

UNIT 36 *Constructions and Enlargements*

Introduction to SIM

Learning objectives

This unit revises symmetry of 2-dimensional shapes, leading the student into accurate construction problems. The concept of transformations of shapes through enlargements is illustrated. After completing this unit of STUDENT INSTRUCTIONAL MATERIAL (SIM) you should

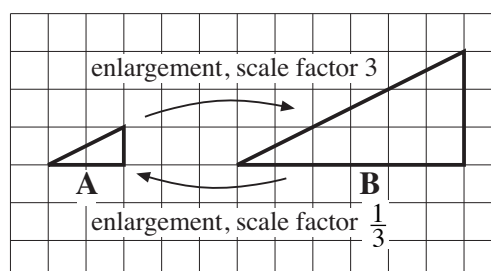
- understand how to identify and draw shapes with specified line symmetry and/or rotational symmetry
- be able to use ruler, pair of compasses and protractor to construct accurate 2-D diagrams
- be confident in making and identifying enlargements of 2-D shapes with given scale factors (and centres of enlargement).

Key points and principles

- Scale drawings must be drawn accurately.
- Constructions (e.g. triangles, perpendicular bisectors) must be drawn according to the instructions.
- For enlargements, you need:
 - (a) scale factor
 - (b) centre of enlargement. If only a scale factor is given, the enlargement can be located anywhere.

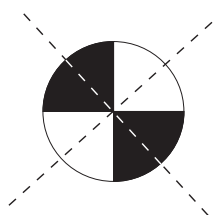
Facts to remember

- Two shapes are similar if they have the same shape, but may differ in size.
- An enlargement of scale factor α from shape A to shape B is equivalent to an enlargement of scale factor $\frac{1}{\alpha}$ from shape B to shape A.

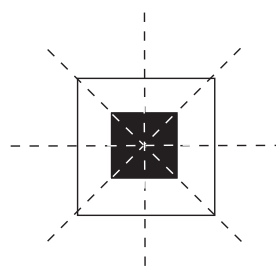


Glossary of terms

- Shapes have *line symmetry* if a mirror could be placed so that one side is an exact reflection of the other. These imaginary 'mirror lines' are shown by dotted lines in the diagrams below.



This shape has
2 lines of symmetry.



This shape has
4 lines of symmetry.

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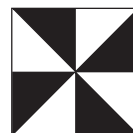
Introduction to SIM

- An object has *rotational symmetry* if it can be rotated about a point so that it fits on top of itself without completing a full turn. The shapes below have rotational symmetry.



In a complete turn this shape fits on top of itself two times.

It has rotational symmetry of order 2.

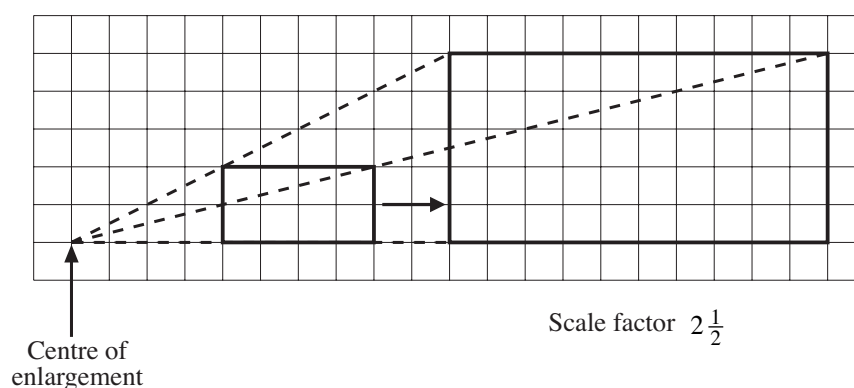


In a complete turn this shape fits on top of itself four times.

It has rotational symmetry of order 4.

- Transformation* - moving a shape so that it is in a different position but retains the same size, area, angles and line lengths.
- An *enlargement* is similar to a transformation but it alters (enlarges or reduces) the size of the image. An enlargement is described in terms of a *scale factor* and also a *centre of enlargement* which defines the exact location of the image.

For example, the image on the left below has been enlarged by a scale factor of $2\frac{1}{2}$, with a specified centre of enlargement.



The enlargement opposite (actually a reduction) of scale factor $\frac{1}{3}$ has no specified centre of enlargement, so the actual location of the smaller shape could be anywhere.

