

GEOMETRY AND MEASURES

Transformations and coordinates

Pupils should learn to:	As outcomes, Year 7 pupils should, for example:
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Recognise and visualise transformations and symmetries of 2-D shapes (continued)

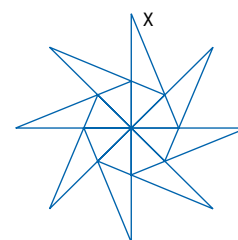
Rotation symmetry

Know that:

- A 2-D shape has **rotation symmetry** of order n when n is the largest positive integer for which a rotation of $360^\circ \div n$ produces an identical looking shape in the same position.
- The **order of rotation symmetry** is the number of ways the shape will map on to itself in a rotation of 360° .

For example:

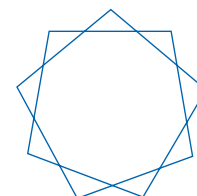
- This shape has rotation symmetry of order 8 because it maps on to itself in eight distinct positions under rotations of 45° about the centre point.



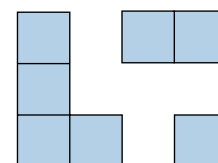
Solve problems such as:

- Prove that the central shape in the above diagram is a regular octagon. What shape is traced by point X as it moves through one complete revolution?
- Recognise the rotation symmetry of familiar shapes, such as parallelograms and regular polygons.

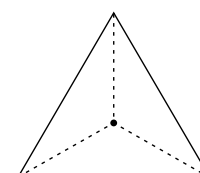
- Use **Logo** or other **ICT resource** to produce shapes with a specified order of rotation symmetry, e.g. 9.



- Combine these shapes to make a single shape with rotation symmetry of order 2.



- Identify the centre of rotation in a shape with rotation symmetry, such as an equilateral triangle. Justify the choice.



[Link to properties of 2-D shapes \(pages 186–9\).](#)

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As outcomes, Year 8 pupils should, for example:

As outcomes, Year 9 pupils should, for example:

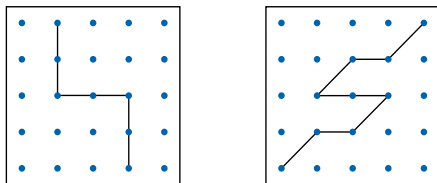
Reflection symmetry and rotation symmetry

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Recognise all the symmetries of 2-D shapes.

For example:

- Make polygons on a 3 by 3 pinboard. Explore:
 - the maximum number of sides;
 - whether any of the polygons are regular;
 - symmetry properties of the polygons...
- Recognise the rotation symmetry in congruent divisions of a 5 by 5 pinboard.



Identify and describe the reflection and rotation symmetries of:

- regular polygons (including equilateral triangles and squares);
- isosceles triangles;
- parallelograms, rhombuses, rectangles, trapeziums and kites.

Devise a tree diagram to sort quadrilaterals, based on questions relating to their symmetries. Compare and evaluate different solutions.

Relate symmetries of triangles and quadrilaterals to their side, angle and diagonal properties.

For example:

- An isosceles triangle has reflection symmetry. Use this to confirm known properties, such as:
 - The line of symmetry passes through the vertex which is the intersection of the two equal sides, and is the perpendicular bisector of the third side.
 - The base angles on the unequal side are equal.
- A parallelogram has rotation symmetry of order 2, and the centre of rotation is the intersection of the diagonals. Use this to confirm known properties, such as:
 - The diagonals bisect each other.
 - Opposite sides and opposite angles are equal.
 - The angles between a pair of opposite sides and a diagonal are equal.

[Link to properties of 2-D shapes \(pages 186–91\).](#)