

Transformations and Invariant Points

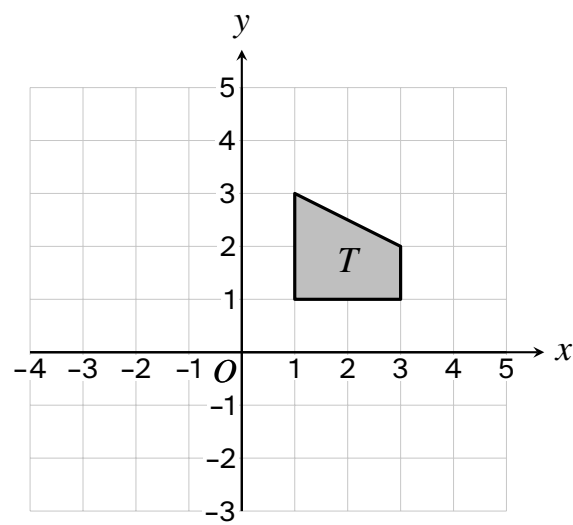
For Pearson Edexcel GCSE Mathematics (1MA1) • Higher tier

Name _____

Total marks: **20**

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

- 1** (a) Rotate shape T 90° anticlockwise about the point $(1,1)$
Label the image U .



(2)

- (b) Write down the coordinates of the invariant point.

(..... ,)

(1)

(Total for Question 1 is 3 marks)

- 2** A shape is rotated 90° clockwise about the origin.
The image is then reflected in the x -axis.
Describe fully the single transformation that is equivalent to these two transformations.

(2)

(Total for Question 2 is 2 marks)

- 3** Shape A is reflected in the line $x = 1$ to give shape B .
Shape B is then reflected in a line L to give shape C .
Line L is parallel to $x = 1$.
Shape C is the image of shape A under the translation $\begin{pmatrix} 6 \\ 0 \end{pmatrix}$.

(a) Find an equation of line L .

.....
(2)

(b) Explain why there are no invariant points when shape A is mapped onto shape C .

(1)

(Total for Question 3 is 3 marks)

- 4 The line L is reflected in the line $y = x$ and is unchanged.
 L is not $y = x$. Write down a possible equation of L .

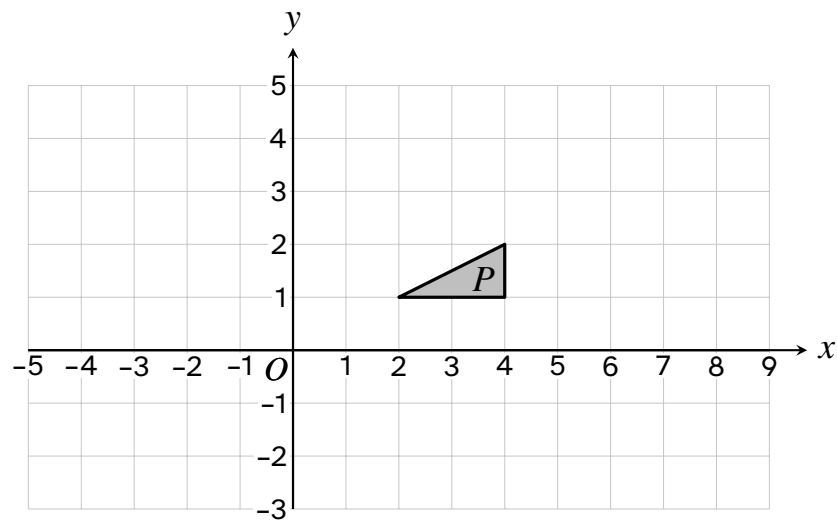
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(1)

(Total for Question 4 is 1 mark)

5 Triangle P is drawn on the grid.

(a) Enlarge triangle P by scale factor -1 , centre $(0,0)$. Label the image Q .



(1)

(b) Triangle Q is then enlarged by scale factor -1 , centre $(2,1)$, to give triangle R . Describe fully the single transformation that maps triangle P onto triangle R .

(2)

(c) Explain why no point is invariant under the transformation that maps triangle P onto triangle R .

(1)

(Total for Question 5 is 4 marks)

- 6 Shape S is transformed by the combined transformation of a reflection in the line $y = 1$ followed by a translation by the vector $\begin{pmatrix} 0 \\ 6 \end{pmatrix}$.

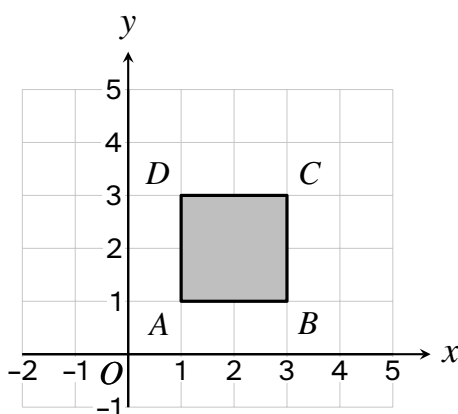
Point $(5, k)$ on shape S is invariant under the combined transformation.
Find the value of k .

.....
(2)

(Total for Question 6 is 2 marks)

- 7 Square $ABCD$ is drawn on the grid.

Square $ABCD$ is rotated 90° anticlockwise about A .
The image is then reflected in a line L .
Under the combined transformation, A and C are both invariant.
Find an equation of line L .

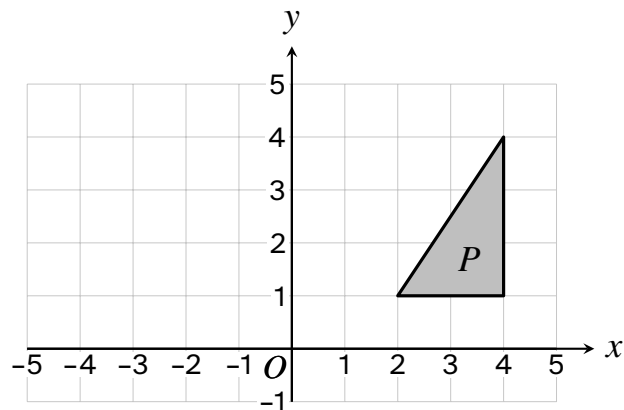


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(2)

(Total for Question 7 is 2 marks)

8 Triangle P is drawn on the grid.

- (a) Rotate triangle P 90° anticlockwise about the origin.
Label the image Q .



(2)

- (b) Triangle P is rotated 90° anticlockwise about one of its own vertices.
The image of the vertex $(2, 1)$ is $(4, -1)$.
Which vertex of triangle P is invariant?

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(1)

(Total for Question 8 is 3 marks)