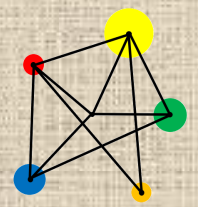
Rotations



Accurately rotate a shape.

Describe a rotation using angle, direction and centre of rotation.

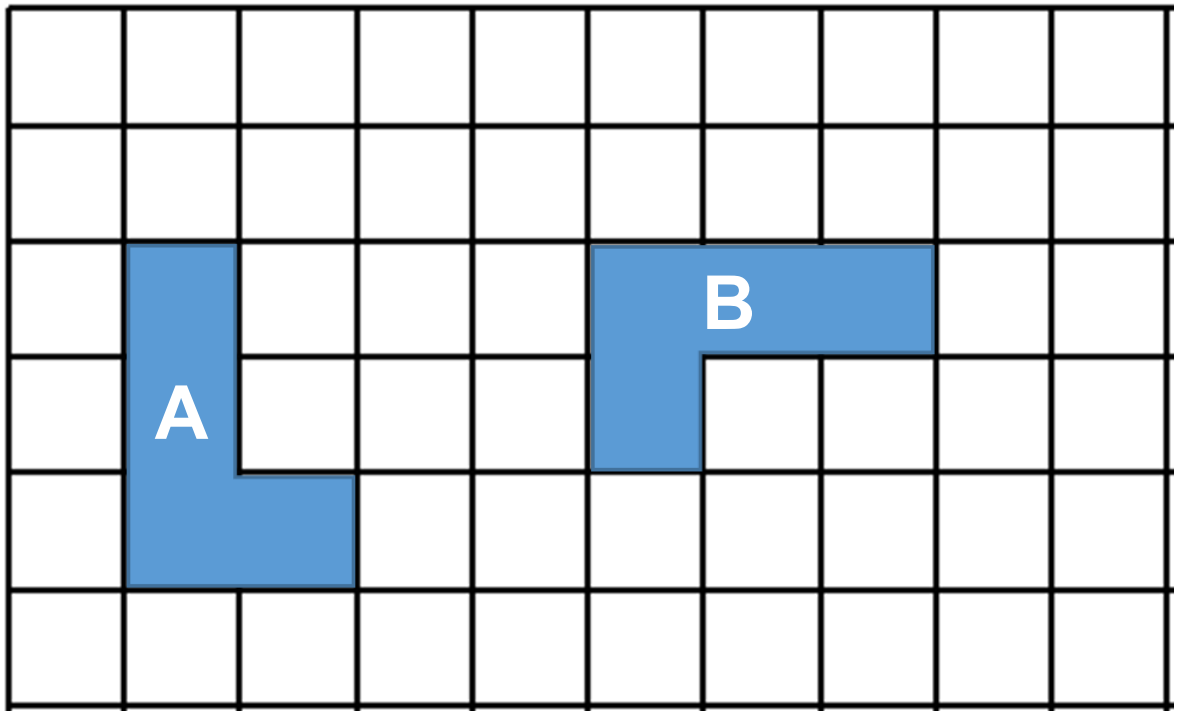
Vocabulary

Rotation
A turn.

Key Facts

A rotation is described by an angle of turn and a direction.

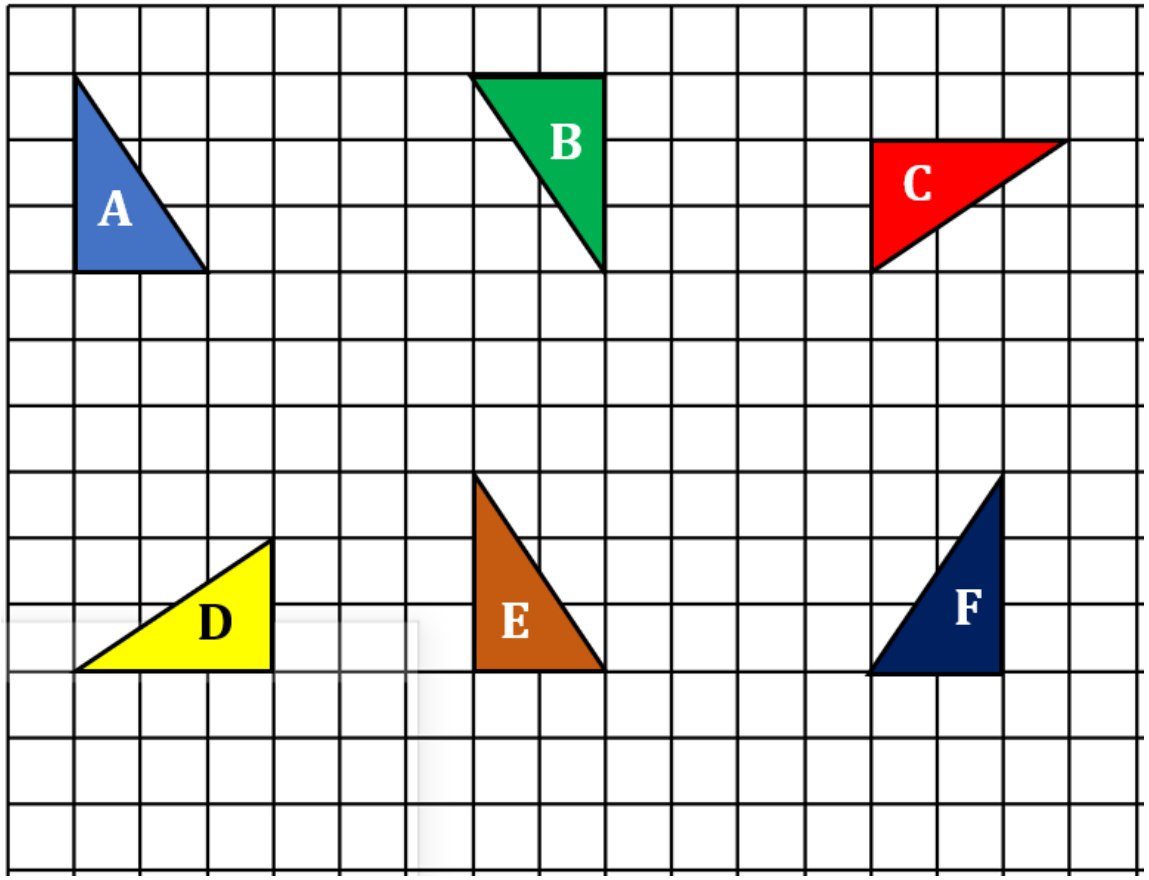
Shape A has been rotated 90° clockwise to obtain shape B



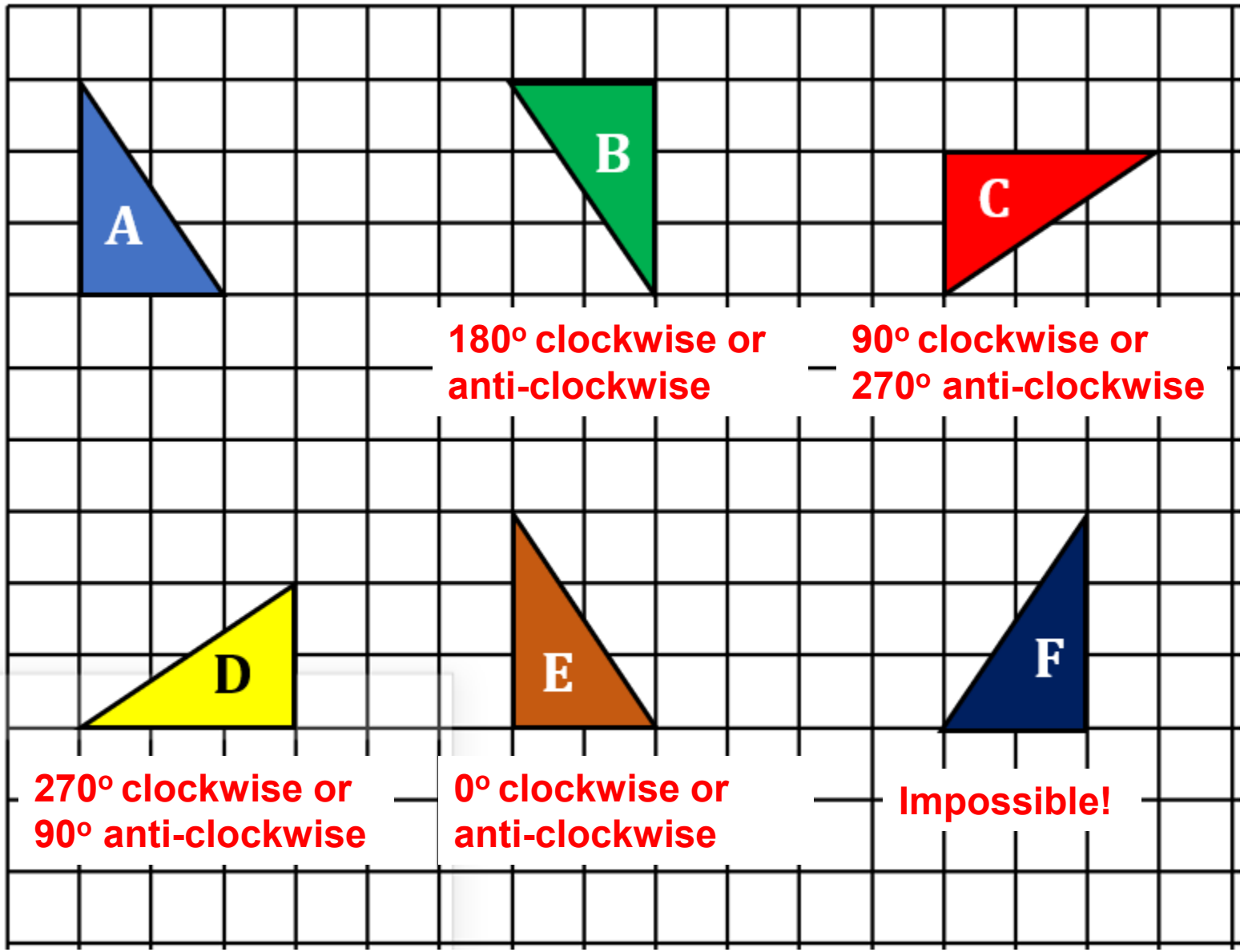
Note that a rotation of 90° clockwise is equivalent to a rotation of 270° anticlockwise.

Exercise

Shape A has been rotated to give each of shapes B, C, D and E.
Describe each rotation by giving an angle and direction of rotation.



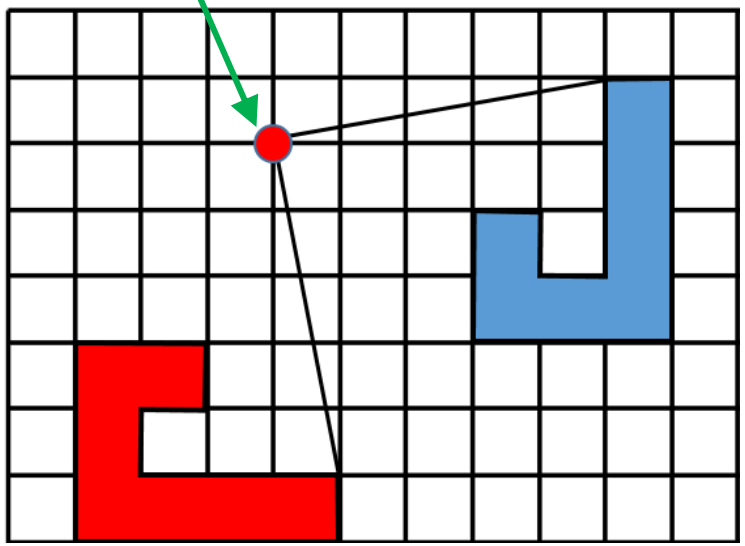
Solutions


A
B
C
D
E
F
180° clockwise or
anti-clockwise
90° clockwise or
270° anti-clockwise
270° clockwise or
90° anti-clockwise
0° clockwise or
anti-clockwise
Impossible!

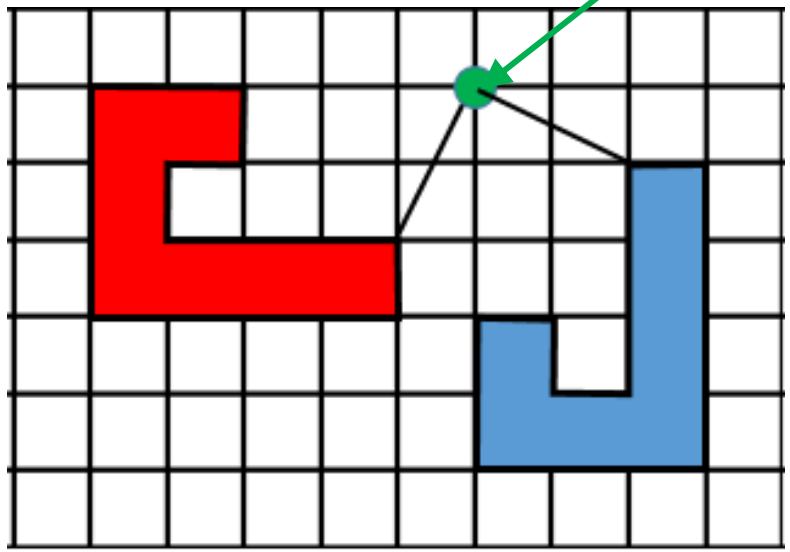
Key Facts

A rotation can have the same angle and direction but a different **centre of rotation**.

Centre of rotation

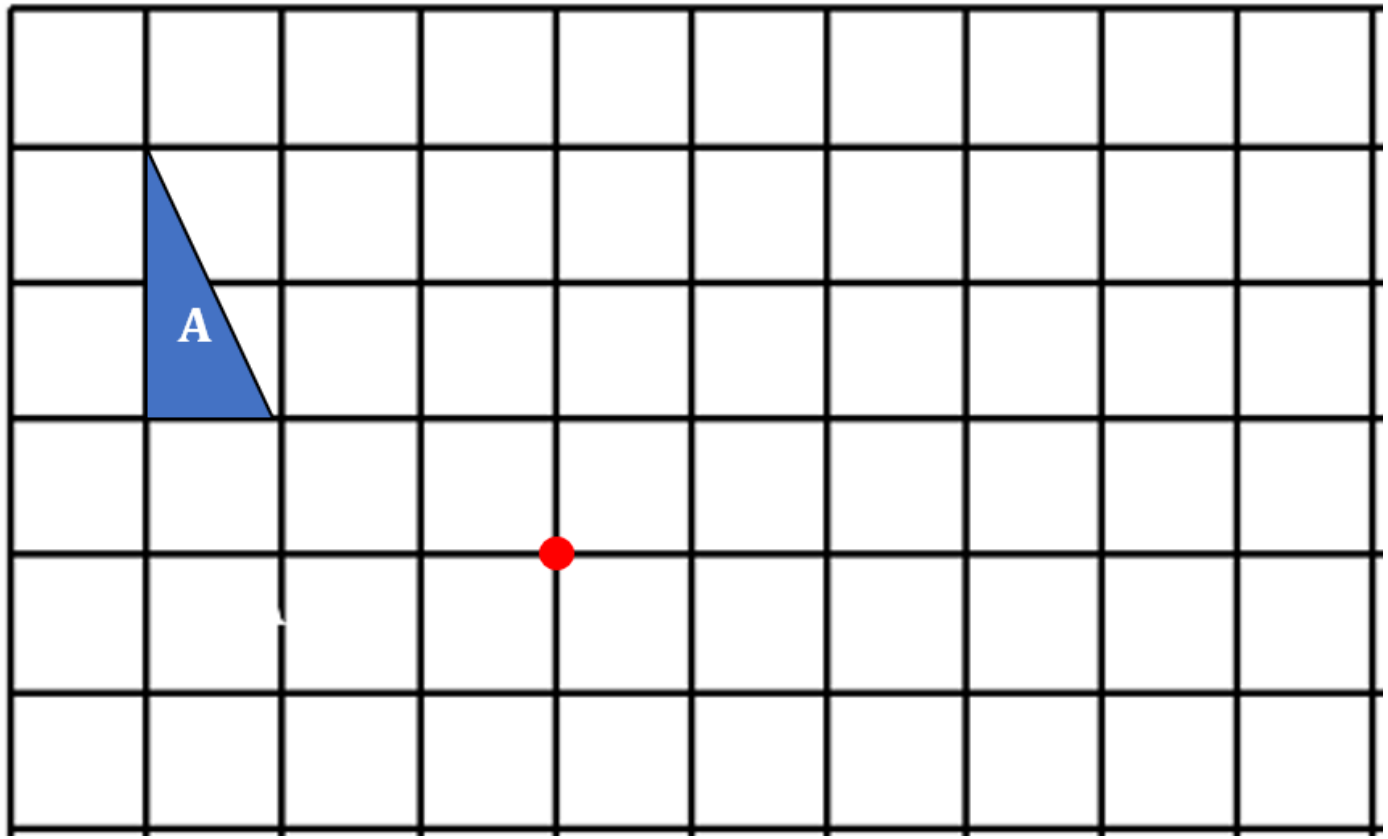


Centre of rotation



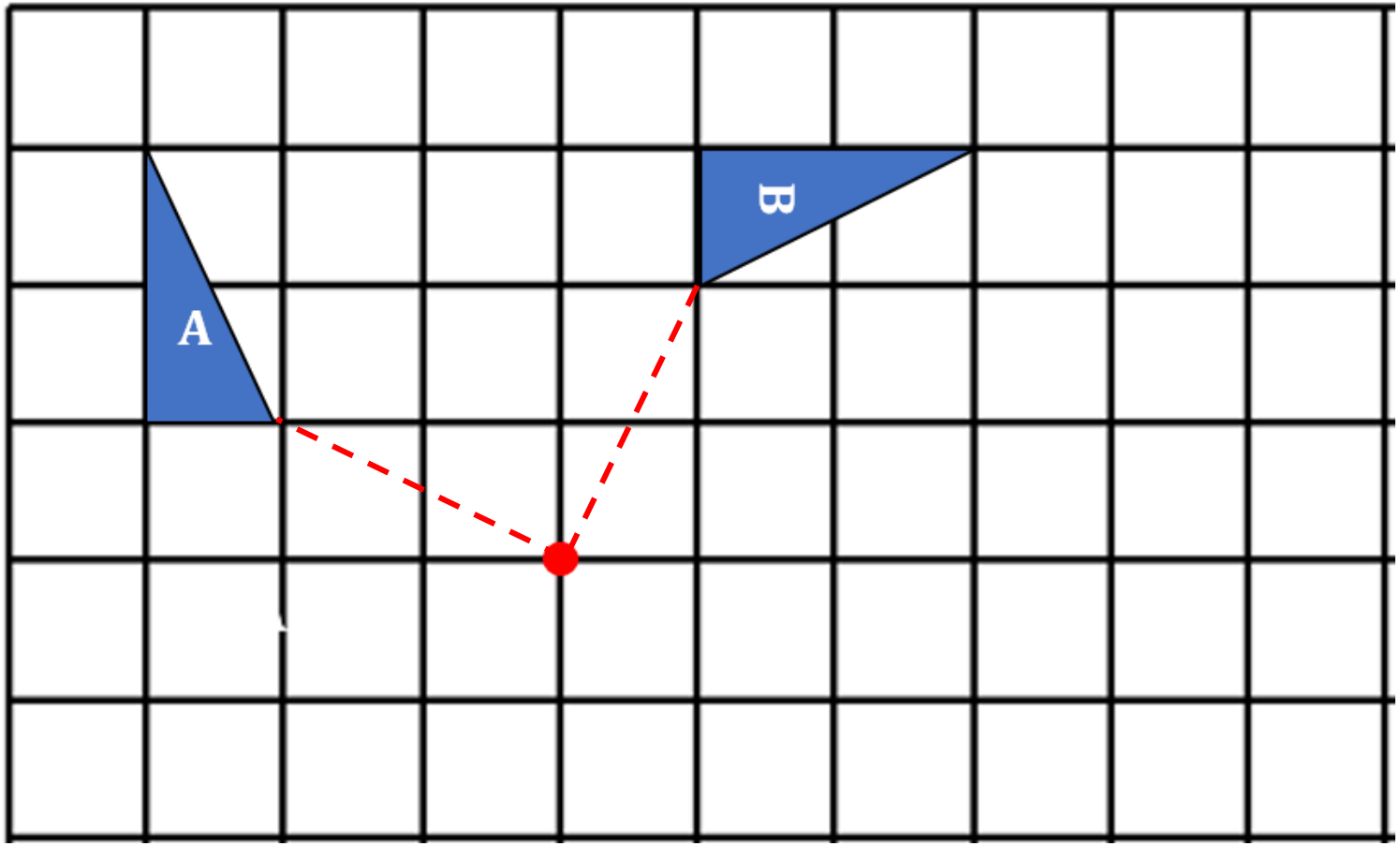
Example

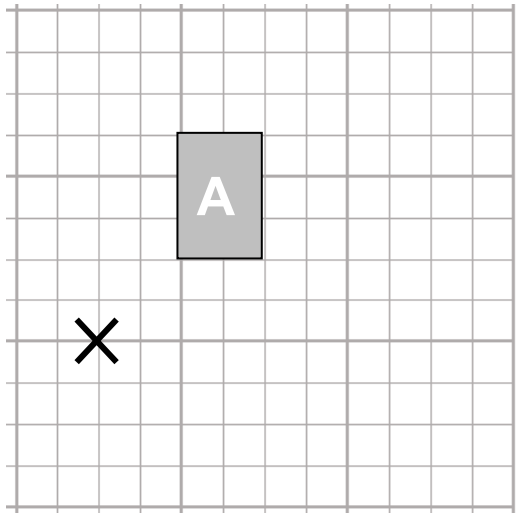
Rotate shape A 90° clockwise about the red point.



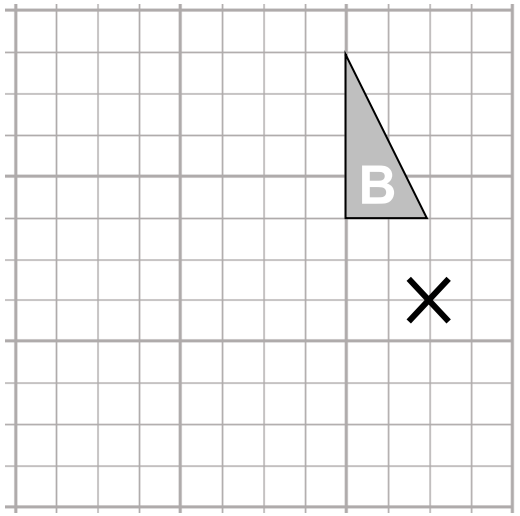
Solution

Rotate shape A 90° clockwise about the red point.

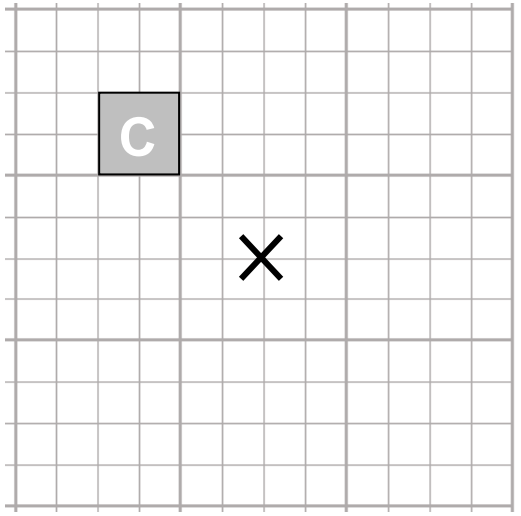




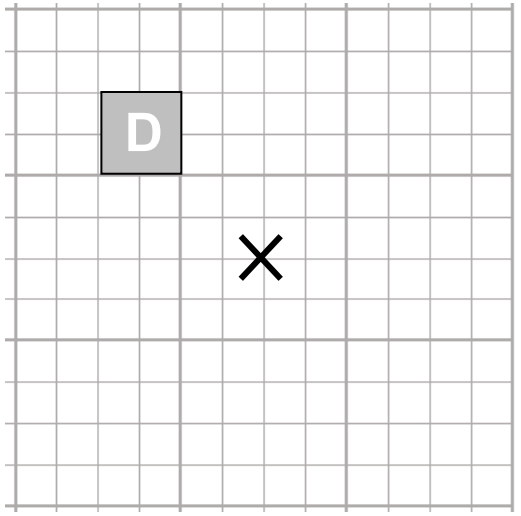
Rotate A 90° clockwise about the cross.



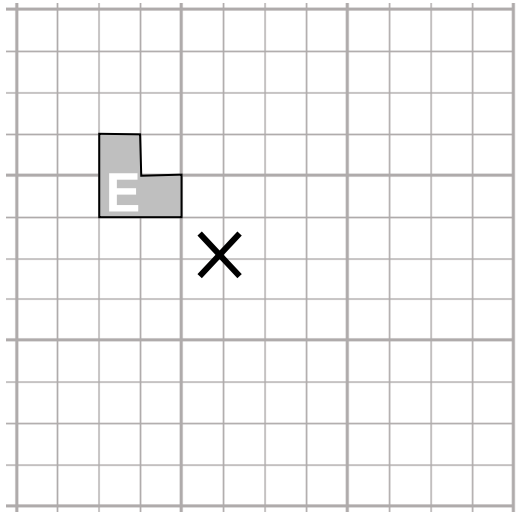
Rotate B 90° anticlockwise about the cross.



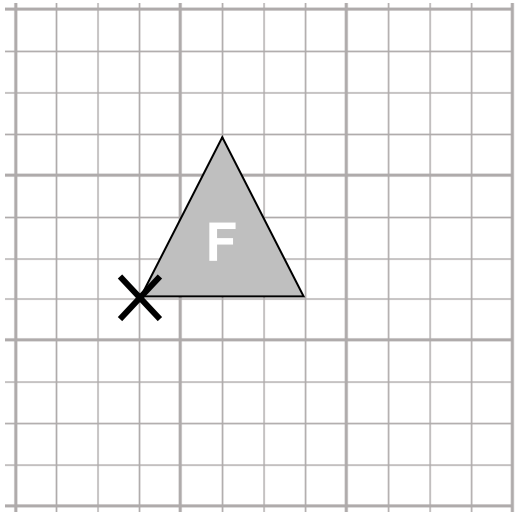
Rotate C 180° clockwise about the cross.



Rotate D 180° anticlockwise about the cross.



Rotate E 270° clockwise about the cross.

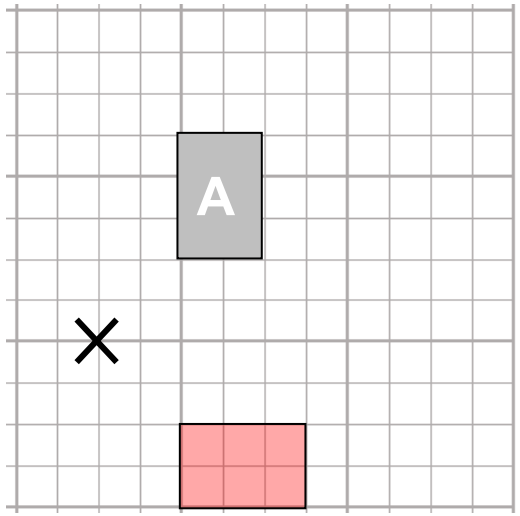


Rotate F 90° clockwise about the cross.

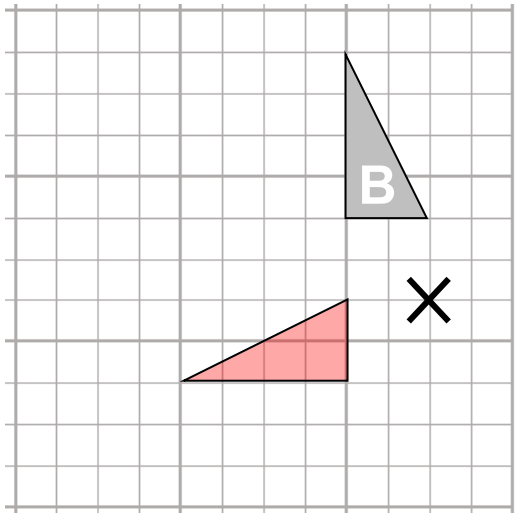
Challenge

Can you find a word that stays the same after rotating it by 180°?

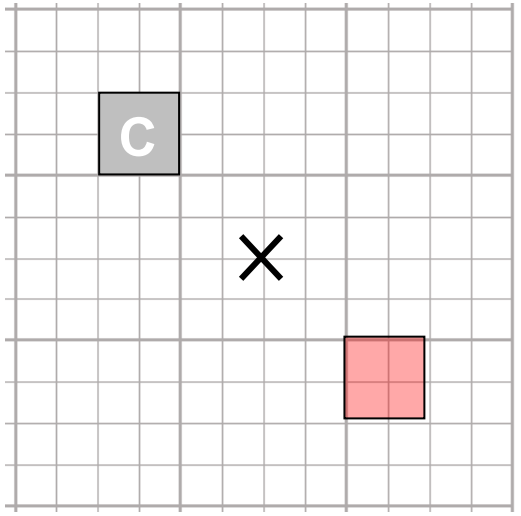
(All capital letters)



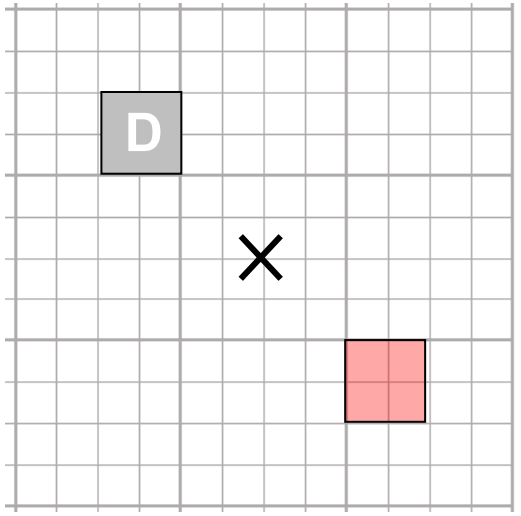
Rotate A 90° clockwise about the cross.



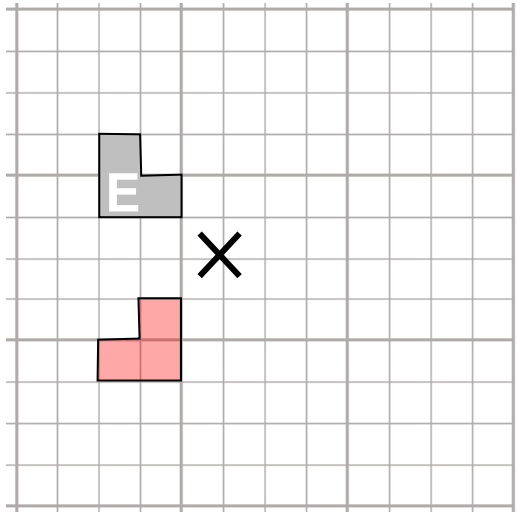
Rotate B 90° anticlockwise about the cross.



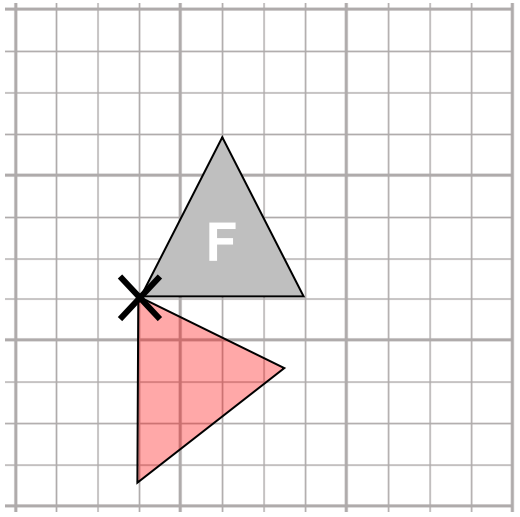
Rotate C 180° clockwise about the cross.



Rotate D 180° anticlockwise about the cross.



Rotate E 270° clockwise about the cross.



Rotate F 90° clockwise about the cross.

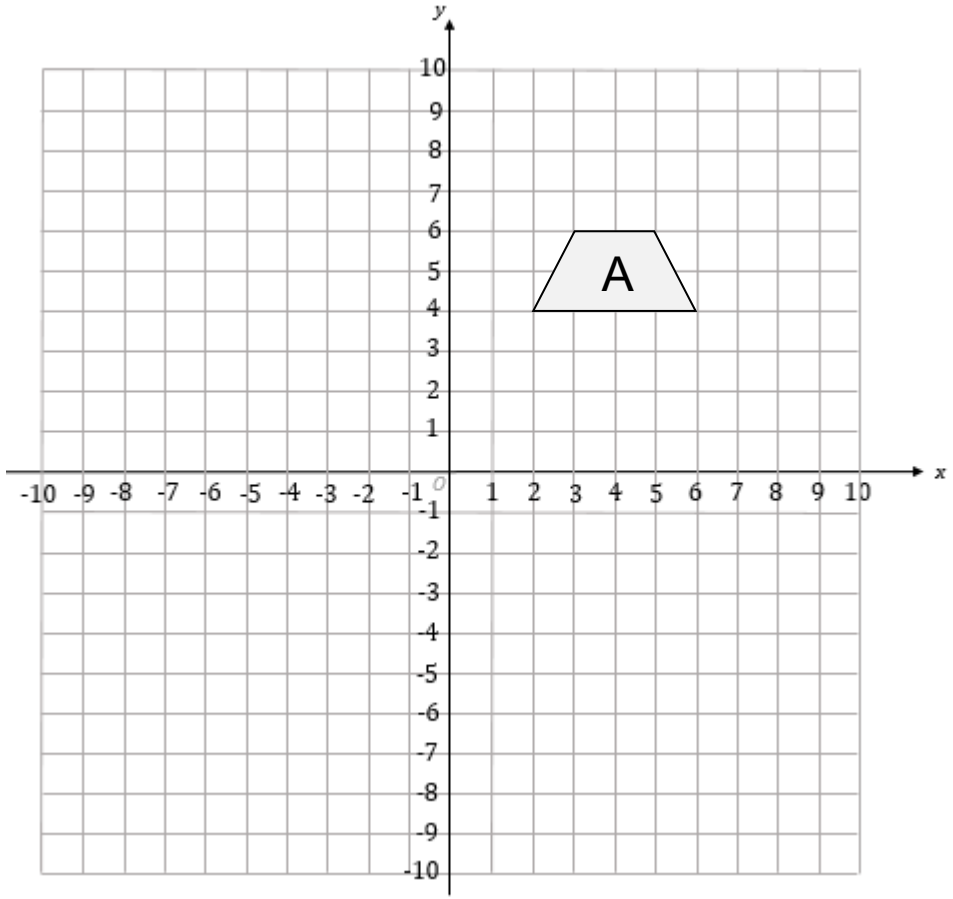
Challenge

Can you find a word that stays the same after rotating it by 180°?

NOON

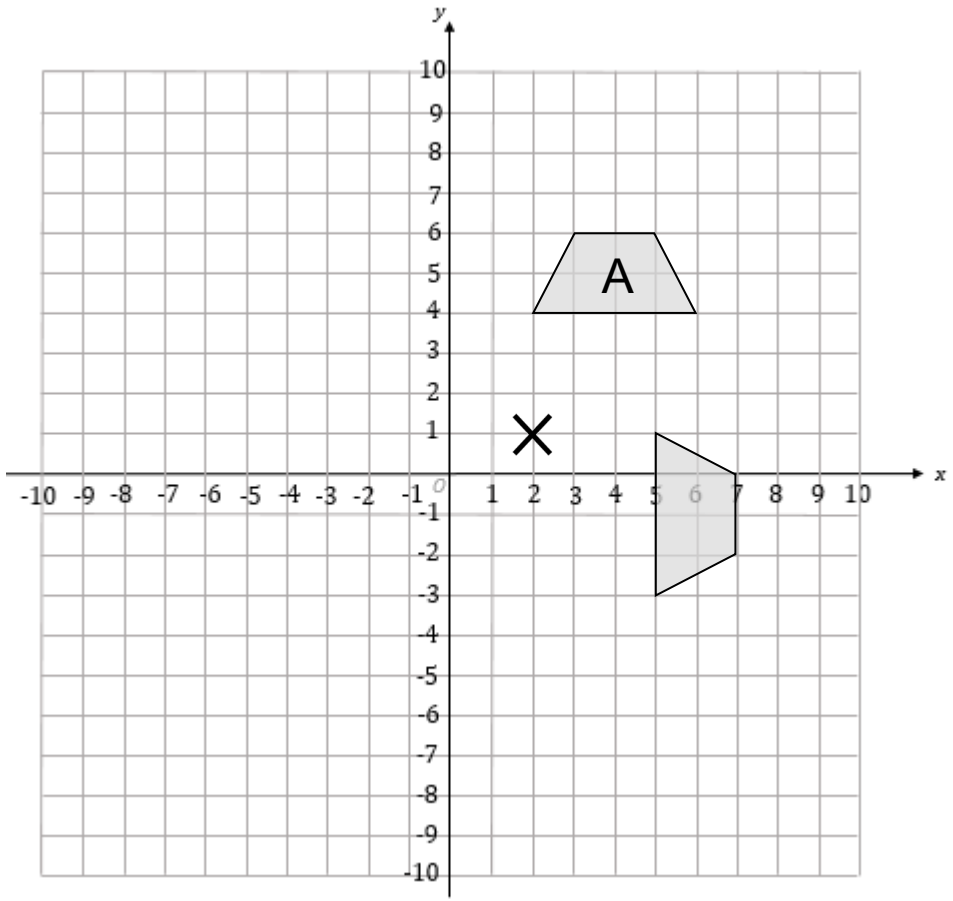
Example

Rotate shape A 90^{o} clockwise about the point (2 , 1)

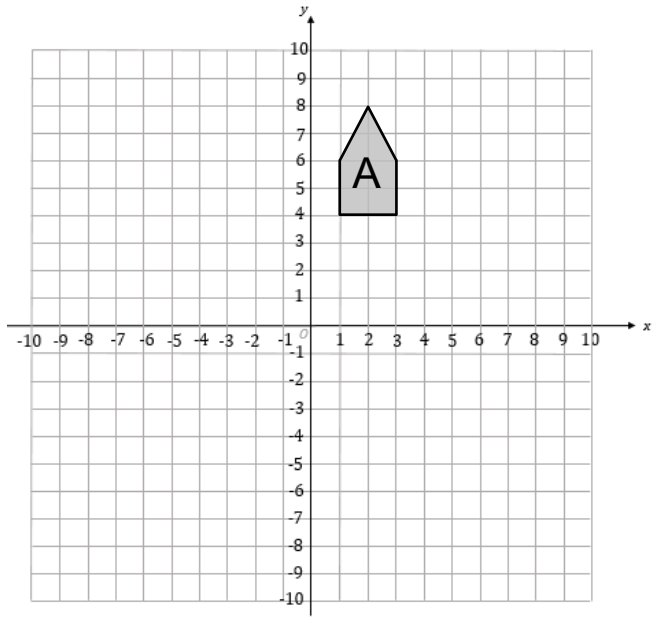


Solution

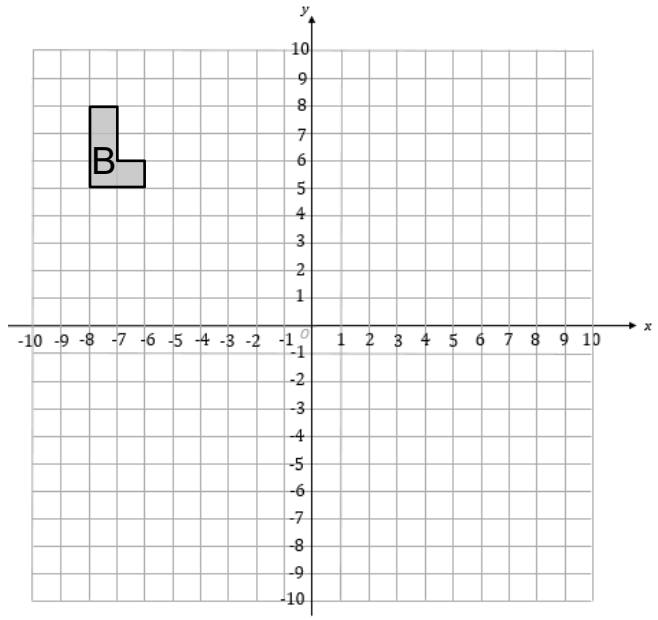
Rotate shape A 90° clockwise about the point (2 , 1)



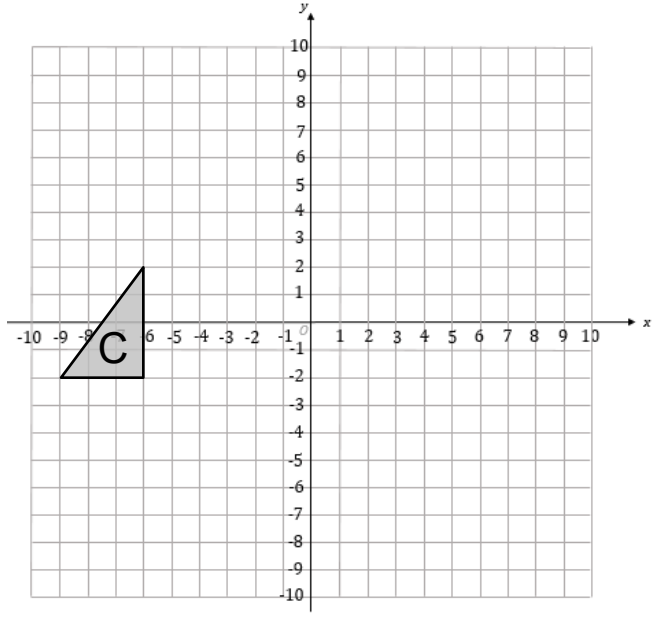
a) Rotate shape A 90° clockwise about the point (4 , 2).



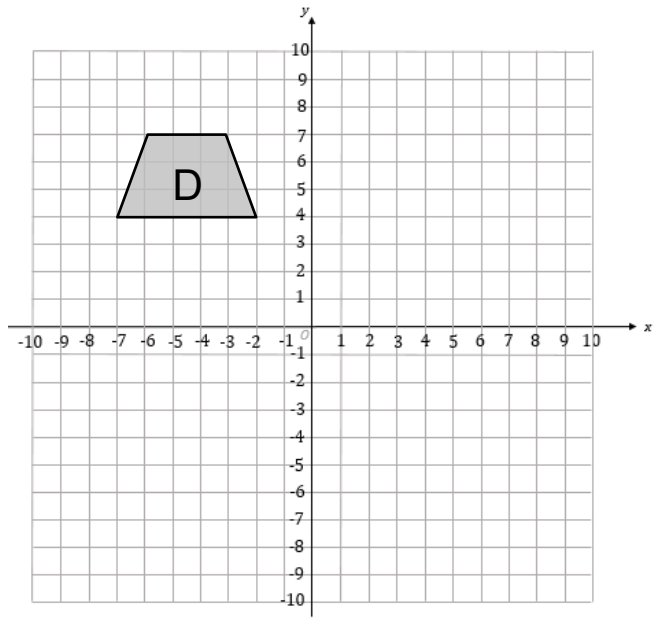
b) Rotate shape B 180° about the point (- 2 , 2).



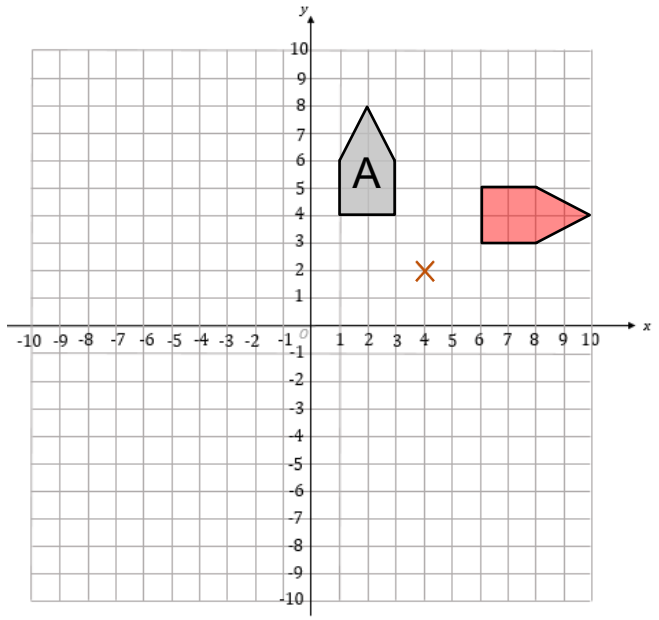
c) Rotate shape C 270° anti-clockwise about the point (2 , -2).



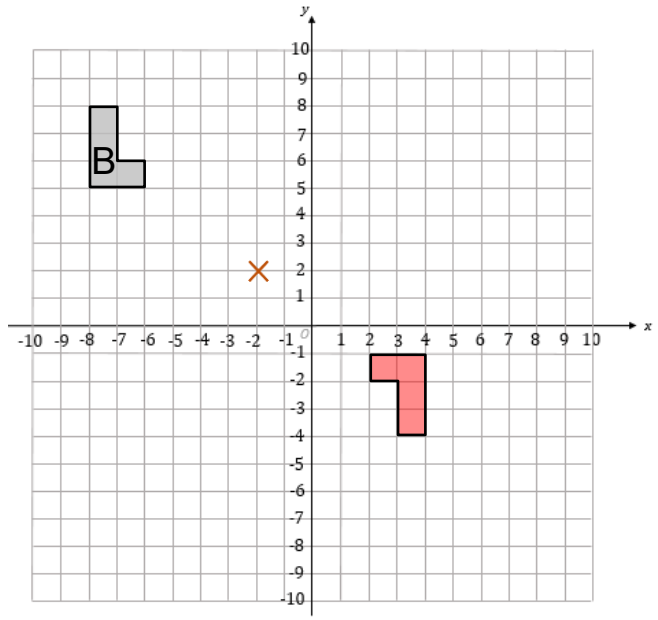
d) Rotate shape D 90° clockwise about the point (1 , 2) and then 180° anticlockwise about (4 , 1)



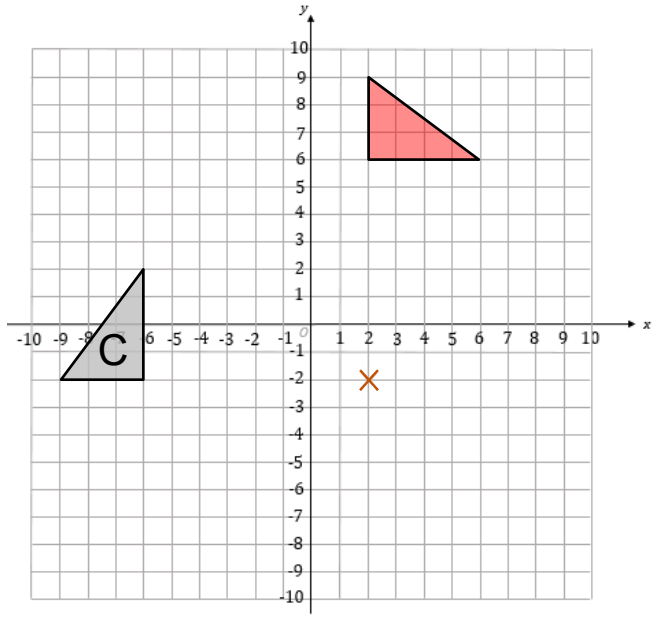
a) Rotate shape A 90° clockwise about the point (4 , 2).



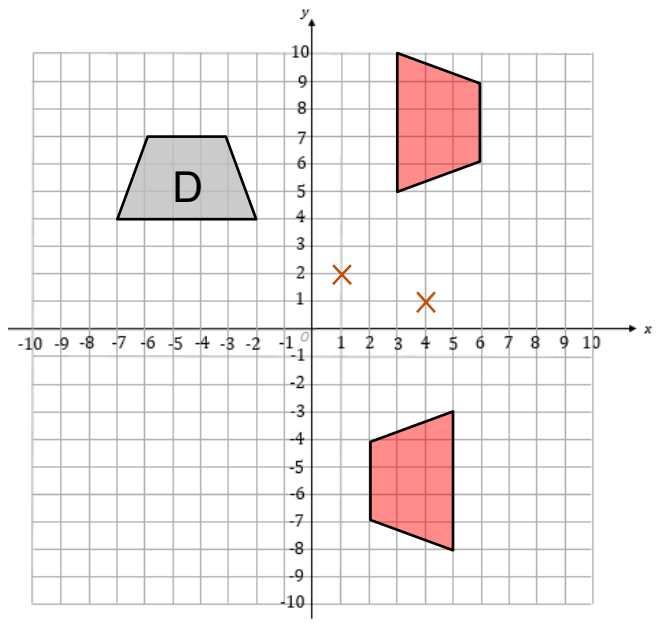
b) Rotate shape B 180° about the point (- 2 , 2).



c) Rotate shape C 270° anti-clockwise about the point (2 , -2).

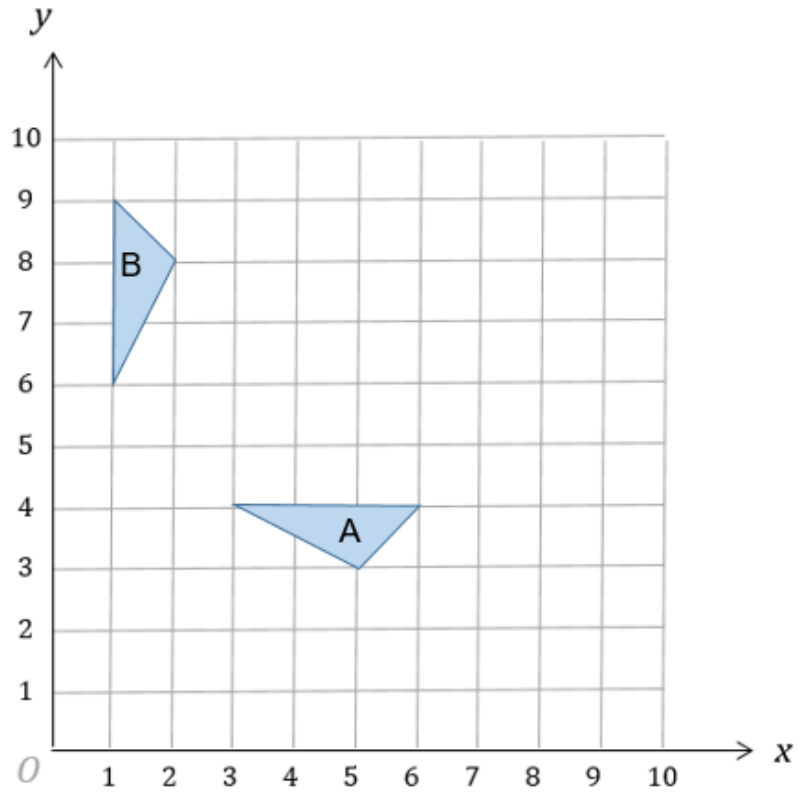


d) Rotate shape D 90° clockwise about the point (1 , 2) and then 180° anticlockwise about (4 , 1)



Example

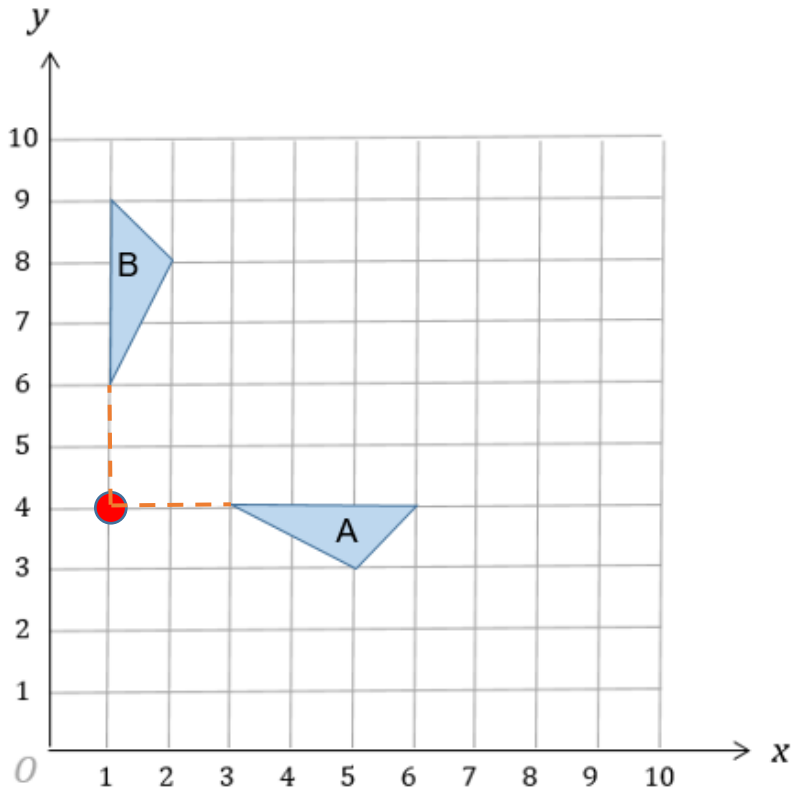
Describe fully the single transformation that maps triangle A onto triangle B.



Solution

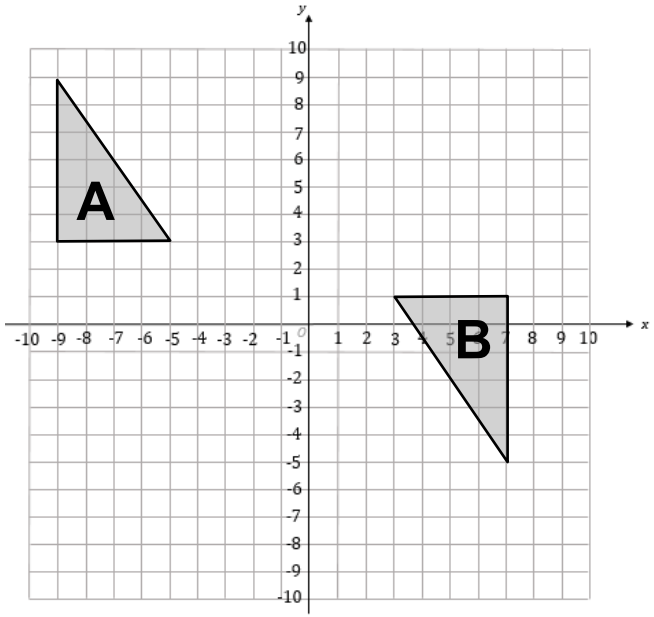
Describe fully the single transformation that maps triangle A onto triangle B.

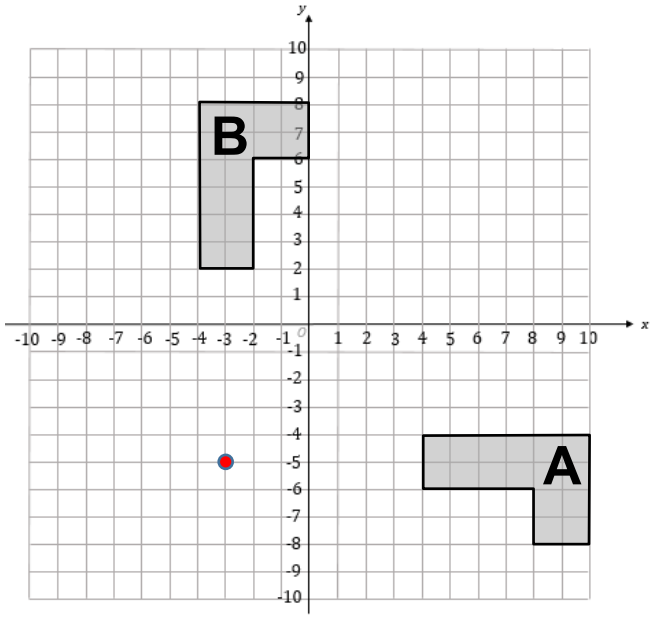
A rotation 90° anti-clockwise about (1 , 4).

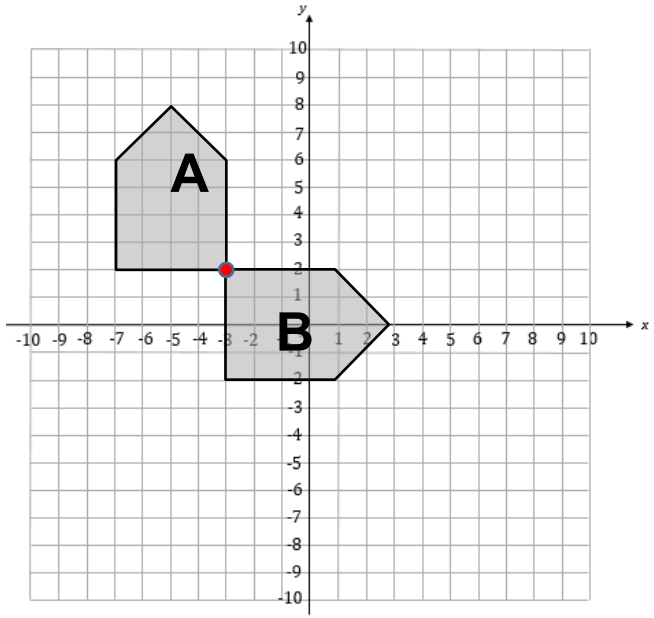


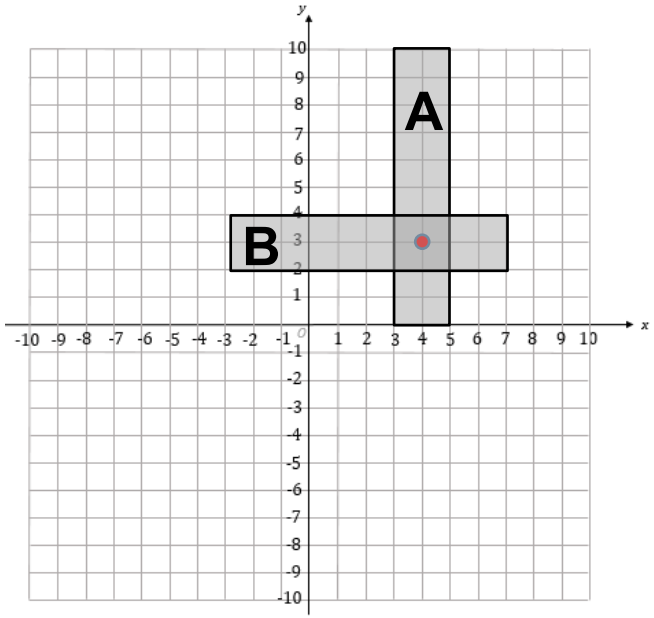
"Use tracing paper to help you find the centre of rotation"

a) Fully describe each of the rotations from A to B below.









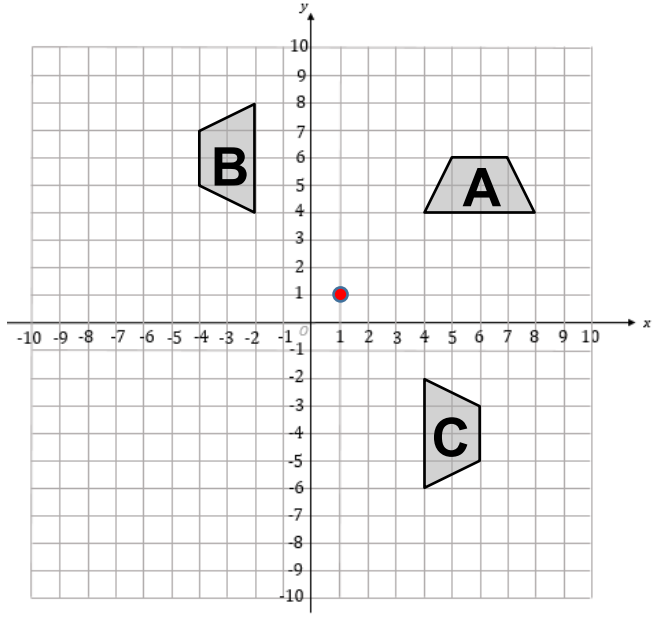
Fully describe each of the rotations from:

A to B

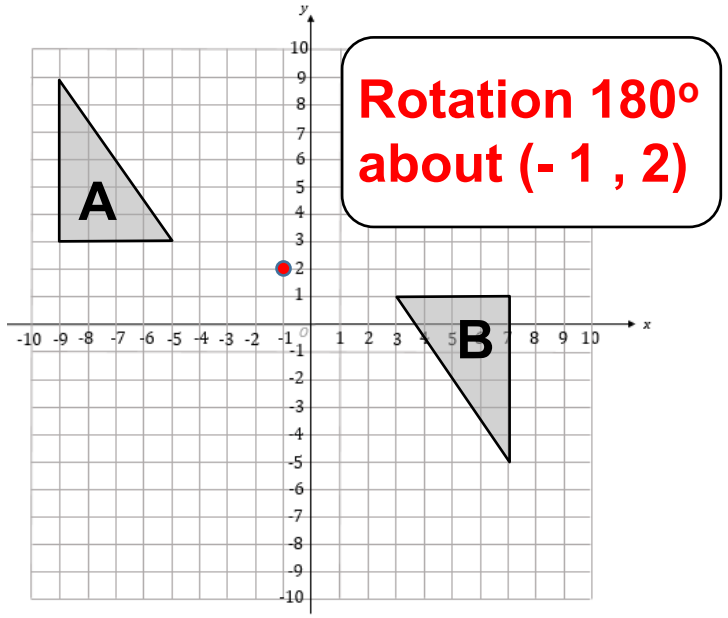
B to C

A to C

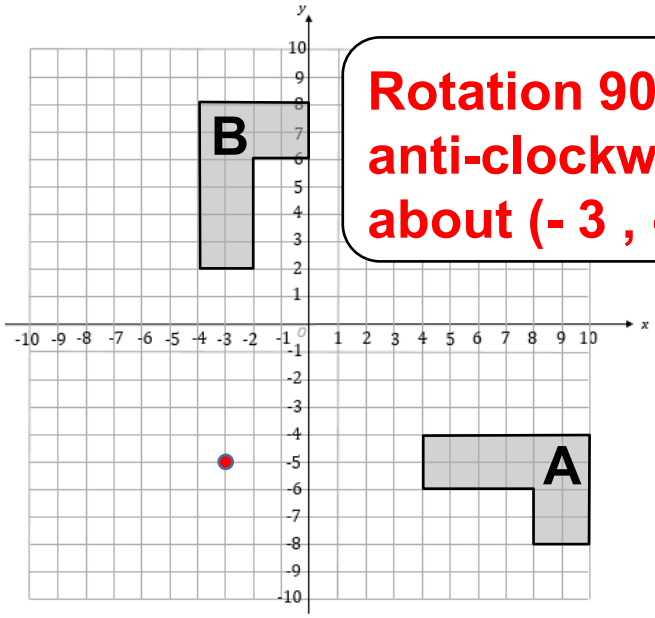
C to A



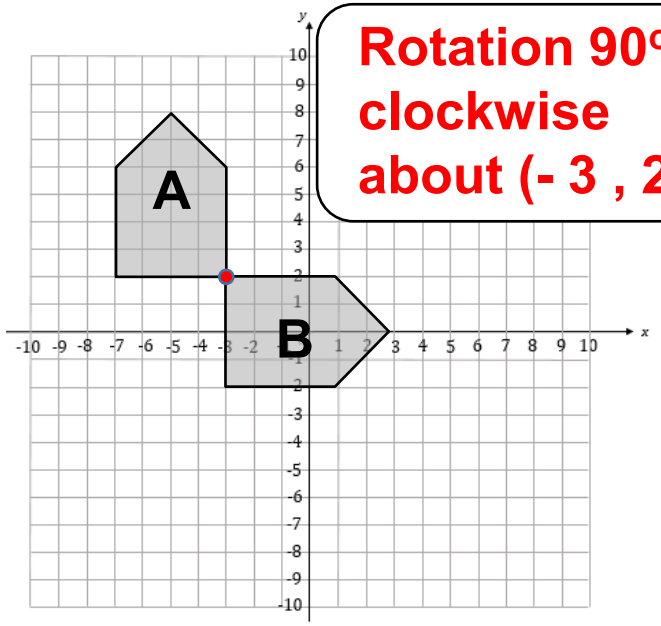
a) Fully describe each of the rotations from A to B below.



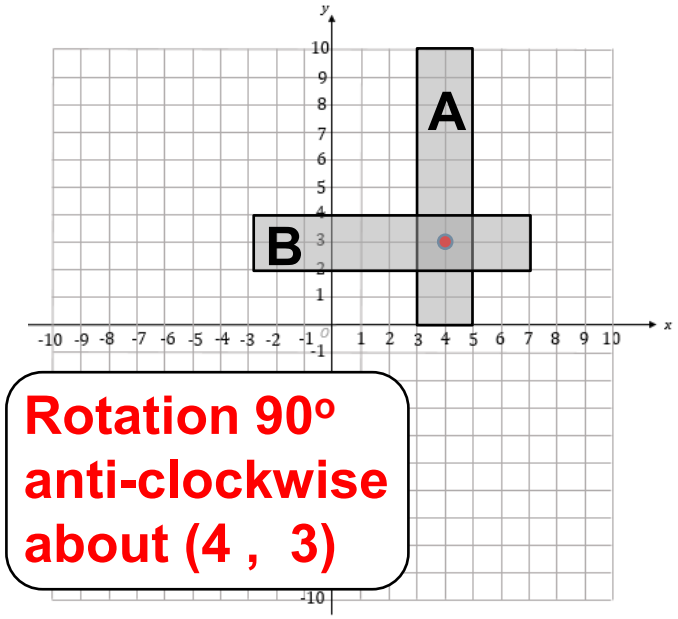
Rotation 180° about (- 1 , 2)



Rotation 90° anti-clockwise about (- 3 , - 5)



Rotation 90° clockwise about (- 3 , 2)



Rotation 90° anti-clockwise about (4 , 3)

Fully describe each of the rotations from:

A to B

Rotation 90° anti-clockwise about (1 , 1)

B to C

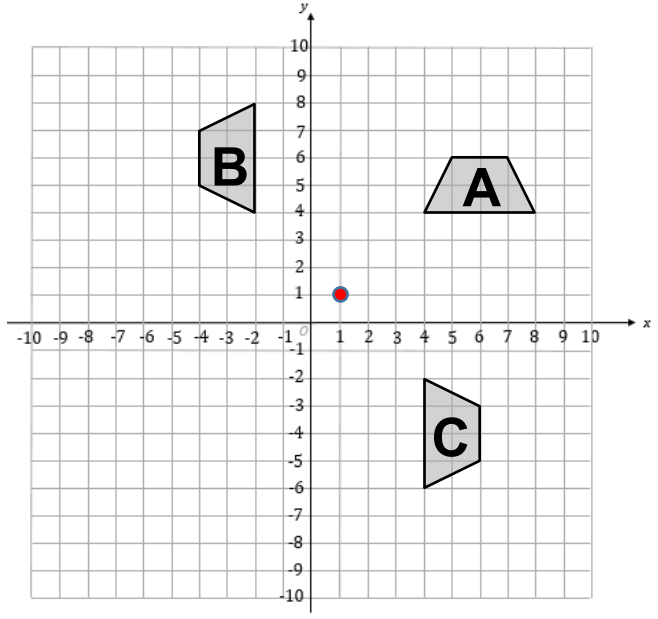
Rotation 180° about (1 , 1)

A to C

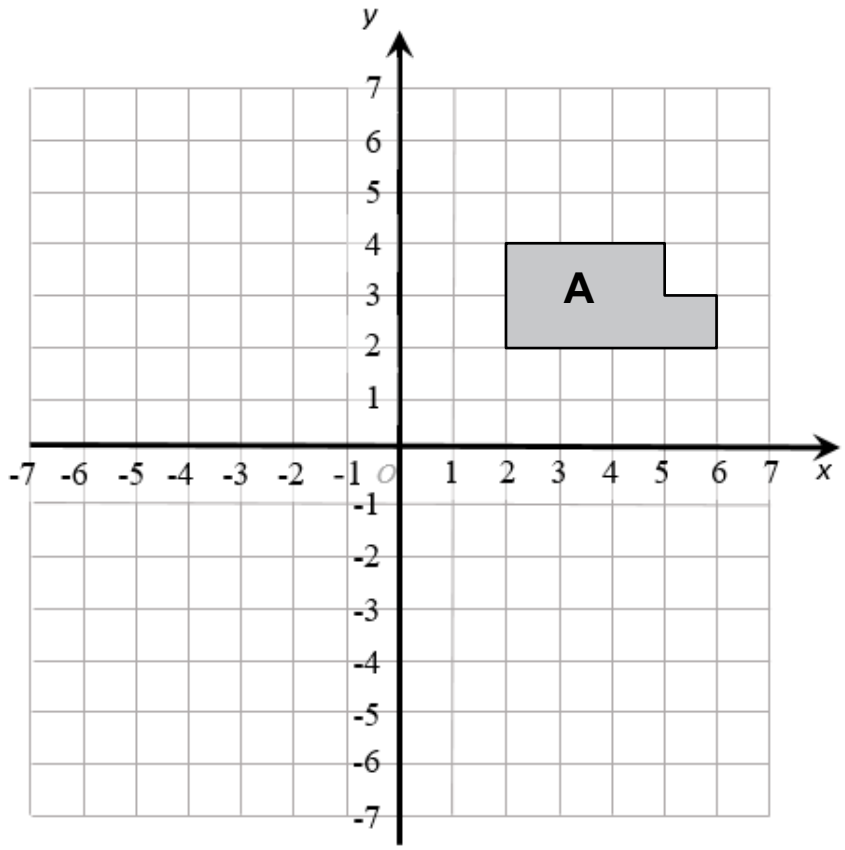
Rotation 90° clockwise about (1 , 1)

C to A

Rotation 90° anti-clockwise about (1 , 1)



Extension

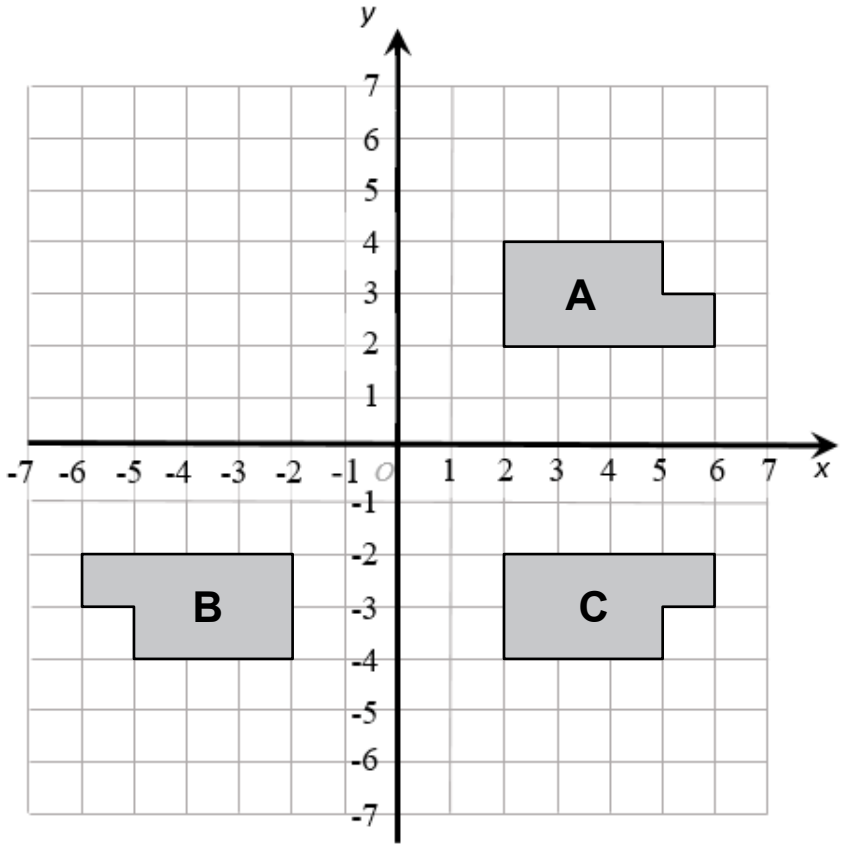


Shape **A** is rotated clockwise by 180° about (0,0) to obtain shape **B**.

Shape **B** is then reflected in the y-axis to obtain shape **C**.

What single transformation maps shape **A** to shape **C**?

Solution



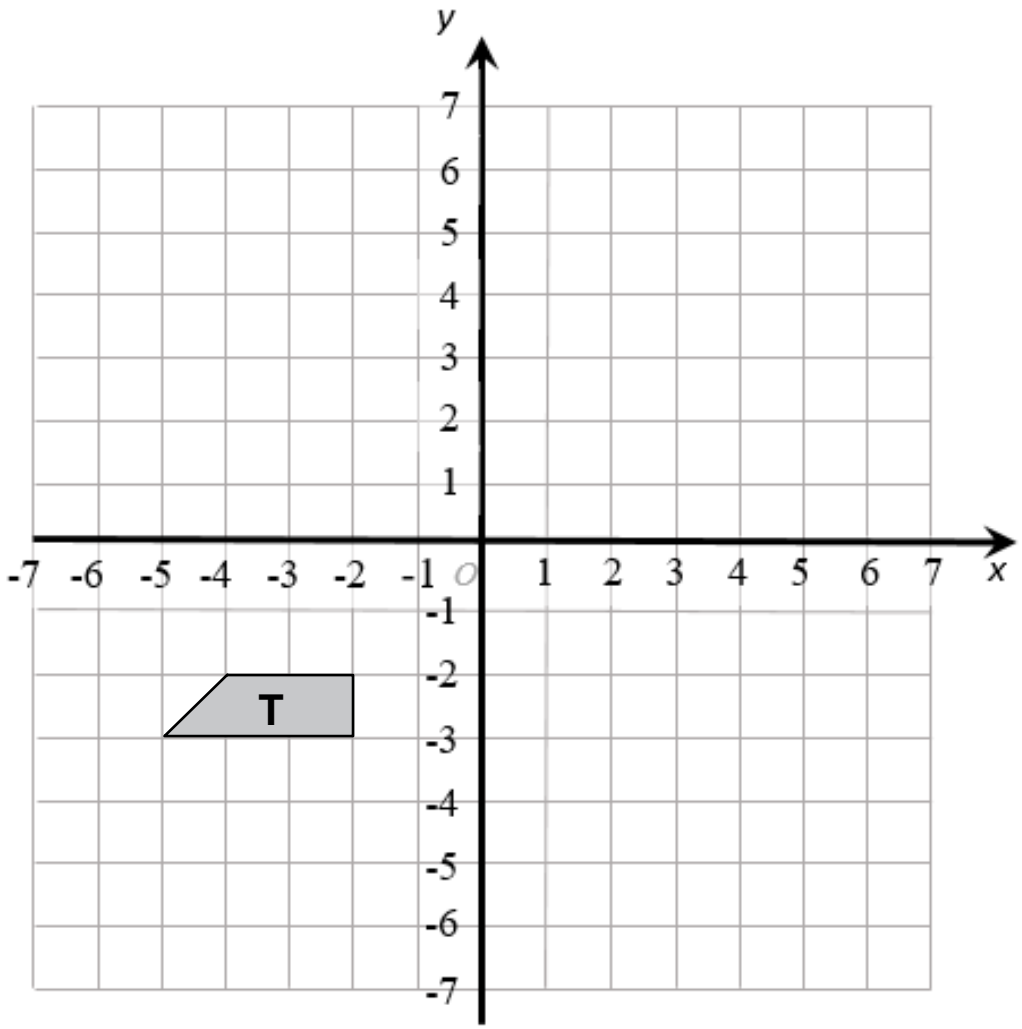
Shape **A** is rotated clockwise by 180° about (0,0) to obtain shape **B**.

Shape **B** is then reflected in the y-axis to obtain shape **C**.

What single transformation maps shape **A** to shape **C**?

A reflection in the x-axis.

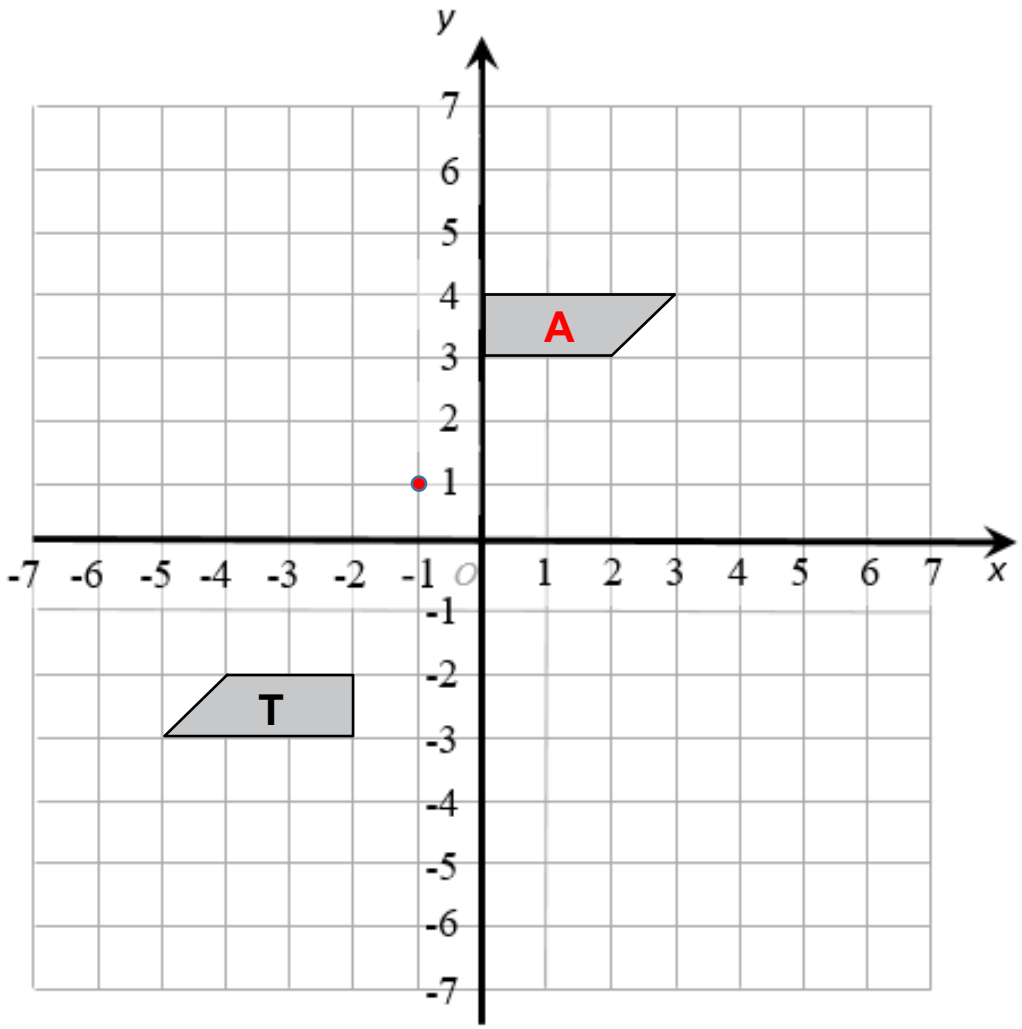
Exam Style Question



a) Rotate trapezium **T** 180° about the point (-1 , -1). Label the new trapezium **A**.

b) Describe the single transformation that maps trapezium **A** onto trapezium **T**.

Solution



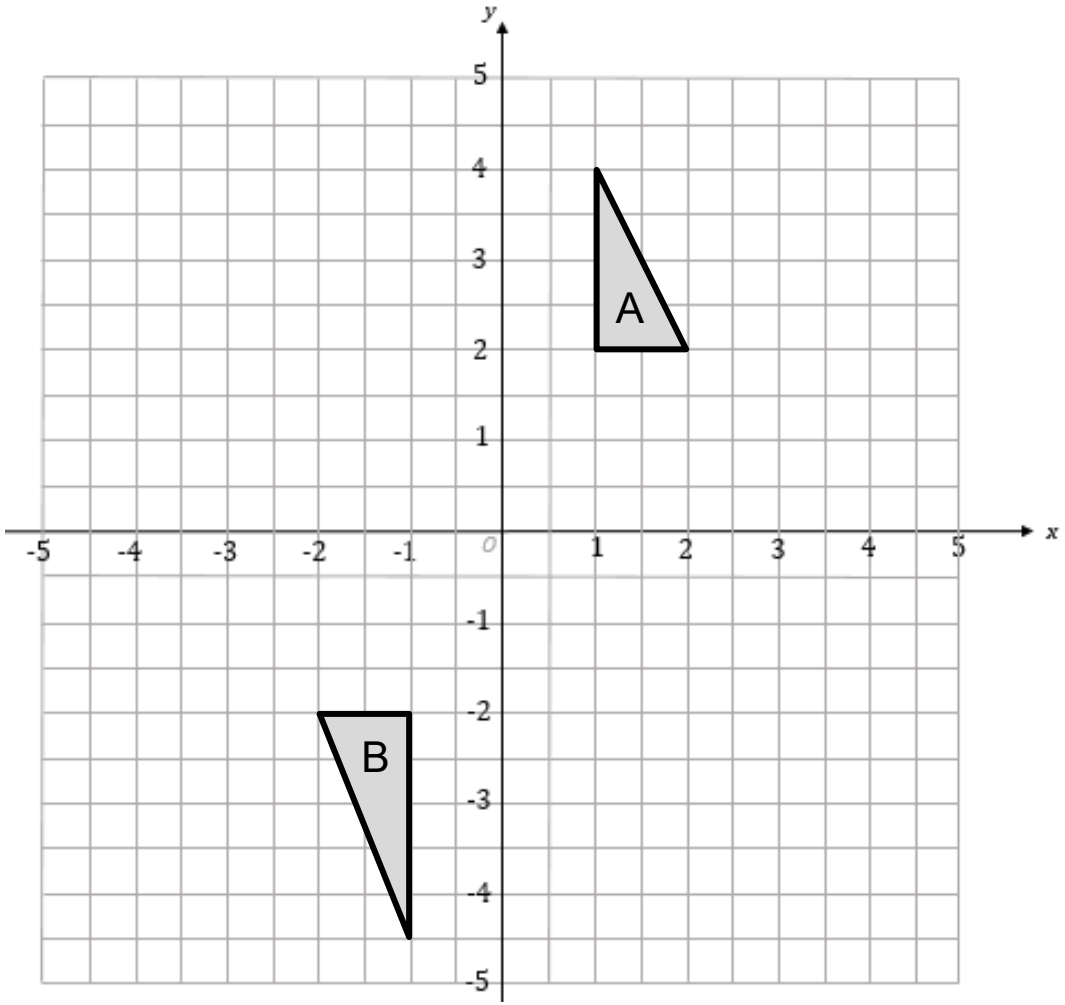
a) Rotate trapezium **T** 180° about the point (-1 , 1). Label the new trapezium **A**.

b) Describe the single transformation that maps trapezium **A** onto trapezium **T**.

A rotation 180° about the point (-1 , 1).

Lost marks....

Describe fully the single transformation that maps shape A onto shape B



Here is Verity's answer:

Shape A has been rotated

.....

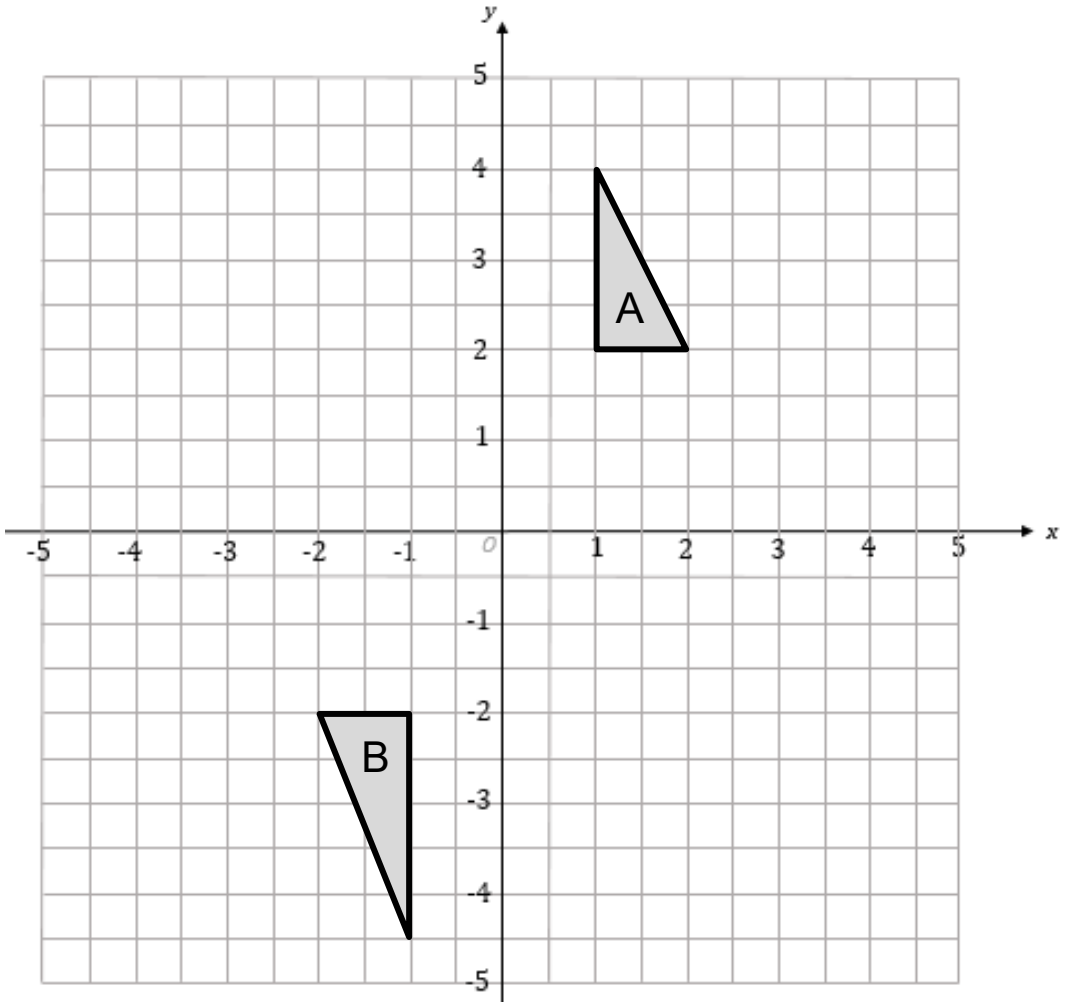
180° clockwise.

.....

Can you find where Verity has dropped a mark?

Solution

Describe fully the single transformation that maps shape A onto shape B



Here is Verity's answer:

Shape A has been rotated

180° clockwise.

Can you find where Verity has dropped a mark?

Shape A has been rotated 180° with centre of rotation (0 , 0)

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