Rotations

Notes

What stays the same and what changes when a shape is rotated?

Stays the same: size, shape, distance to centre of rotation

The orientation changes.

Drawing rotations

N.B. Tracing paper is allowed in examinations so always ask for it if there is a rotations question.

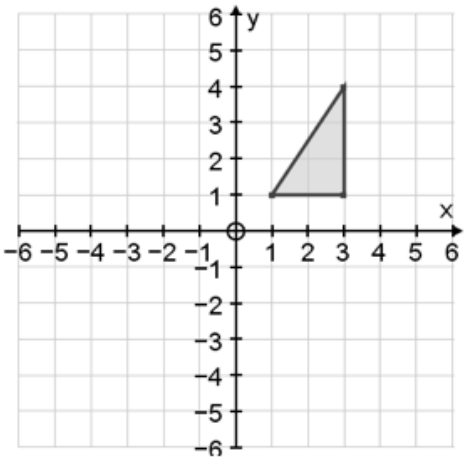
1. Place the tracing paper over the grid.
2. On tracing paper, draw the shape that is to be rotated and mark on the centre of rotation.
3. Place you pencil firmly on the centre of rotation and rotate the tracing paper the number of degrees required in the right direction.
4. Draw over the shape firmly so that a slight indentation is made in the paper below. Alternatively, you can carefully lift the edges of the tracing paper up and mark the vertices of the shape.
5. Draw the image of the object based on step 4.

E.g. 1 Rotate this shape:

(a) 90^{o} anti-clockwise about $(1, 0)$

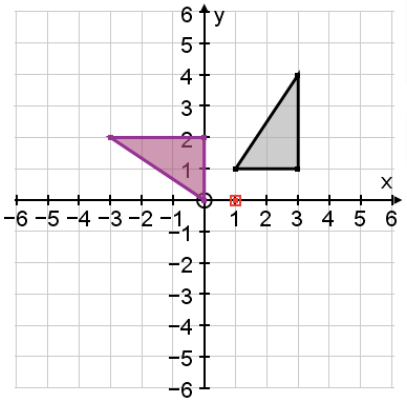
(b) 180^{o} about $(-1, 1)$

(c) 90^{o} clockwise about $(2, 0)$



Working: The ***image*** (i.e. the answer) is in ***purple*** and the centre of rotation is ***red***.

(a) (b) (c)



Describing rotations

Describing a rotation requires 3 pieces of information (unless the rotation is 180^o):

1. angle of rotation
2. direction of rotation (unless the angle is 180^o)
3. centre of rotation

For example, "rotation, 90^o clockwise about $(3, 4)$" or "rotation, 180^o about $(-1, 2)$"

Finding the centre of rotation

Tracing paper and 'trial and error' will usually get the centre of rotation.

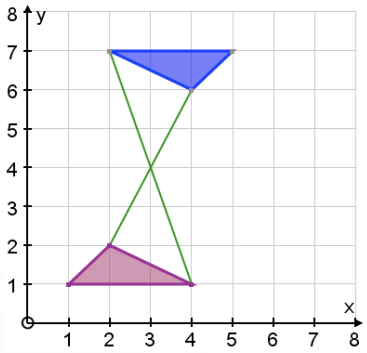
1. Place the tracing over the grid and draw ***one*** of the shapes ***but not the other***
2. Keeping the tracing paper in the same place, put your pencil firmly on the tracing paper roughly where you think the centre of rotation is.
3. Rotate the tracing paper and see if the shape moves onto the other shape
4. Repeat steps 2 and 3 until you have a perfect fit.

If you are having difficulty finding the centre of rotation though, you can use these methods.

180°

1. Draw a line between a pair corresponding points on object and image (green line)
2. Draw another line between a different pair of corresponding points on object and image (other green line)
3. The centre of rotation is where the two lines intersect

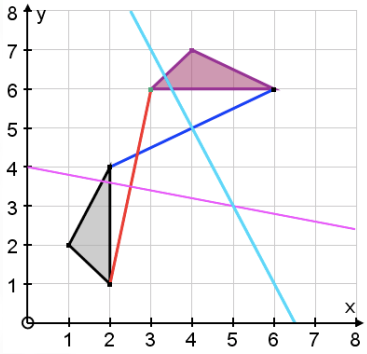
So the centre of rotation is at $(5, 3)$



You can tell the rotation is 180^o because the shape has flipped over.

90° or other angles

1. Construct the perpendicular bisector between two corresponding points on object and image
2. Draw another line between a different pair of corresponding points on object and image
3. the centre of rotation lies along the perpendicular bisector



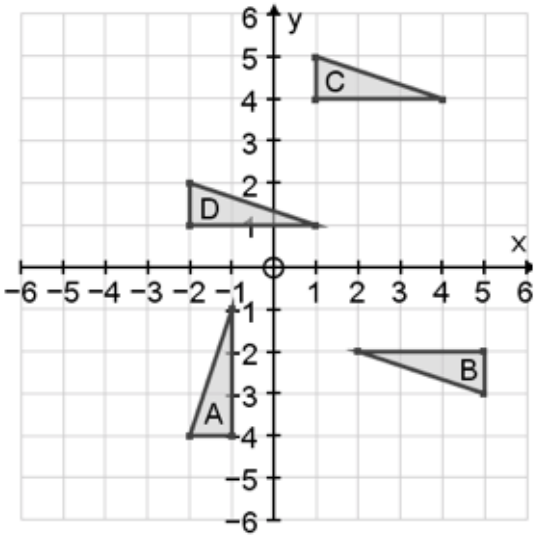
In the example, the **dark blue line** connects the 2 corresponding points and the **light blue line** is the perpendicular bisector. The **red line** connects 2 other corresponding points and the **pink line** is the perpendicular bisector. The bisectors intersect at $(5, 3)$ so these are the coordinates of the centre of rotation.

E.g. 2 Describe the transformation that takes:

(a) triangle B to triangle C

(b) triangle D to triangle B

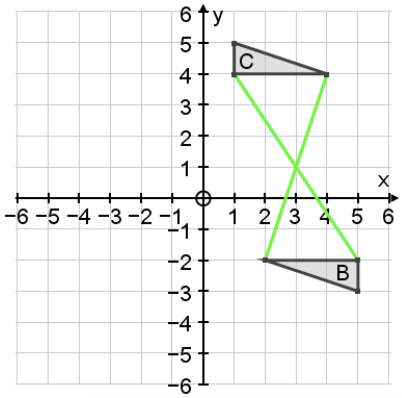
(c) triangle A to triangle B



Working: (a) Rotation, 180^{o} about $(3, 1)$

If you weren't able to find the centres of enlargement using tracing paper here are the diagrams using the longer method.

(a) 180^{o} so intersection of lines between corresponding points.



Video: Rotations

Video (w/o tracing paper 3:30): Rotations without tracing paper

Video (start from 2:43): Finding the centre of rotation

Video: How to construct a perpendicular bisector

Solutions to Starter and E.g.s

Exercise

9-1 class textbook:	p281 M9.5 Qu 1-6
A*-G class textbook:	p243 M9.5 Qu 1-8
9-1 homework book:	p97 M9.5 Qu 1-7
A*-G homework book:	p69 M9.5 Qu 1-7

Summary

Drawing rotations — use tracing paper (ask for it in examinations).

Describing a rotation requires 3 pieces of information (unless the rotation is 180^{o}):

1. angle of rotation
2. direction of rotation (unless the angle is 180^{o})
3. centre of rotation

Finding the centre of rotation — tracing paper and 'trial and error' will usually get the centre of rotation.

Homework book answers (only available during a lockdown)