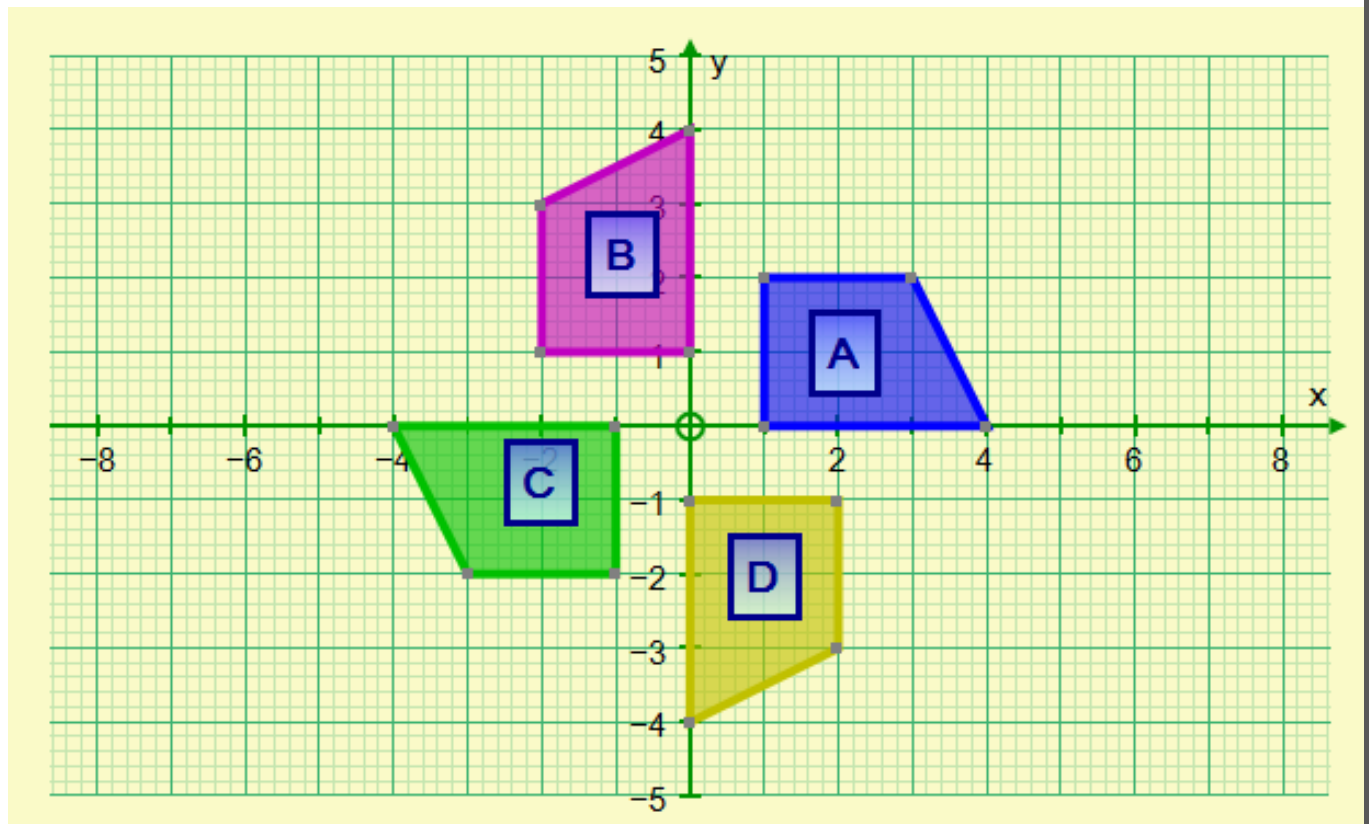


## Worksheet on Rotations (Years 7-11)

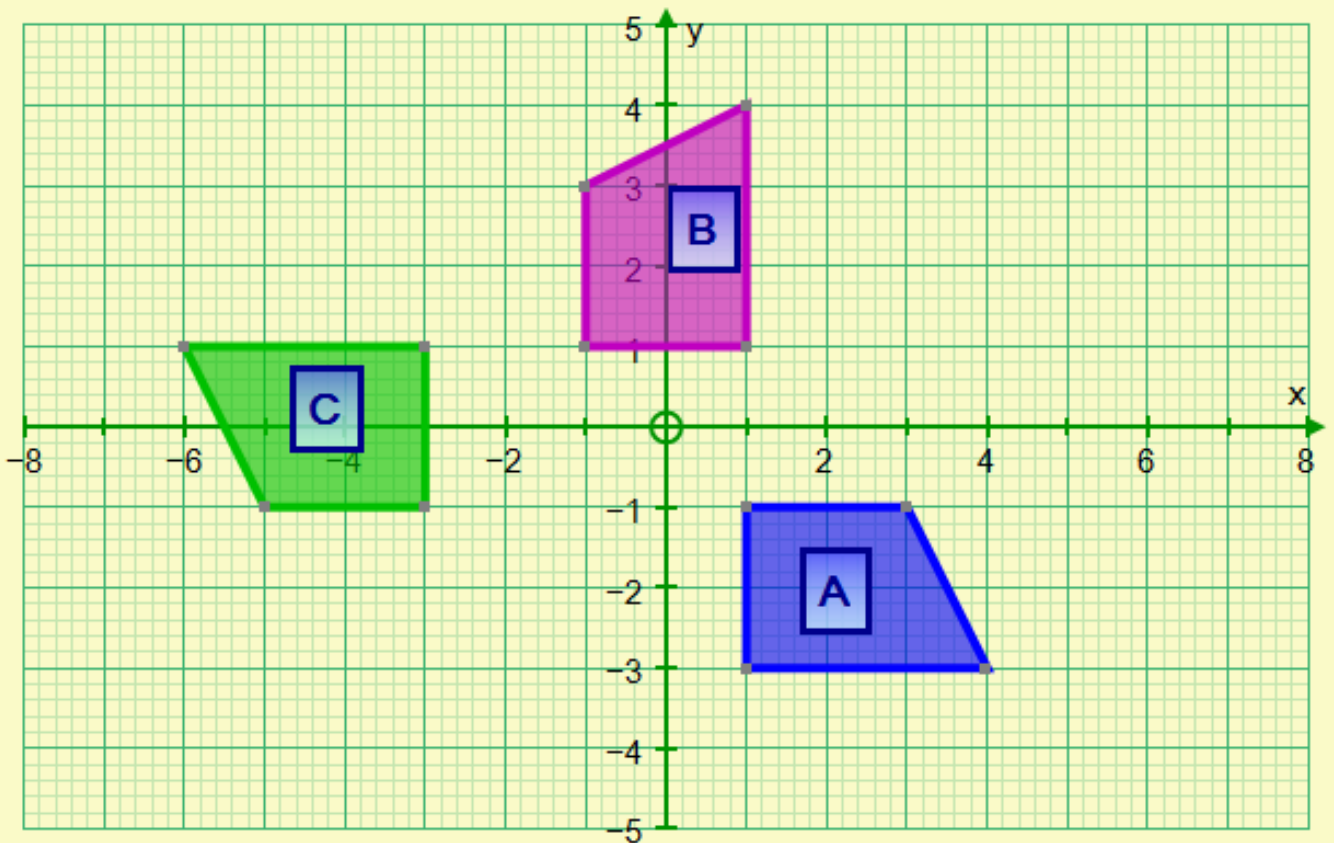
1. (i) Work out the angle of rotation, direction and centre of rotation that maps:
- (a) Shape A to shape B
  - (b) Shape A to shape C
  - (c) Shape A to shape D
  - (d) Shape B to shape C
  - (e) Shape B to shape D
- (ii) On the diagram below, draw the image of shape A under a rotation of  $90^\circ$  anticlockwise about the point  $(5,0)$  and label the image E.

Note: You may use tracing paper.



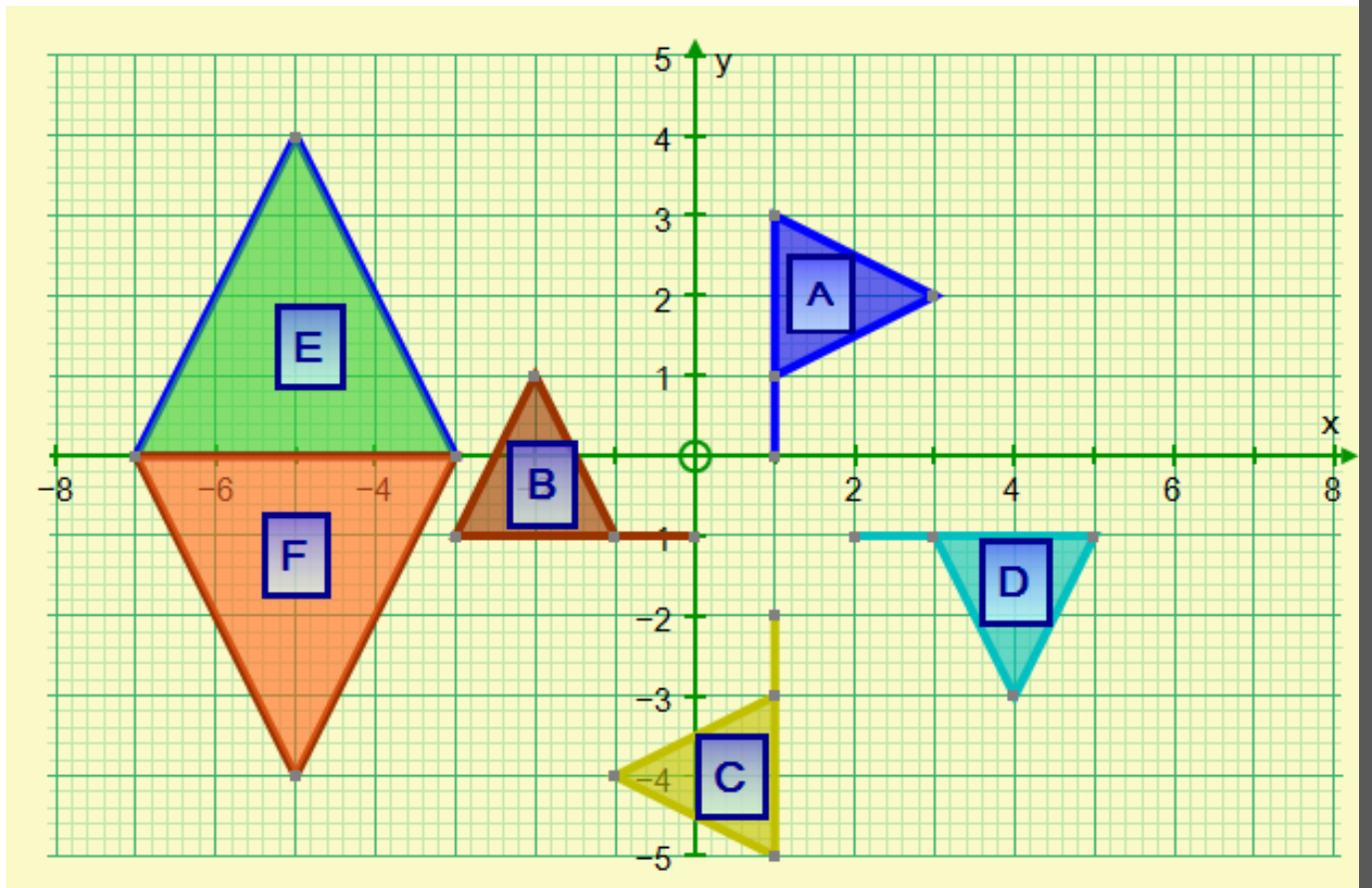
2. (i) Work out the angle of rotation, direction and centre of rotation that maps:
- (a) Shape A to shape B
  - (b) Shape A to shape C
  - (c) Shape B to shape C
- (ii) On the diagram below, draw the image of shape A under a rotation of  $270^\circ$  about the point  $(4, -1)$  and label the image D.

Note: You may use tracing paper.



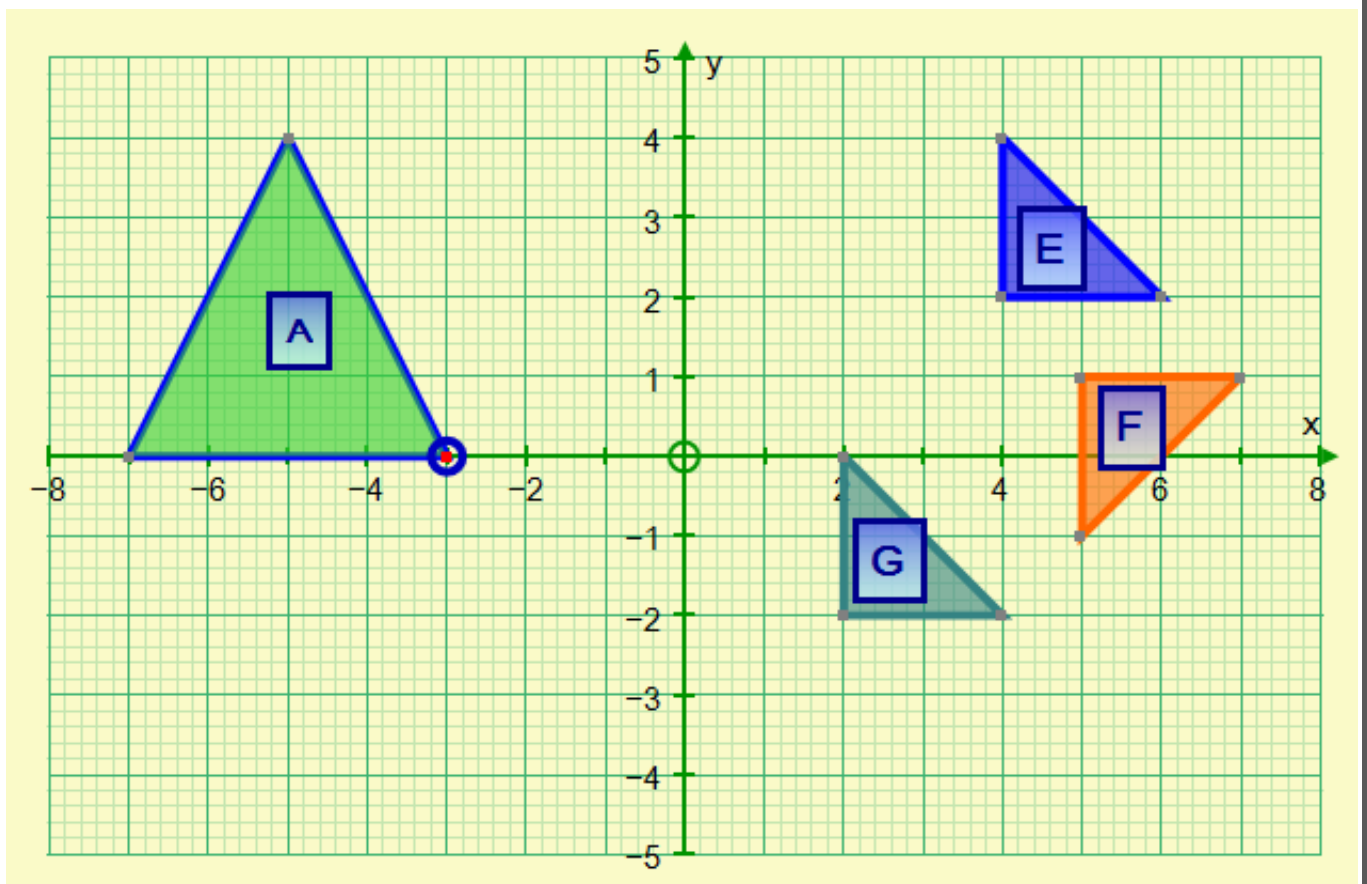
3. Describe fully the transformation that maps:
- (a) Shape A to B
  - (b) Shape B to C
  - (c) Shape D to C
  - (d) Shape E to F

Note: You may use tracing paper.



4. (a) Draw the image of shape A under a rotation of  $180^\circ$  about the point  $(-3,0)$  and label the image C.
- (b) Draw the image of shape C under a rotation of  $90^\circ$  anticlockwise about the point  $(-3, 0)$  and label the image D.
- (c) Draw the image of shape D under a rotation of  $180^\circ$  about the point  $(-3, 0)$  and label the image B.
- (d) Describe fully the transformation that would map shape A to shape B.
- (e) Describe fully the transformation that would map shape E to shape F.
- (f) Describe fully the transformation that would map shape F to shape G.
- (g) Describe fully the transformation that would map shape E to shape G.

Note: You may use tracing paper.



**Mixed Transformations (and more challenging for some).**

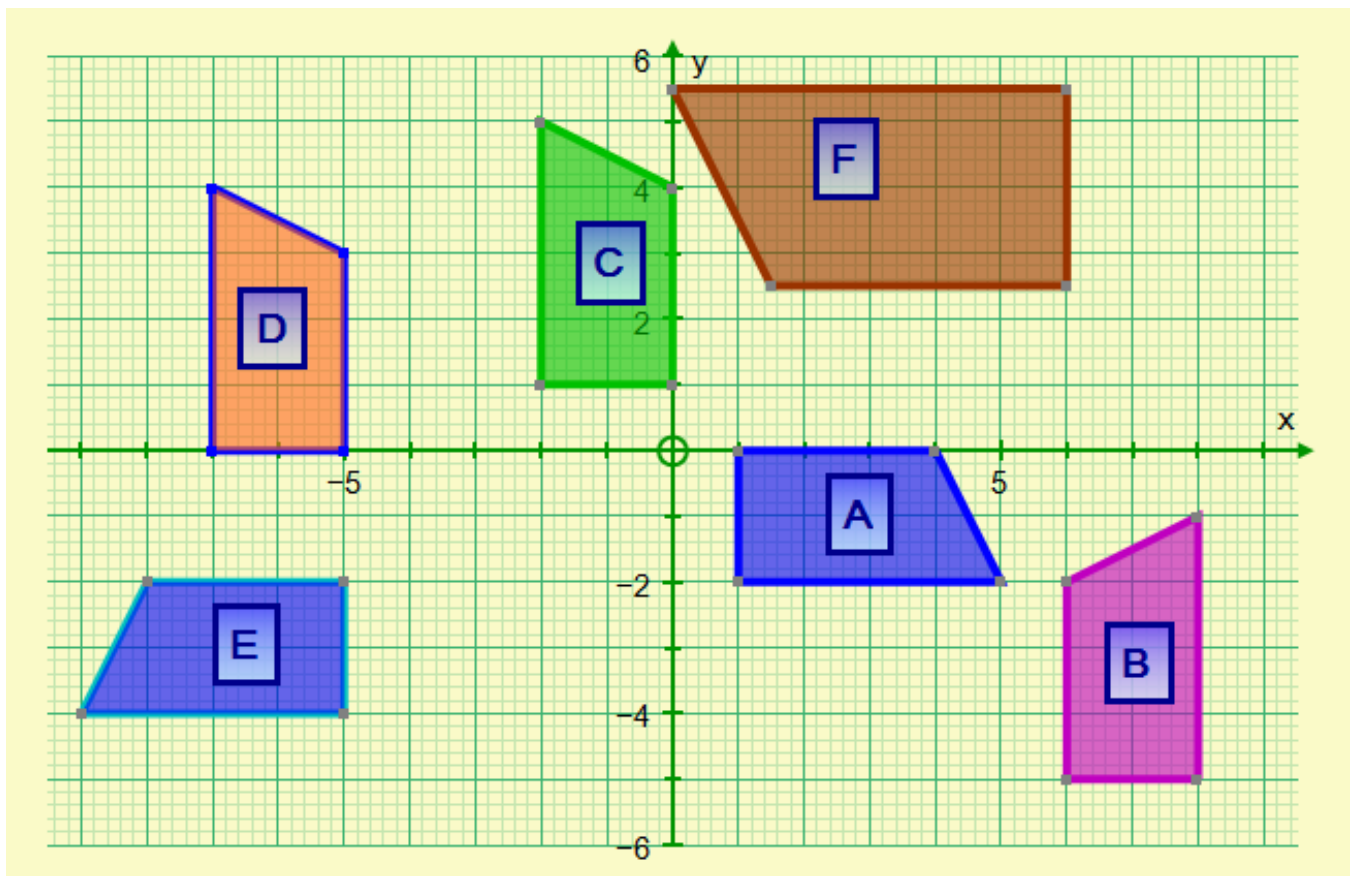
5. (i) Describe fully the transformation that would map:

- (a) Shape A to shape B
- (b) Shape A to shape C
- (c) Shape C to shape D

\* (ii) Describe fully two combined transformations that would map shape C to shape E

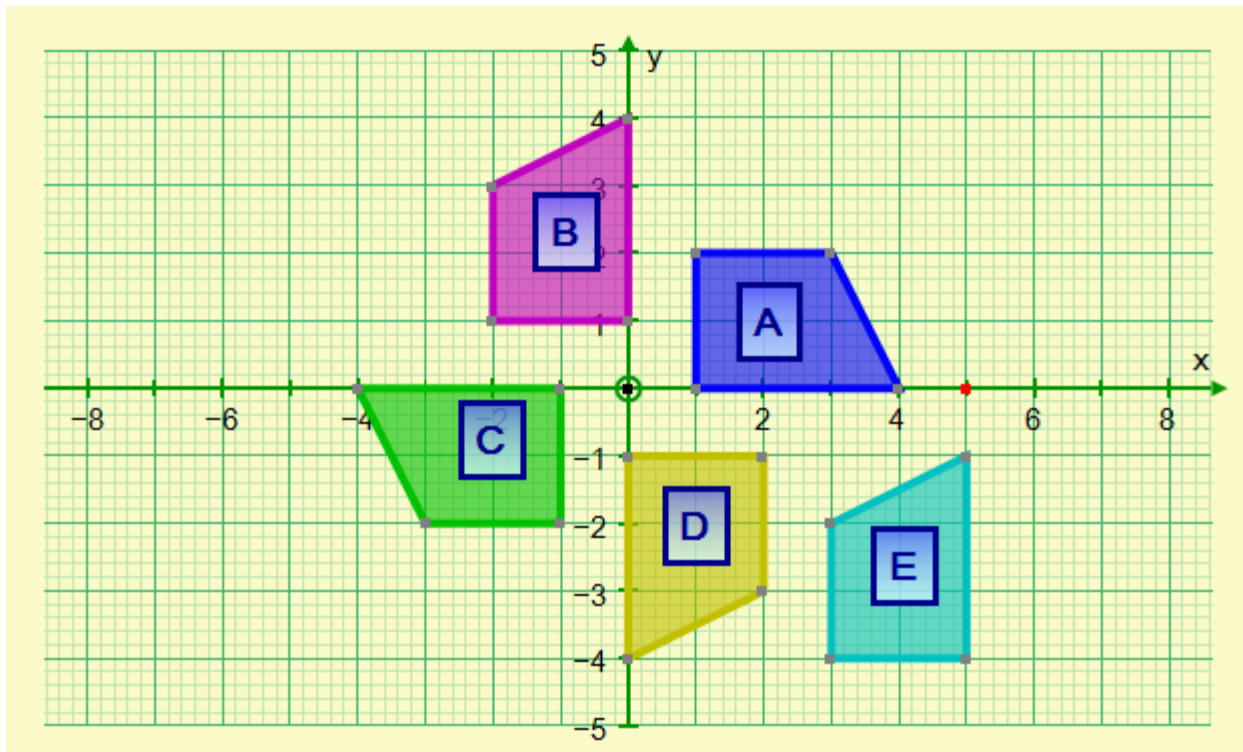
(iii) Describe fully the single transformation that would map shape A to F.

Note: You may use tracing paper.

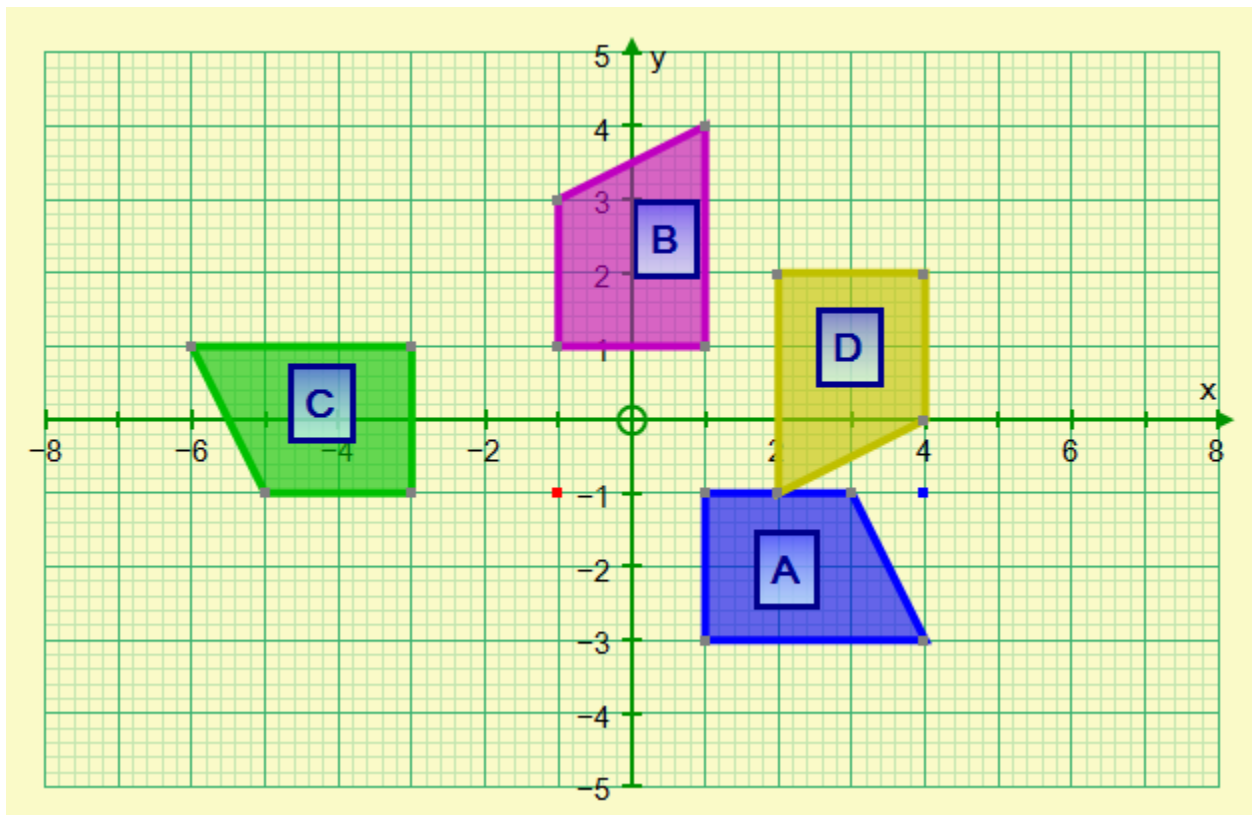


**Answers:**

1. (a)  $90^\circ$  anticlockwise about the origin  
(b)  $180^\circ$  about the origin  
(c)  $90^\circ$  clockwise about the origin  
(d)  $90^\circ$  anticlockwise about the origin  
(e)  $180^\circ$  about the origin

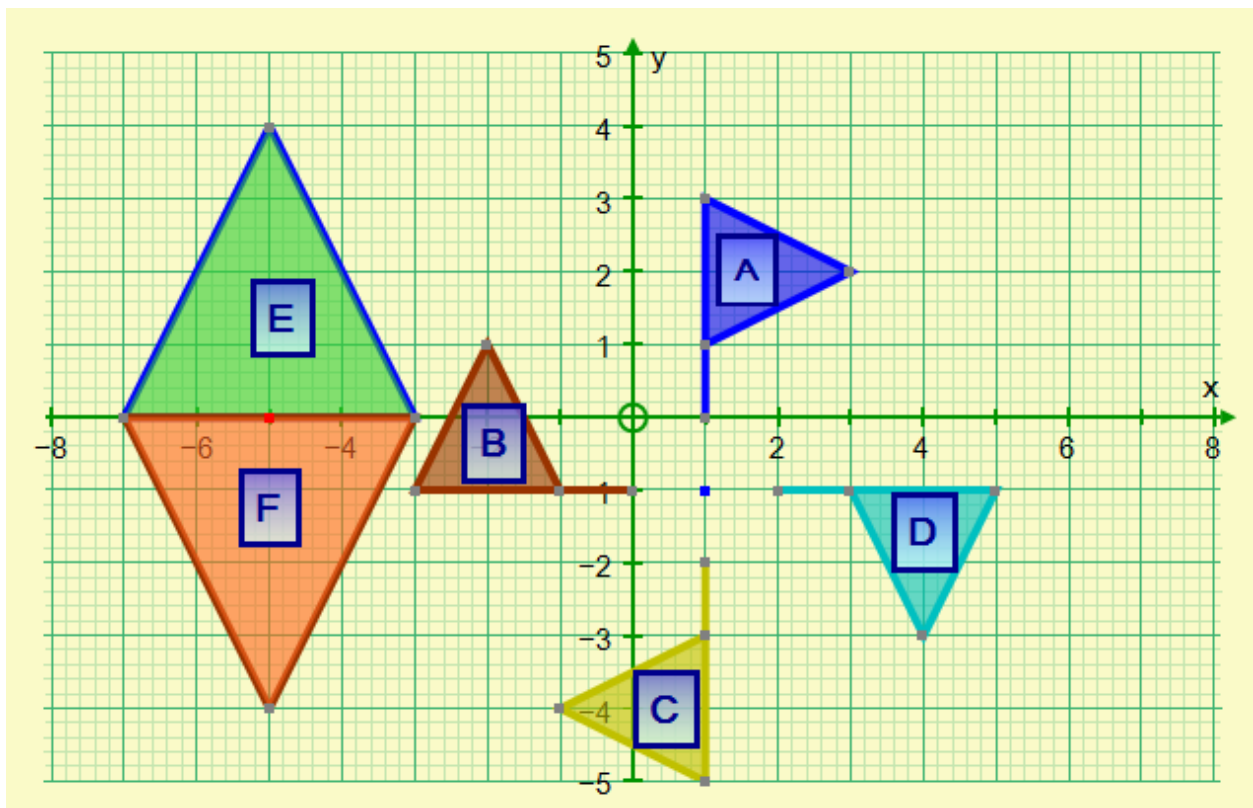


2. (a)  $90^\circ$  anticlockwise about the point  $(-1,-1)$   
(b)  $180^\circ$  about the point  $(-1,-1)$   
(c)  $90^\circ$  clockwise about the point  $(-1,-1)$



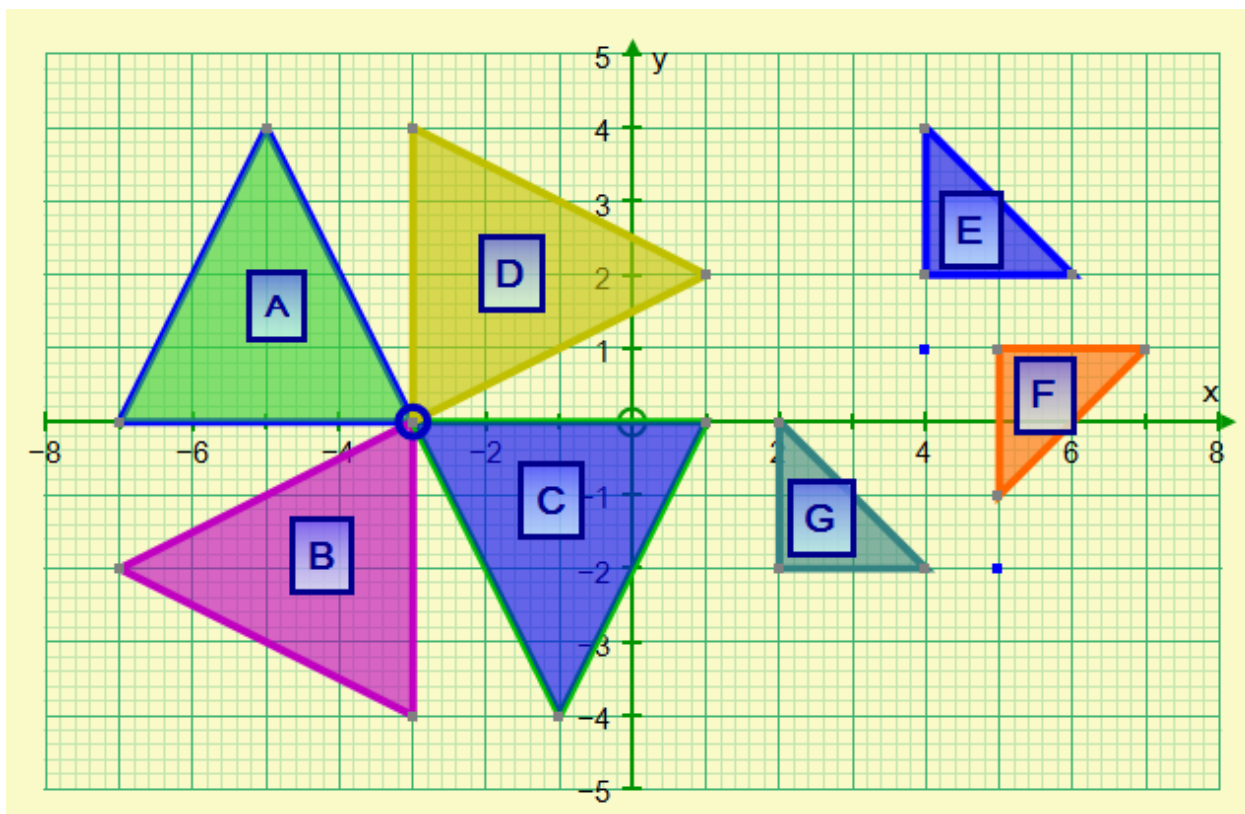
3.

- (a) Rotation of  $90^\circ$  anticlockwise about the point  $(1, -1)$
- (b) Rotation of  $90^\circ$  anticlockwise about the point  $(1, -1)$
- (c) Rotation of  $90^\circ$  clockwise about the point  $(1, -1)$
- (d) Rotation of  $180^\circ$  about the point  $(-5, 0)$





4. (d) A to B: Rotation  $90^\circ$  anticlockwise about the point  $(-3,0)$ .  
 (e) E to F: Rotation  $90^\circ$  clockwise about  $(4, 1)$   
 (f) F to G: Rotation  $90^\circ$  anticlockwise about the point  $(5, -2)$   
 (g) E to G: Translation vector  $\begin{pmatrix} -2 \\ -4 \end{pmatrix}$  or two units to the left followed by four units down.



5.

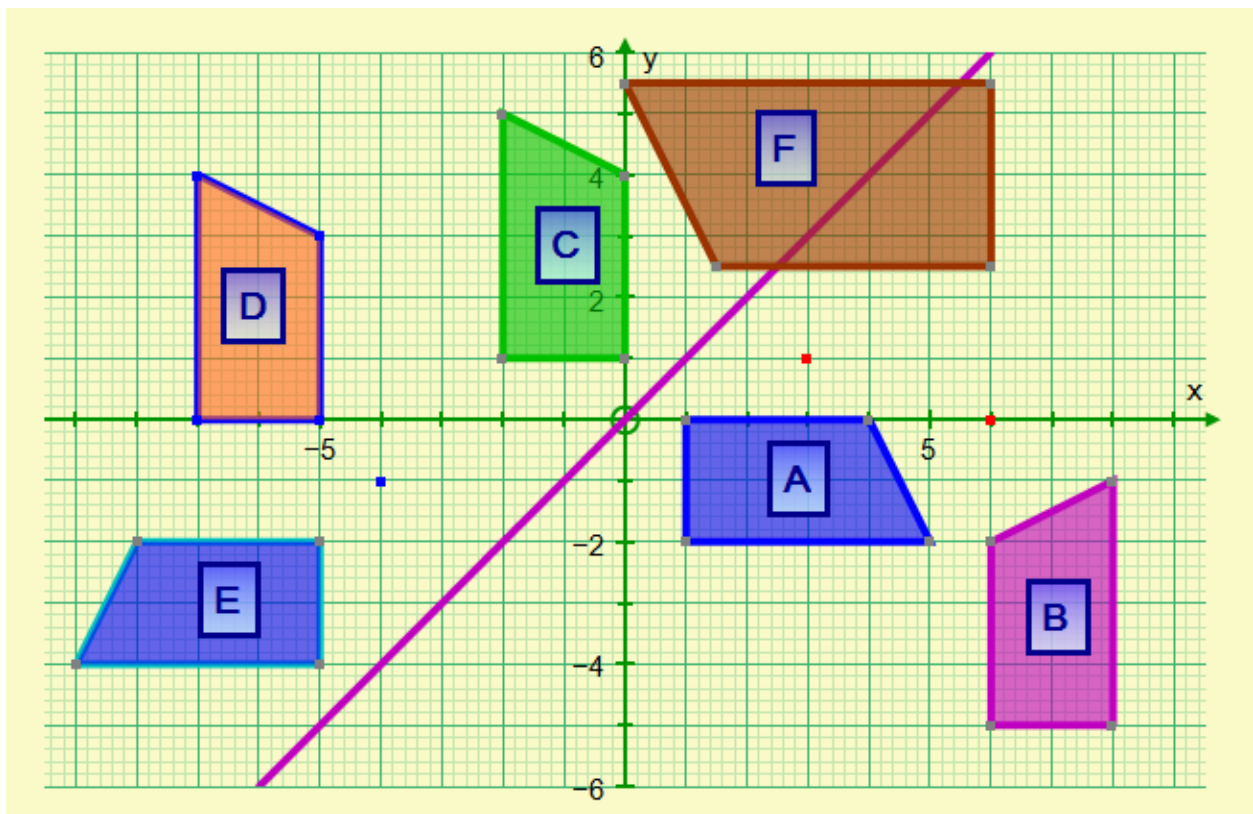
(i) (a) A to B: Rotation  $90^\circ$  anticlockwise about the point  $(6,0)$

(b) A to C: reflection in the line  $y = x$ .

(c) C to D: Translation vector  $\begin{pmatrix} -5 \\ -1 \end{pmatrix}$  or 5 units to the left followed by 1 unit down

(ii) C to D: translation vector  $\begin{pmatrix} -5 \\ -1 \end{pmatrix}$  followed by a rotation of  $90^\circ$  anticlockwise about the point  $(-4, -1)$  **or** a rotation of  $90^\circ$  anticlockwise about the point  $(-4, -1)$  followed by a translation vector  $\begin{pmatrix} 1 \\ -5 \end{pmatrix}$  **or** a rotation of  $90^\circ$  anticlockwise about some point (eg.  $(2,1)$ ) followed by some translation (eg. a translation vector  $\begin{pmatrix} -7 \\ -1 \end{pmatrix}$ )

(i) A to F: enlargement scale factor  $-1.5$ , centre  $(3, 1)$ .



I hope you find this useful. Please let me know if you find any errors.

**Note:** With the most able students you may want them to try one question on rotation without tracing paper (using constructions of the perpendicular bisectors of two of the lines joining a pair of points to their images to locate the centre of rotation).