



eClassroom

GCSE Mathematics

Transformations

Worked Solutions

Pearson Edexcel GCSE & iGCSE Mathematics



Section A — Foundation — Worked Solutions

[Fluency] Question 1

Reflect in y-axis: $(x,y) \rightarrow (-x,y)$

$(1,1) \rightarrow (-1,1), (4,1) \rightarrow (-4,1), (4,3) \rightarrow (-4,3), (1,3) \rightarrow (-1,3)$

\therefore **B: $(-1,1), (-4,1), (-4,3), (-1,3)$**

[Fluency] Question 2

Reflect in $y=x$: $(x,y) \rightarrow (y,x)$

$(1,0) \rightarrow (0,1), (3,0) \rightarrow (0,3), (2,2) \rightarrow (2,2)$

\therefore **B: $(0,1), (0,3), (2,2)$**

[Fluency] Question 3

90° CCW: $(x,y) \rightarrow (-y,x)$

$(1,1) \rightarrow (-1,1), (3,1) \rightarrow (-1,3), (2,3) \rightarrow (-3,2)$

\therefore **B: $(-1,1), (-1,3), (-3,2)$**

[Fluency] Question 4

Add $(3,-2)$ to each vertex

$(0,0) \rightarrow (3,-2), (2,0) \rightarrow (5,-2), (2,2) \rightarrow (5,0), (0,2) \rightarrow (3,0)$

\therefore **B: $(3,-2), (5,-2), (5,0), (3,0)$**

[Fluency] Question 5

Multiply by 3: $(x,y) \rightarrow (3x,3y)$

$(1,1) \rightarrow (3,3), (2,1) \rightarrow (6,3), (2,2) \rightarrow (6,6), (1,2) \rightarrow (3,6)$

\therefore **B: $(3,3), (6,3), (6,6), (3,6)$**

[Reasoning] Question 6

A and B are mirror images in the y-axis.

\therefore **Reflection in the y-axis**

[Reasoning] Question 7

Each coordinate of B is half of A. SF = $1/2$, centre at origin.

\therefore **Enlargement, SF = $1/2$, centre $(0,0)$**





[Reasoning] Question 8

Corresponding vertices: $(1,1) \rightarrow (2,2)$. SF: $\Delta = (1,1) \rightarrow (2,2)$, ratio=2.

Check: $(3,1) \rightarrow (6,2)$ ✓. Centre = $(0,0)$.

∴ **Enlargement, SF = 2, centre (0,0)**

[Problem Solving] Question 9

Offset from $(1,2)$: $(3,3)$. Rotate 180° : $(-3,-3)$. Add centre: $(-2,-1)$.

∴ **P' = $(-2, -1)$**

[Problem Solving] Question 10

$(x,y) \rightarrow$ reflect x-axis $\rightarrow (x,-y) \rightarrow$ reflect y-axis $\rightarrow (-x,-y)$

This is a rotation of 180° about the origin.

∴ **Rotation 180° about the origin**



Section B — Higher — Worked Solutions

[Fluency] Question 1

SF = -2, centre (0,0): multiply by -2

$(1,1) \rightarrow (-2,-2), (3,1) \rightarrow (-6,-2), (2,3) \rightarrow (-4,-6)$

\therefore **B: $(-2,-2), (-6,-2), (-4,-6)$**

[Fluency] Question 2

Vertices doubled from A to B? No: $3 \rightarrow 2, 6 \rightarrow 4$. SF = $\frac{2}{3}$

Centre: extend lines through corresponding vertices $\rightarrow (0,0)$

\therefore **SF = $\frac{2}{3}$, centre (0,0)**

[Fluency] Question 3

$5 = cx + 3(2 - cx) = 6 - 2cx \rightarrow cx = 0.5$

$4 = cy + 3(1 - cy) = 3 - 2cy \rightarrow cy = -0.5$

\therefore **Centre = $(0.5, -0.5)$**

[Reasoning] Question 4

Matrix maps $(1,0) \rightarrow (0,1)$ and $(0,1) \rightarrow (-1,0)$. This is 90° anticlockwise rotation.

\therefore **Rotation 90° anticlockwise about origin**

[Reasoning] Question 5

$(x,y) \rightarrow (-x,y) \rightarrow (-x,-y)$. This is a rotation of 180° about the origin.

\therefore **Rotation 180° about the origin**

[Reasoning] Question 6

Multiplying by -1 about C sends every point to the diametrically opposite position through C.

\therefore **Rotation of 180° about C**

[Problem Solving] Question 7

90° CW: $(x,y) \rightarrow (y,-x)$

\therefore **$(b, -a)$**



**[Problem Solving] Question 8**

Step 1: reflect in $y=x$: $(x,y) \rightarrow (y,x)$. $A \rightarrow (1,1), (1,3), (4,2)$

Step 2: 90° CCW: $(x,y) \rightarrow (-y,x)$. $\rightarrow (-1,1), (-3,1), (-2,4)$

\therefore Final: $(-1,1), (-3,1), (-2,4)$

[Problem Solving] Question 9

180° rotation maps $P \rightarrow P'$ via the centre C such that C is the midpoint of PP' .

Enlargement $SF=-1$ maps P to point on the other side of C at equal distance.

Both operations are identical. ✓

\therefore Equivalent transformations ✓

[Problem Solving] Question 10

$A \rightarrow B$ ($SF=2$): $(1,2) \rightarrow (2,4), (3,2) \rightarrow (6,4), (2,4) \rightarrow (4,8)$

$B \rightarrow C$ (translate $(-1,3)$): $(2,4) \rightarrow (1,7), (6,4) \rightarrow (5,7), (4,8) \rightarrow (3,11)$

\therefore C: $(1,7), (5,7), (3,11)$

