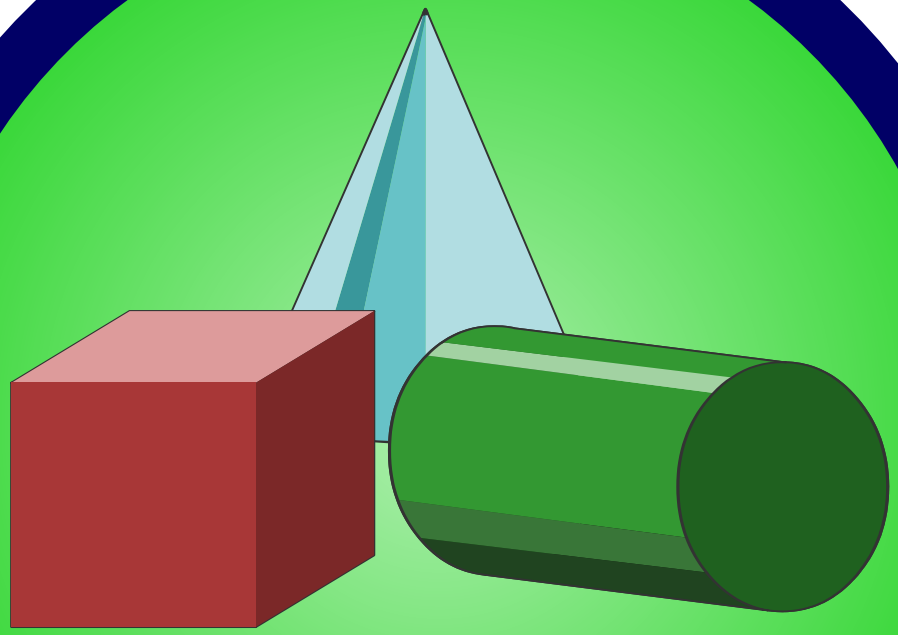
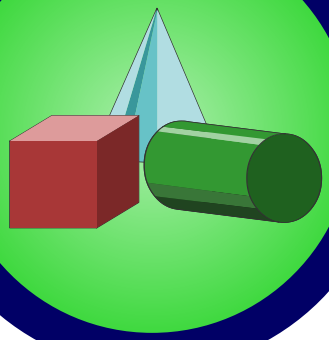
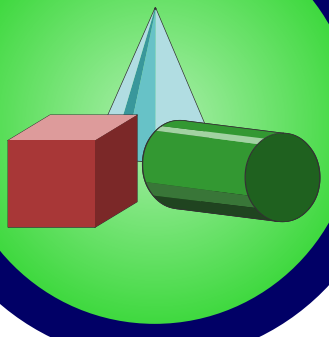
Shape and Space







Rotations

Rotation

Which of the following are examples of **rotation** in real life?

- Opening a door?
- Walking up stairs?
- Riding on a Ferris wheel?
- Bending your arm?
- Opening your mouth?
- Opening a drawer?

Can you suggest any other examples?

Describing a rotation

A **rotation** occurs when an object is turned around a fixed point.

To describe a rotation we need to know three things:

- The **angle** of rotation.

  For example,

  ½ turn = 180° ¼ turn = 90° ¾ turn = 270°

- The **direction** of rotation.

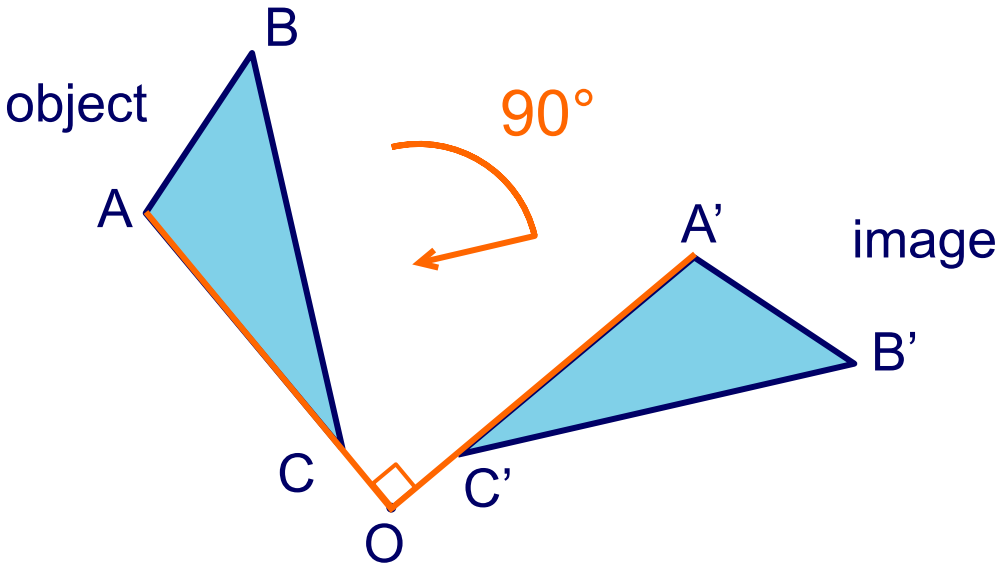
  For example, clockwise or anticlockwise.

- The **centre** of rotation.

  This is the fixed point about which an object moves.

Rotating shapes

If we rotate triangle ABC 90° clockwise about point O the following **image** is produced:



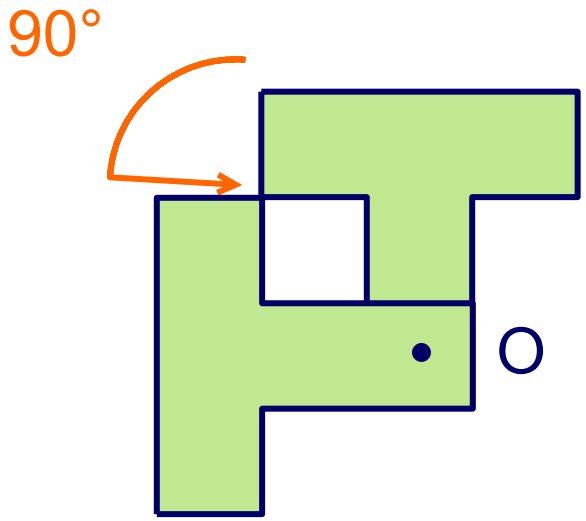
A is mapped onto A’, B is mapped onto B’ and C is mapped onto C’.

The image triangle A’B’C’ is **congruent** to triangle ABC.

Rotating shapes

The centre of rotation can also be inside the shape.

For example,



Rotating this shape 90° anticlockwise about point O produces the following image.

Determining the direction of a rotation

Sometimes the direction of the rotation is not given.

If this is the case then we use the following rules:

A **positive** rotation is an **anticlockwise** rotation.

A **negative** rotation is an **clockwise** rotation.

For example,

A rotation of 60° = an anticlockwise rotation of 60°

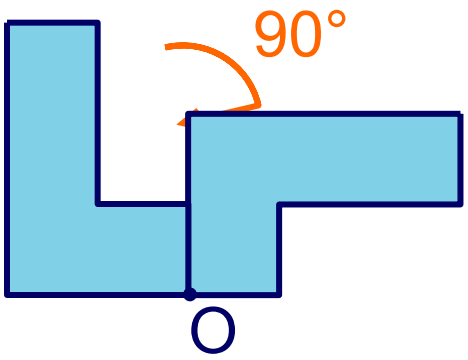
A rotation of –90° = an clockwise rotation of 90°

Explain why a rotation of 120° is equivalent to a rotation of –240°.

Inverse rotations

The inverse of a rotation maps the image that has been rotated back onto the original object.

For example, the following shape is rotated 90° clockwise about point O.



What is the inverse of this rotation?

Either, a 90° rotation anticlockwise,

or a 270° rotation clockwise.

Inverse rotations

The inverse of any rotation is either

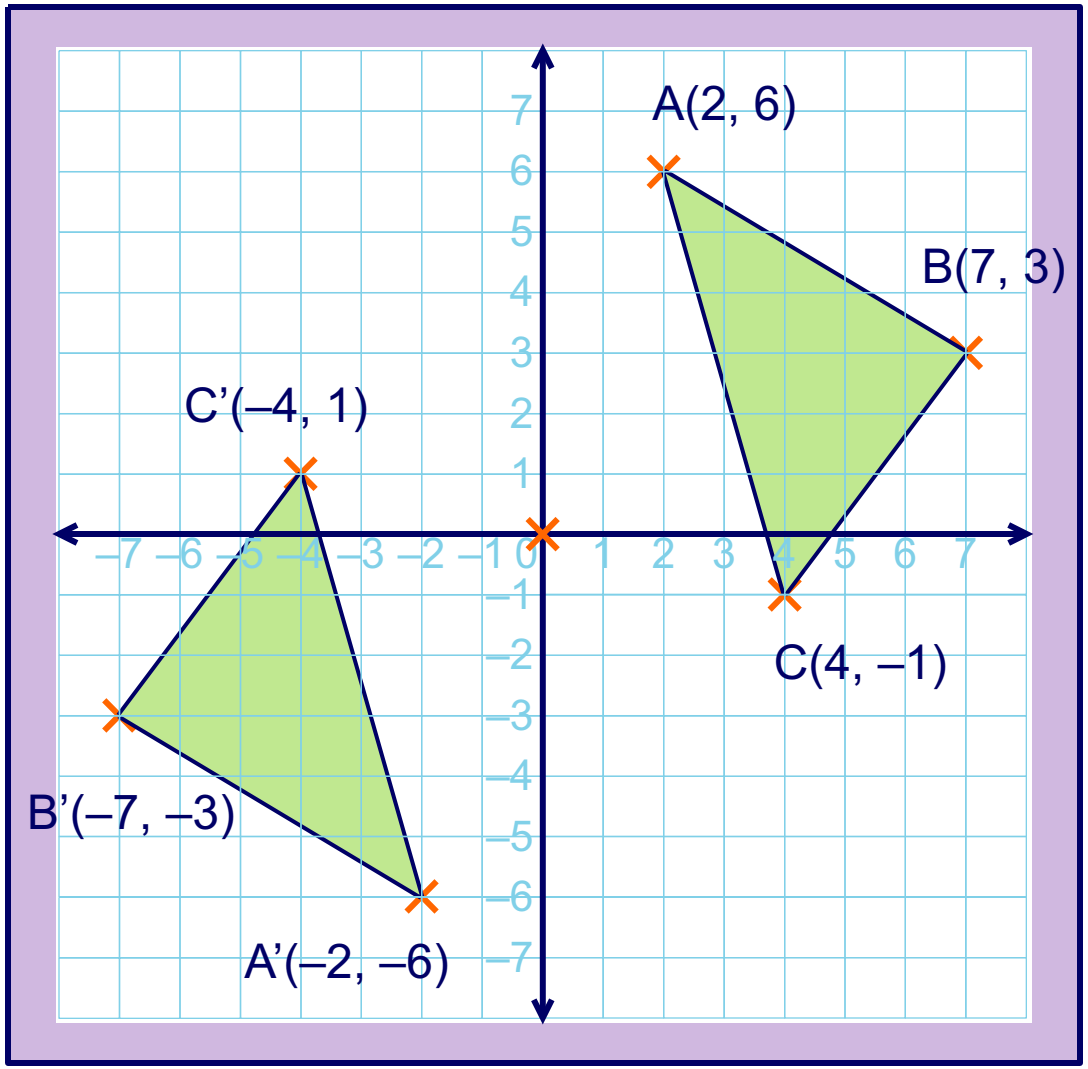
- A rotation of the *same* size, about the same point, but in the *opposite* direction, or
- A rotation in the *same* direction, about the same point, but such that the two rotations have a sum of 360°.

What is the inverse of a –70° rotation?

Either, a 70° rotation,

or a –290° rotation.

Rotations on a coordinate grid

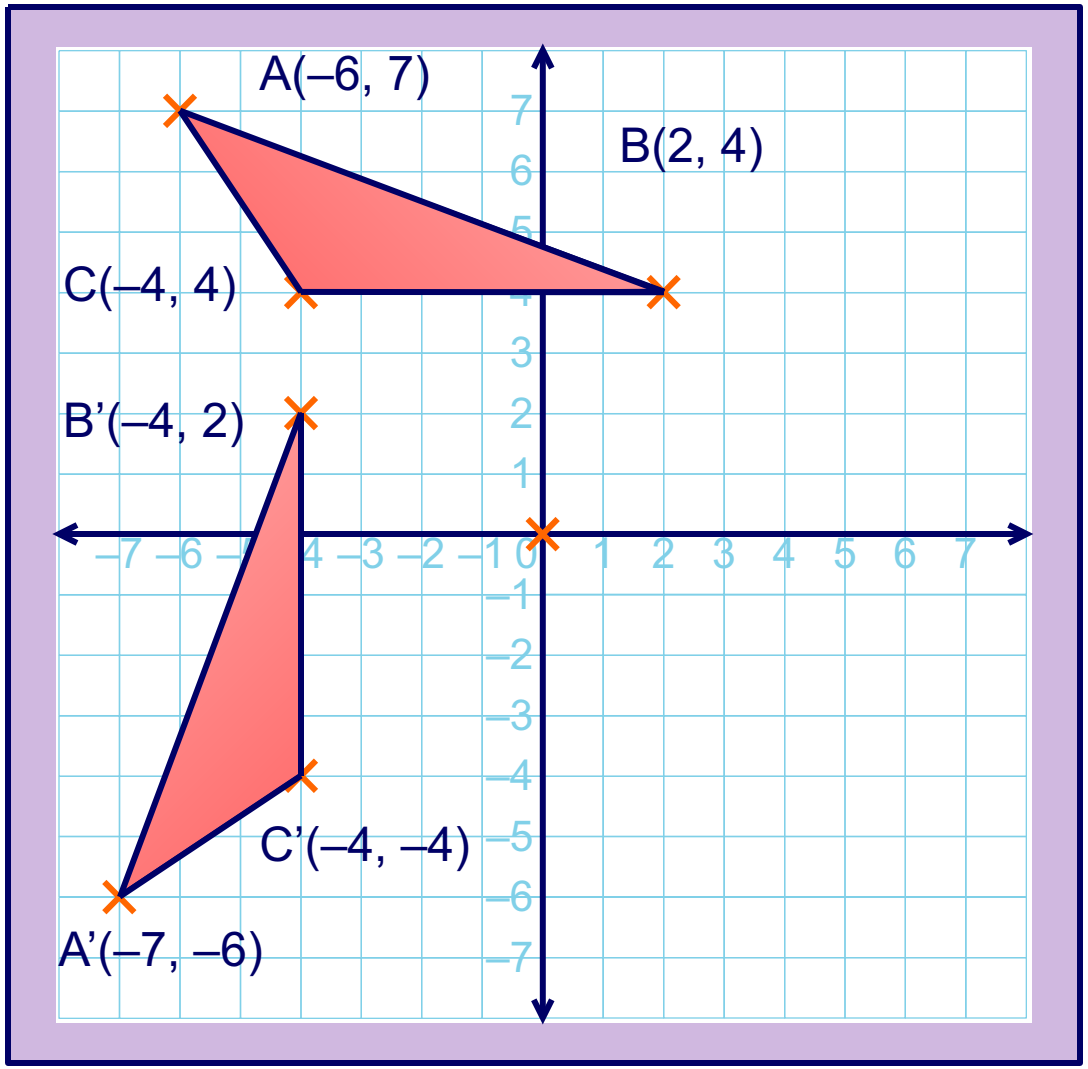


The vertices of a triangle lie on the points A(2, 6), B(7, 3) and C(4, –1).

Rotate the triangle 180° clockwise about the origin and label each point on the image.

What do you notice about each point and its image?

Rotations on a coordinate grid



The vertices of a triangle lie on the points A(–6, 7), B(2, 4) and C(–4, 4).

Rotate the triangle 90° anticlockwise about the origin and label each point in the image.

What do you notice about each point and its image?