3$$

Find the midpoints of segments joining corresponding vertices.

$$x = 3$$

Draw the vertical mirror line.

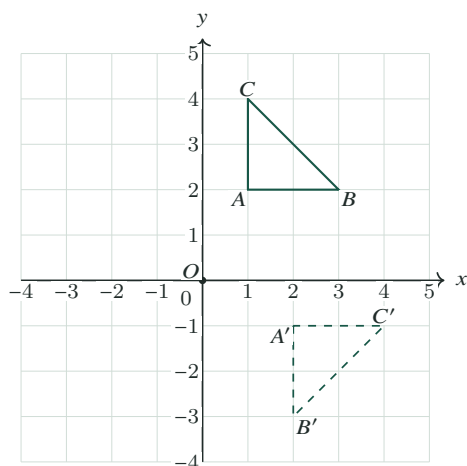


Q7

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$$A' = (2, -1), B' = (2, -3), C' = (4, -1)$$

Turn each vertex a quarter-turn clockwise, keeping its distance from the origin.

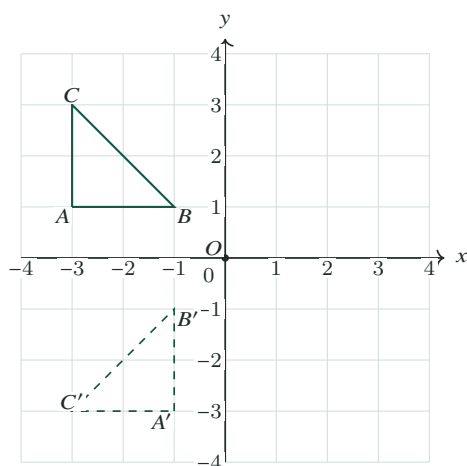


Q8

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$$A' = (-1, -3), B' = (-1, -1), C' = (-3, -3)$$

Turn each vertex a quarter-turn anticlockwise, keeping its distance from the origin.

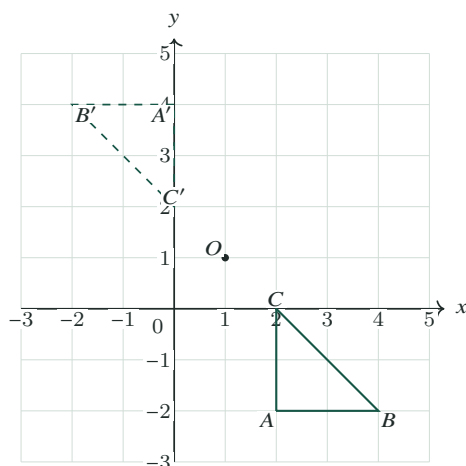


Q9

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$$A' = (0, 4), B' = (-2, 4), C' = (0, 2)$$

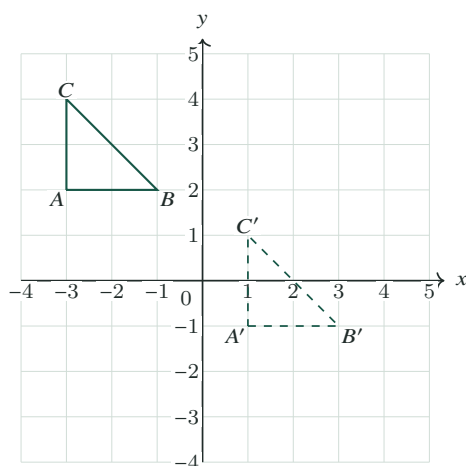
Put each image vertex the same distance beyond O along the line through that vertex and O .

**Q10**

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$$A' = (1, -1), B' = (3, -1), C' = (1, 1)$$

Move every vertex four squares right and three squares down.

**Q11**

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$$\begin{pmatrix} -2 - 2 \\ 2 - (-1) \end{pmatrix} = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$$

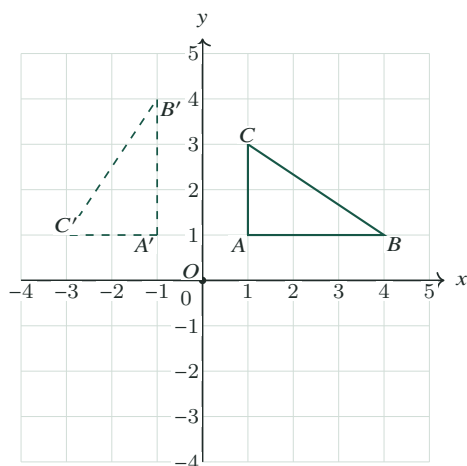
Subtract the coordinates of A from those of its image.

Q12

**

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

Turn every vertex a quarter-turn anticlockwise about the origin.

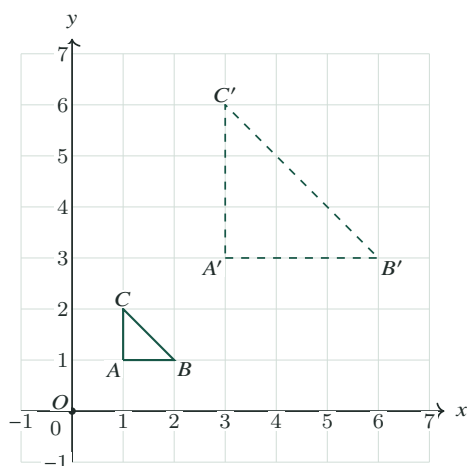


Q13

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$$A' = (3, 3), B' = (6, 3), C' = (3, 6)$$

Multiply each distance from the origin by three, keeping each image vertex on the same ray.

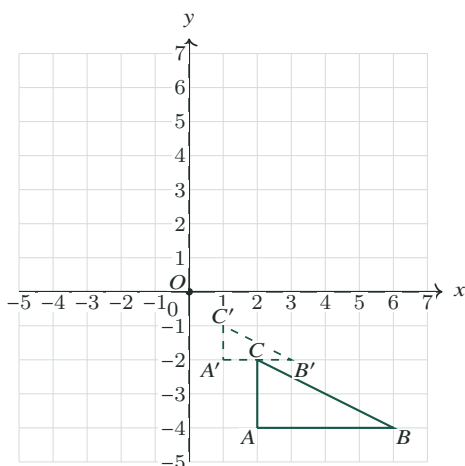


Q14

**

$$A' = (1, -2), B' = (3, -2), C' = (1, -1)$$

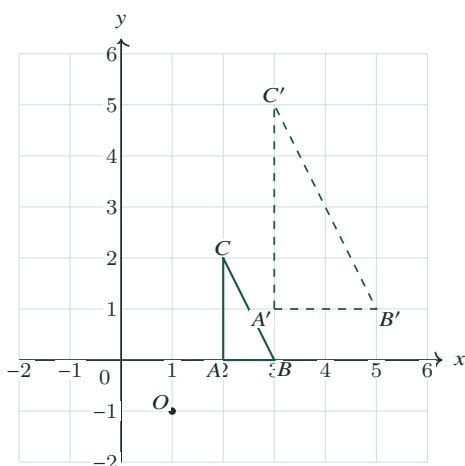
Place each image vertex halfway from the origin to the original vertex.



Q15

$$A' = (3, 1), B' = (5, 1), C' = (3, 5)$$

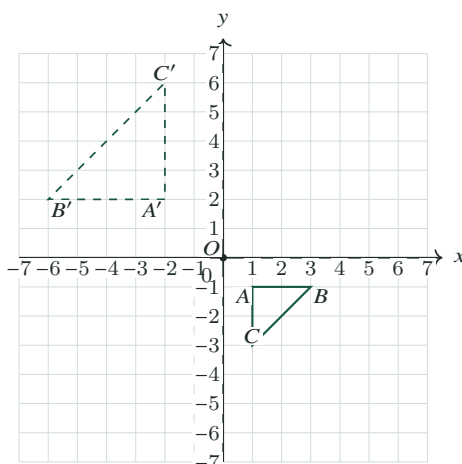
Double each vector from O to a vertex, then draw the image.



Q16

$$A' = (-2, 2), B' = (-6, 2), C' = (-2, 6)$$

Double each distance from the origin and place the image on the opposite side.



Q17

$$\overrightarrow{OA} = (1, 1)$$

$$\overrightarrow{OA'} = (-2, -2)$$

$$k = -2$$

Compare vectors from the centre.

The image is twice as far away on the opposite side.

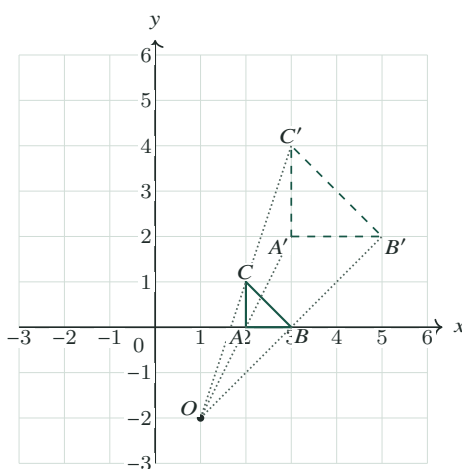
Q18

$$O = (1, -2)$$

$$\overrightarrow{OA'} = 2\overrightarrow{OA}$$

Extend lines through matching vertices; they meet at the centre.

Check that the image is twice as far from this centre.



Q19

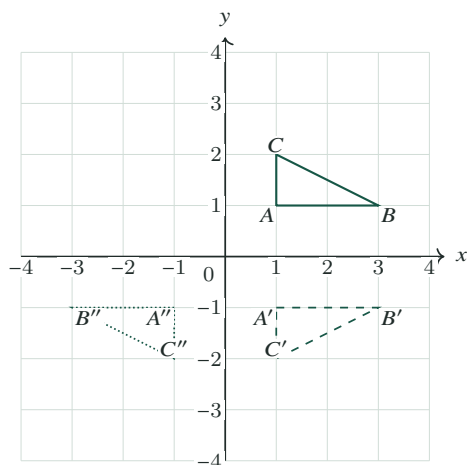
**

$$A' = (1, -1), B' = (3, -1), C' = (1, -2)$$

Reflect each vertex in the x -axis.

$$A'' = (-1, -1), B'' = (-3, -1), C'' = (-1, -2)$$

Apply the second transformation to the first image.



Q20

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

Both coordinates reverse sign.

Half-turn about the origin

This rule holds for every point.

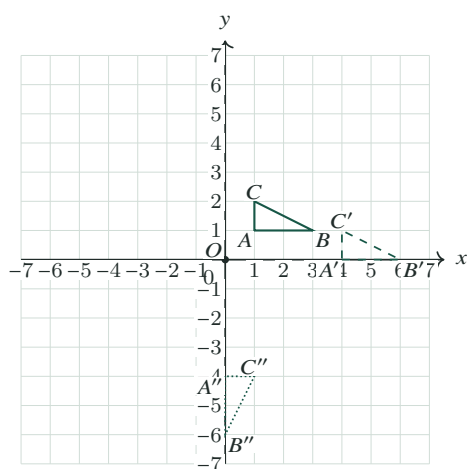
Q21

$$A' = (4, 0), B' = (6, 0), C' = (4, 1)$$

Move every vertex three squares right and one square down.

$$A'' = (0, -4), B'' = (0, -6), C'' = (1, -4)$$

Apply the second transformation to the first image.



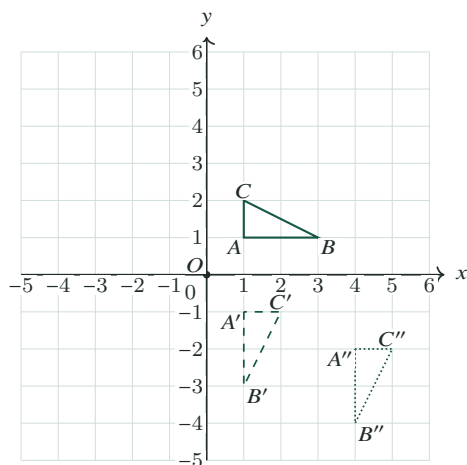
Q22

$$A' = (1, -1), B' = (1, -3), C' = (2, -1)$$

Rotate each vertex a quarter-turn clockwise about the origin.

$$A'' = (4, -2), B'' = (4, -4), C'' = (5, -2)$$

Apply the second transformation to the first image.



Q23

$$A' = (-3)^2(7) = 63$$

Area uses the square of the scale factor;
translation preserves area.

Q24

$$x' = 2 - x$$

Reflect in $x = 1$.

$$x'' = 8 - (2 - x) = x + 6$$

Reflect the result in $x = 4$.

$$(x, y) \mapsto (x + 6, y)$$

Every point moves six units right.