• Translations
• Axial Symmetry
• Central Symmetry
• Rotations
• Reductions/enlargements
Translations

The Size and Orientation of the object do not change.

All points move the same distance and in the same direction as the translation indicated in the question.
Translations

1. Each point on the object is moved the same direction for the new image.
2. Each point is moved the same distance for the new image.
3. The new image remains the same size and the same way up.

Remember the above 3 points as they are the same for all translations.
- **TRANSLATION**: All points move in the same direction and all move the same distance.
- **NOTE**: You can be asked to move the object from A to A, or move the object under a translation equal to 'XY'.
- **NOTE**: The centre point of all circles must be moved under the translation also. The image should be identical.
QUESTION:

Move the given object under a translation equal to the line 'MN'. (Show all lines of construction)
Axial Symmetry
Axial Symmetry

The image of the object will be inverted.

All points move perpendicularly to the axis and extend the same distance beyond.

The axis will be given in the question or can easily be found by bisecting a line between a point and its image.
AXIAL SYMMETRY

- In an axial symmetry, all points on the object must pass through an axis at 90° and continue through the same distance beyond.
- Note: The axis is half way between the object points and the image points. The image will be inverted and flipped.
QUESTION:

MOVE THE OBJECT FROM A TO A, UNDER AXIAL SYMMETRY.
Central Symmetry

- The above animation shows a central of symmetry of a boy about point O.
- You can see that the boy is inverted in the second image.
- The original image and the inverted image is equal distance from point O.
Central Symmetry

The image will be inverted (upside-down).

All points will pass through a given central point and extend the same distance beyond this point.
**CENTRAL SYMMETRY**

- In a central symmetry, all points on the object must pass through a central point and continue on the same distance.

- Note: To find the centre point if not given, bisect the line between the object point and its image point (e.g., A - A)."
Move the object from $P$ to $P_1$ under a central symmetry.

Note: Find the central point $Z$ first.
Rotations

All points will be rotated about a given point through the same angle.

The angle of rotation will either be given in the question or it may have to be found using a triangle method. (HL)
IN A ROTATION, ALL POINTS ARE ROTATED ABOUT A FIXED POINT THROUGH A GIVEN ANGLE.

- **POINT A:** JOIN POINT 'A' TO POINT 'R'. MEASURE AN ANGLE OF 110° WITH CENTRE POINT 'R'. ROTATE 'A' USING YOUR COMPASS WHERE THIS INTERSECTS THE 110° LINE GIVES POINT A₁ WHICH HAS BEEN ROTATED THROUGH 110°.

- **POINT B:** JOIN 'B' TO 'R', MEASURE AN ANGLE OF 110°. ROTATE POINT 'B' TO INTERSECT THE 110° LINE. THIS FINDING POINT 'B₁'.

- **POINT C:** JOIN 'C' TO 'R' AND REPEAT STEPS AS ABOVE.
Rotations

Complete the image once all points are found.

Note: Distances do not change, 'A' to 'B' is the same as 'A' to 'B'.
With this in mind it is not necessary to rotate all points fully.
Find one or two points fully and to find other points use the distances
given in the object to find all points in the image. E.g. in the above
question find pts 'A' and 'B' fully, pt 'C' is 60mm away from both,
using your compass swing an arc of 60mm away from 'A' and 'B', this
will locate point 'C'
Rotations

Note: If not given rotation point 'r', but given the object, a point on the image after rotation, and the angle of rotation, the rotation point must be found first.

Example: Rotate the given object clockwise through an angle of 110°, moving point 'A' to 'A1'.
To find the rotation point 'R' we must make a sketch of the triangle created by the rotation process. We are given two points and an angle in this triangle. Note all triangle have 180°. One of the angles at 'R' is 110° so the other two angles must be equal to each other.

\[
\begin{align*}
\text{Clockwise} & \quad \rightarrow \\
A & \quad \rightarrow \quad A_1 \\
110° & \quad \rightarrow \\
R & \quad \rightarrow \\
\frac{180°}{35°} & \quad \rightarrow \\
-110° & \quad \rightarrow \\
70° & \quad \rightarrow \\
2\frac{70°}{35} & \quad \rightarrow
\end{align*}
\]

If rotation is anti-clockwise 'R' would be sketched above the line 'A' to 'A_1'.

This triangle now needs to be drawn accurately in the question. Given A and A_1, and now the angles of 35° point R can be located. Once done the question can be completed as normal.

A sketch for anti-clockwise questions.
ROTATIONS QUESTION