HIGHER ONLY
HIGHER TIER

Name ..... Class .....

G8: Combined transformations

Combinations of transformations; invariant points

20 marks · 25 minutes · Non-calculator

1) The point (2, 5) is reflected in the x-axis, then the result is reflected in the y-axis.

(a) Where does the point end up?

.....

(2)

(b) Describe the single transformation that has the same effect.

.....

(2)

[Question 1: 4 marks]

2) The point $(3, 1)$ is translated by $\begin{pmatrix} 2 \\ -4 \end{pmatrix}$ and then by $\begin{pmatrix} -5 \\ 1 \end{pmatrix}$.

(a) Where does the point end up?

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(2)

(b) Write the single translation that has the same effect as a column vector.

.....

(1)

[Question 2: 3 marks]

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3) The point $(1, 3)$ is rotated 90° clockwise about the origin, then the result is reflected in the x-axis.

(a) Where does the point end up?

.....

(2)

(b) Describe the single transformation that has the same effect.

.....

(2)

[Question 3: 4 marks]

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4) A shape is reflected in the y-axis.

(a) Describe the points that are invariant (do not move).

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(1)

(b) Which of $(0, 4)$, $(4, 0)$ and $(-2, -2)$ is invariant?

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(1)

[Question 4: 2 marks]

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5) A shape is rotated 90° about the point $(1, 1)$. Write down an invariant point.

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[Question 5: 1 marks]

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6) Does a translation by $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ have any invariant points?

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[Question 6: 1 marks]

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7) A shape is reflected in the line $y = x$, then reflected in $y = x$ again. Describe the result.

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[Question 7: 1 marks]

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8) A shape is reflected in the line $x = 2$, then in the line $x = 5$. Describe the single transformation that has the same effect.

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[Question 8: 2 marks]

9) Which of these points is invariant under a reflection in the line $y = -x$: $(2, -2)$ or $(2, 2)$?

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[Question 9: 1 marks]

10) A shape is rotated 90° clockwise about the origin three times. Describe the single rotation that has the same effect.

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[Question 10: 1 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	(a) $(-2,-5)$ (b) Rotation 180° about $(0,0)$	(a) $(2,-5)$ (M1); A1. (b) B1 rotation 180°, B1 centre.
2	(a) $(0,-2)$ (b) $\begin{pmatrix} -3 \\ -3 \end{pmatrix}$	(a) $(5,-3)$ (M1); A1. (b) B1.
3	(a) $(3,1)$ (b) Reflection in $y = x$	(a) $(3,-1)$ (M1); A1. (b) B1 reflection, B1 line.
4	(a) Points on the y-axis (b) $(0,4)$	B1 each.
5	$(1,1)$	B1.
6	No	B1.
7	It returns to its starting position	B1.
8	Translation $\begin{pmatrix} 6 \\ 0 \end{pmatrix}$	B1 translation, B1 vector.
9	$(2,-2)$	B1.
10	Rotation 90° anticlockwise about $(0,0)$	B1.