

Transformations and Invariant Points

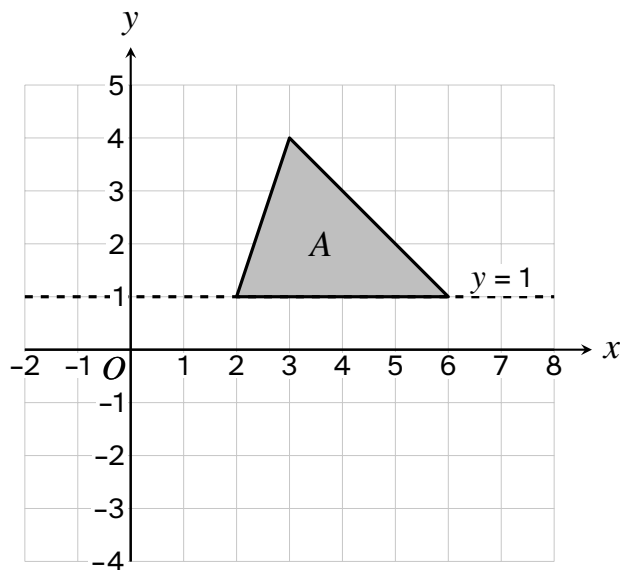
For AQA GCSE Mathematics (8300) • Higher tier

Name _____

Total marks: **24**

Answer **all** questions in the spaces provided. Show your working: marks are given for correct method.

- 1 (a) Reflect triangle A in the line $y = 1$. Label the image B .



[1 mark]

- (b) Write down the coordinates of the invariant points of this reflection that are vertices of the triangle.

[2 marks]

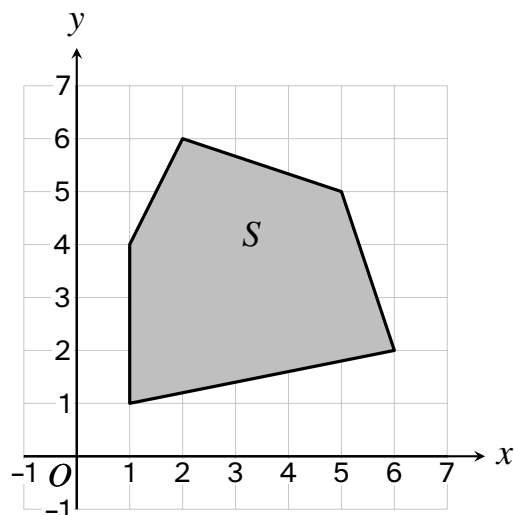
Answer _____

- 2 Point P is invariant under a rotation of 90° clockwise about the origin. Write down the coordinates of P .

[1 mark]

Answer (_____ , _____)

- 3 Shape S is shown on the grid.



S is reflected in the line $y = x$

Which of these vertices of S are invariant? Circle each one.

[1 mark]

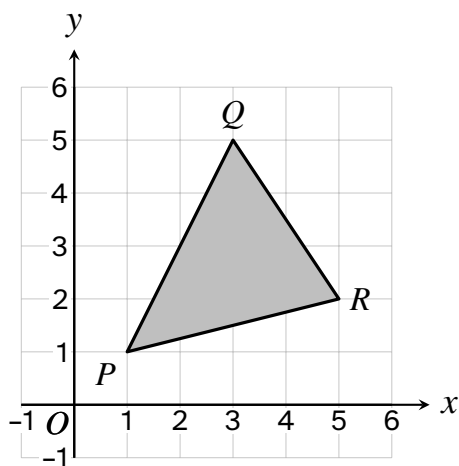
(6, 2)

(5, 5)

(1, 1)

(2, 6)

- 4 Triangle PQR is shown on the grid.



PQR is reflected in the line $y = 2x - 1$

Which side of the triangle is invariant? Circle your answer.

[1 mark]

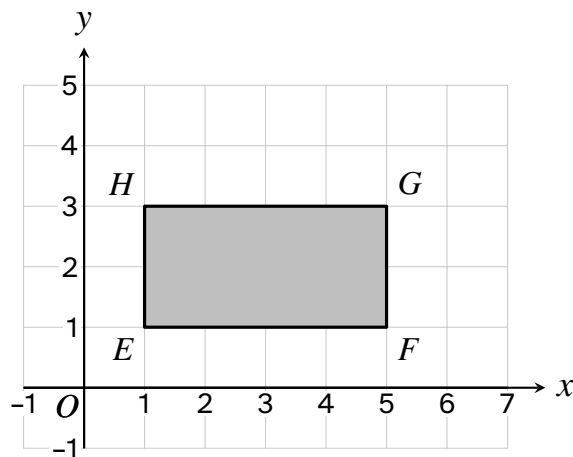
PQ

QR

PR

none of them

5 $EFGH$ is a rectangle.



- (a) $EFGH$ is reflected in the line $y = 2$
How many points on the perimeter of $EFGH$ are invariant? Circle your answer.

[1 mark]

0

1

2

infinitely many

- (b) $EFGH$ is reflected in the line $x = 5$
How many points on the perimeter of $EFGH$ are invariant? Circle your answer.

[1 mark]

0

1

2

infinitely many

- (c) $EFGH$ is rotated 180° about $(3, 2)$
How many points on the perimeter of $EFGH$ are invariant? Circle your answer.

[1 mark]

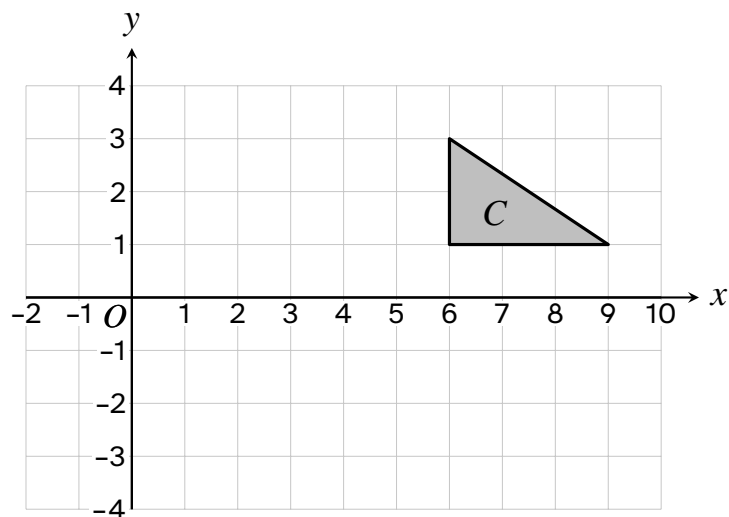
0

1

2

infinitely many

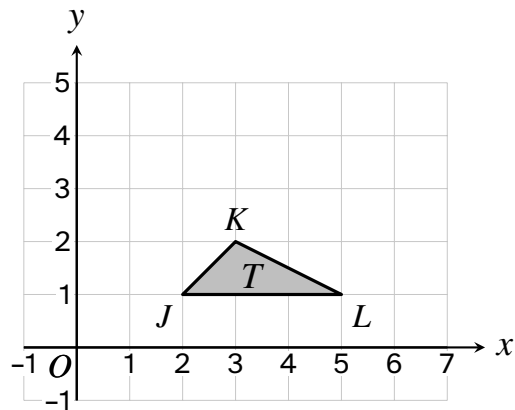
- 6 Triangle C is shown on the grid.



Triangle C is rotated 180° about $(5, 0)$, and the image is then reflected in the line $y = 0$. Describe fully the single transformation equivalent to these two transformations.

[2 marks]

- 7 Triangle T is shown on the grid.



T is enlarged, scale factor 3
Vertex J is invariant under this enlargement.

- (a) Work out the coordinates of the image of K .

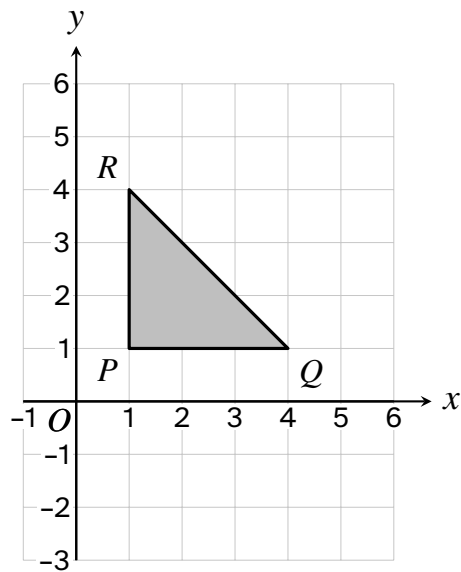
[2 marks]

Answer (_____ , _____)

- (b) Explain why no other point on T is invariant.

[1 mark]

- 8 Triangle PQR is shown on the grid.



- (a) A single transformation maps triangle PQR onto a new triangle.
 Q and R are invariant, and P moves to $(4, 4)$.
Describe fully the transformation.

[2 marks]

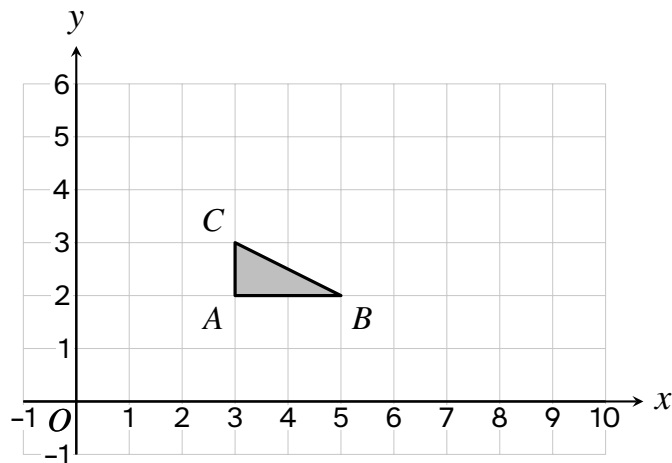
- (b) Triangle PQR is rotated 90° clockwise about a point.
The image of R is $(4, 1)$.
Find the centre of the rotation, and write down which vertex of PQR is invariant.

[3 marks]

Answer _____

- 9 Triangle ABC is drawn on the grid.
 ABC is enlarged, scale factor 2, centre $(1, 1)$, to give triangle P .
Triangle P is then translated by $\begin{pmatrix} -2 \\ -1 \end{pmatrix}$ to give triangle Q .

(a) Draw triangle P and triangle Q on the grid.



[2 marks]

- (b) One vertex of triangle ABC is invariant under the combined transformation.
Which vertex?

[1 mark]

Answer _____

- (c) Describe fully the single transformation that maps triangle ABC onto triangle Q .
[2 marks]
