

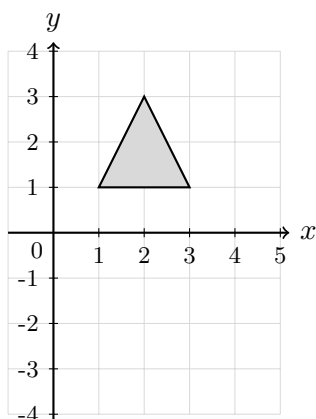
# Foundation GCSE: Rotation

Name: \_\_\_\_\_

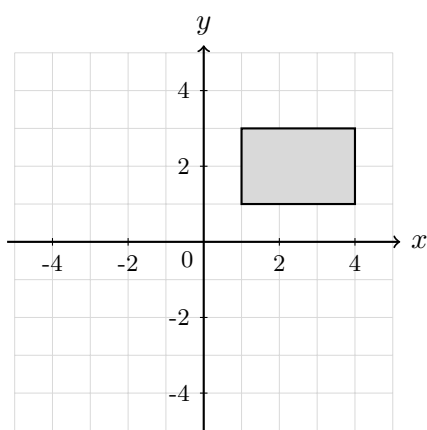
Class: \_\_\_\_\_

*Instructions: Answer all questions. Each question features an accompanying grid diagram. Questions are ordered from easiest (1) to hardest (5). Working out should be shown where appropriate.*

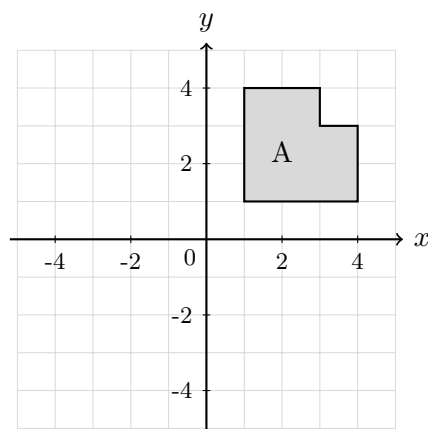
1. Rotate the triangle by  $90^\circ$  clockwise about the origin  $(0,0)$ . State the coordinates of the vertices of the rotation.



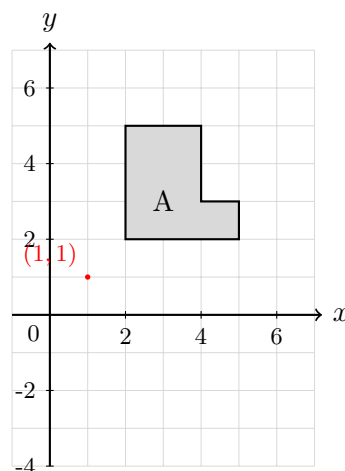
2. Rotate the rectangle by  $180^\circ$  about the origin  $(0,0)$ . State the coordinates of the vertices of the rotation.



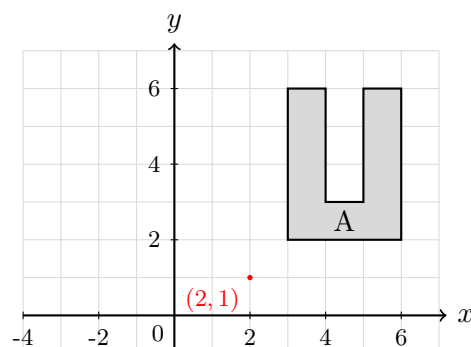
3. Rotate shape A by  $90^\circ$  anticlockwise about the origin  $(0,0)$ . State the coordinates of the vertices of the image.



4. Rotate shape A by  $90^\circ$  clockwise about the center  $(1,1)$ . State the coordinates of the vertices of the image.

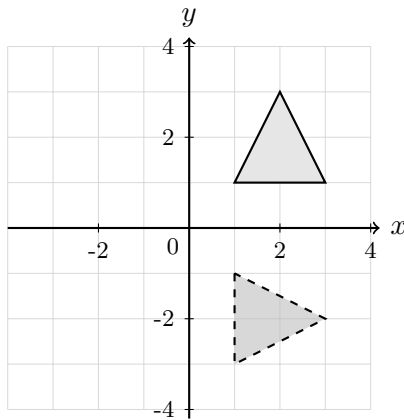


5. Rotate shape A by  $270^\circ$  clockwise about the center  $(2,1)$ . State the coordinates of the vertices of the image.

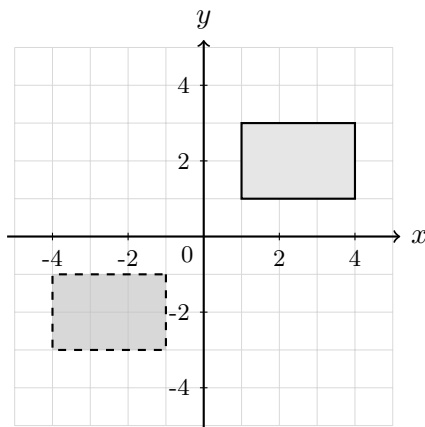


# Answers & Worked Solutions

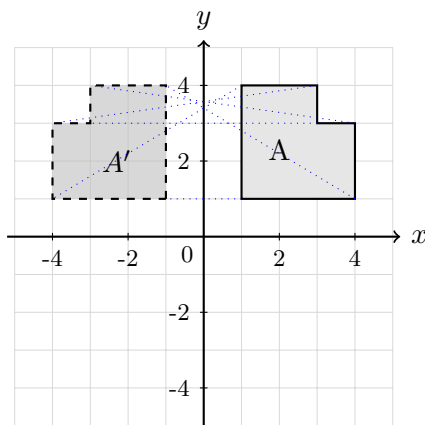
1.  $(1, -1), (3, -1), (3, -2)$  : rule for  $90^\circ$  clockwise about  $(0, 0)$  is  $(x, y) \rightarrow (y, -x)$ .



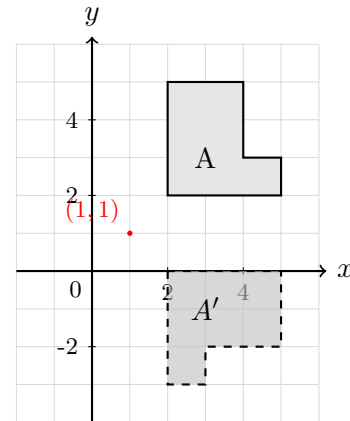
2.  $(-1, -1), (-4, -1), (-4, -3), (-1, -3)$  : rule for  $180^\circ$  about  $(0, 0)$  is  $(x, y) \rightarrow (-x, -y)$ .



3. Rotating any point  $(x, y)$  by  $90^\circ$  anticlockwise about the origin maps it to  $(-y, x)$ :  $(1, 1) \rightarrow (-1, 1)$ ,  $(4, 1) \rightarrow (-1, 4)$ ,  $(4, 3) \rightarrow (-3, 4)$ ,  $(3, 3) \rightarrow (-3, 3)$ ,  $(3, 4) \rightarrow (-4, 3)$ ,  $(1, 4) \rightarrow (-4, 1)$



4. To rotate about the center  $(1, 1)$ , first subtract  $(1, 1)$  to shift to the origin ( $X = x - 1, Y = y - 1$ ), apply the  $90^\circ$  clockwise rule  $(X, Y) \rightarrow (Y, -X)$ , and add  $(1, 1)$  back:  $(2, 2) \rightarrow (2, 0)$ ,  $(5, 2) \rightarrow (2, -3)$ ,  $(5, 3) \rightarrow (3, -3)$ ,  $(4, 3) \rightarrow (3, -2)$ ,  $(4, 5) \rightarrow (5, -2)$ ,  $(2, 5) \rightarrow (5, 0)$ .



5. To rotate about the center  $(2, 1)$  by  $270^\circ$  clockwise (equivalent to  $90^\circ$  anticlockwise), subtract  $(2, 1)$  to shift to the origin ( $X = x - 2, Y = y - 1$ ), apply the rule  $(X, Y) \rightarrow (-Y, X)$ , and add  $(2, 1)$  back:  $(3, 6) \rightarrow (-3, 2)$ ,  $(3, 2) \rightarrow (1, 2)$ ,  $(6, 2) \rightarrow (1, 5)$ ,  $(6, 6) \rightarrow (-3, 5)$ ,  $(5, 6) \rightarrow (-3, 4)$ ,  $(5, 3) \rightarrow (0, 4)$ ,  $(4, 3) \rightarrow (0, 3)$ ,  $(4, 6) \rightarrow (-3, 3)$ .

