

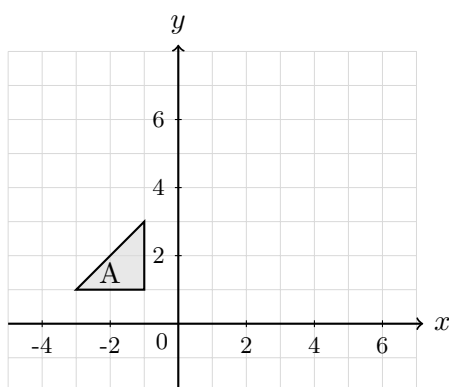
Foundation GCSE: Combinations of Transformations

Name: _____

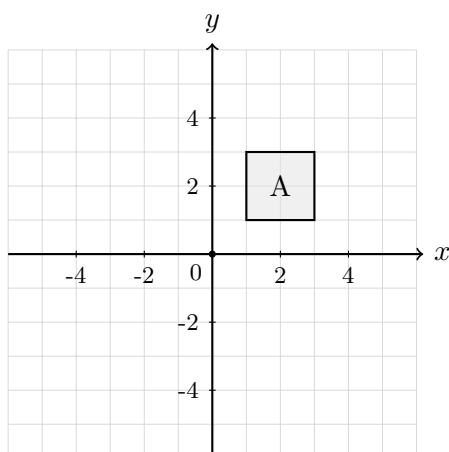
Class: _____

Instructions: Answer all questions. Each question features an accompanying grid diagram combining multiple transformations (such as translation, reflection, rotation, and enlargement). Questions are ordered from easiest (1) to hardest (5). Working out should be shown where appropriate.

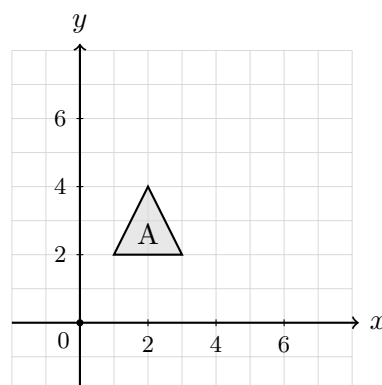
1. Shape A is translated by vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ to give Shape B, and then Shape B is reflected in the line $x = 0$ (y -axis) to give Shape C. Draw the final position of Shape C and state its coordinates.



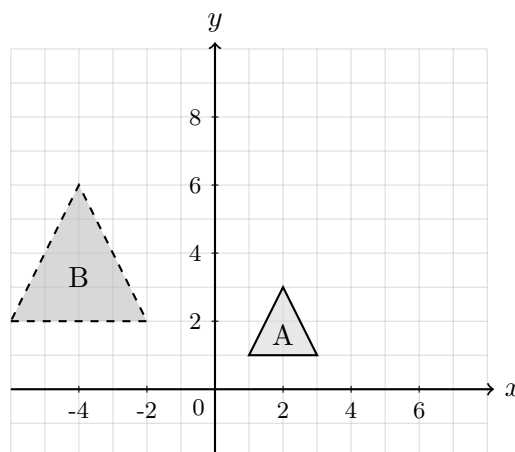
2. Shape A is rotated 90° clockwise about the origin $(0,0)$, and then translated by vector $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$. Draw the final position of the shape.



3. Shape A is reflected in the line $y = x$, and then enlarged by a scale factor of 2 using the origin $(0,0)$ as the centre of enlargement. Draw the final image.



4. Describe fully the combination of two transformations that maps Shape A onto Shape B.

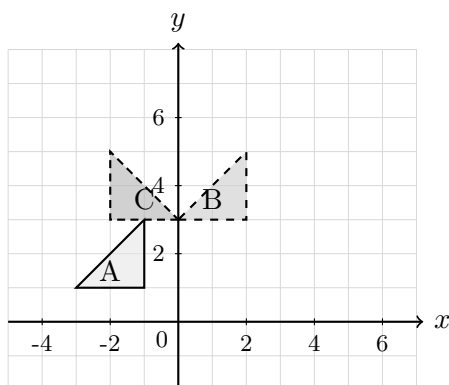


5. On squared paper try several combined transformations with different shapes.

Answers & Worked Solutions

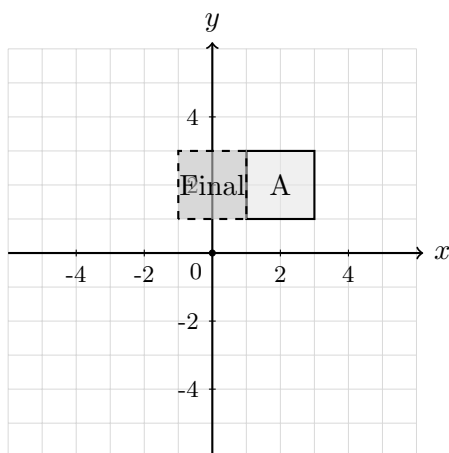
1. **Shift 1 (Translation):** Shift Shape A by $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ (adding 3 to x -coordinates, 2 to y -coordinates) to get Shape B vertices at $(0, 3), (2, 3), (2, 5)$.

Shift 2 (Reflection): Reflect Shape B in the line $x = 0$ (y -axis), negating the x -coordinates $(x, y) \rightarrow (-x, y)$, to get Shape C vertices at $(0, 3), (-2, 3), (-2, 5)$.



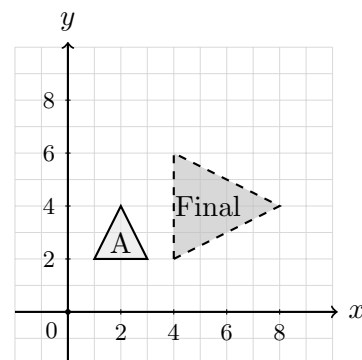
2. **Shift 1 (Rotation):** Rotate 90° clockwise about $(0, 0)$, mapping $(x, y) \rightarrow (y, -x)$. Vertices $(1, 1), (3, 1), (3, 3), (1, 3)$ move to $(1, -1), (1, -3), (3, -3), (3, -1)$.

Shift 2 (Translation): Translate by vector $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$ (subtracting 2 from x , adding 4 to y) to final vertices: $(-1, 3), (-1, 1), (1, 1), (1, 3)$.



3. **Shift 1 (Reflection):** Reflect in the line $y = x$, swapping coordinates $(x, y) \rightarrow (y, x)$, giving intermediate vertices $(2, 1), (2, 3), (4, 2)$.

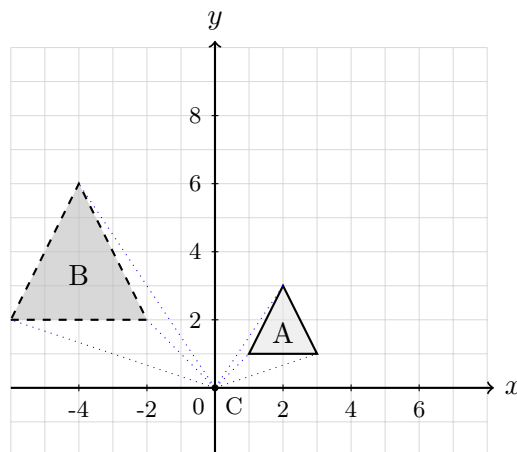
Shift 2 (Enlargement): Enlarge by a scale factor of 2 from the origin $(0, 0)$, doubling all coordinates to give final vertices $(4, 2), (4, 6), (8, 4)$.



4. **Shift 1 (Reflection):** Reflect Shape A in the y -axis ($x = 0$), mapping $(x, y) \rightarrow (-x, y)$.

Shift 2 (Translation): Translate the reflected shape by vector $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$ to arrive at Shape B.

Alternative Single Transformation: Enlargement, scale factor -2 , centre of enlargement $(0, 0)$.



5. Did you try!