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| **UNIT 15: Constructions: triangles, nets, plan and elevation, loci, scale drawings and bearings** |

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**SPECIFICATION REFERENCES**

R2 use scale factors, scale diagrams and maps

G1 use conventional terms and notation: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries; use the standard conventions for labelling and referring to the sides and angles of triangles; draw diagrams from written description;

G2 use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); use these to construct given figures and solve loci problems; know that the perpendicular distance from a point to a line is the shortest distance to the line

G5 use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)

G9 identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment

G12 identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres

G13 construct and interpret plans and elevations of 3D shapes

G15 measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings

**PRIOR KNOWLEDGE**

Students should be able to measure and draw lines.

**KEYWORDS**

Construct, circle, arc, sector, face, edge, vertex, two-dimensional, three-dimensional, solid, elevations, congruent, angles, regular, irregular, bearing, degree, bisect, perpendicular, loci, map, scale, plan, region

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| **15a. Plans and elevations** (G1, G2, G9, G12, G13, G15) | **Teaching time**4-6 hours |

**OBJECTIVES**

By the end of the sub-unit, students should be able to:

* Understand clockwise and anticlockwise;
* Draw circles and arcs to a given radius or given the diameter;
* Measure and draw lines, to the nearest mm;
* Measure and draw angles, to the nearest degree;
* Know and use compass directions;
* Draw sketches of 3D solids;
* Know the terms face, edge and vertex;
* Identify and sketch planes of symmetry of 3D solids;
* Make accurate drawings of triangles and other 2D shapes using a ruler and a protractor;
* Construct diagrams of everyday 2D situations involving rectangles, triangles, perpendicular and parallel lines;
* Understand and draw front and side elevations and plans of shapes made from simple solids;
* Given the front and side elevations and the plan of a solid, draw a sketch of the 3D solid.

**POSSIBLE SUCCESS CRITERIA**

Be able to estimate the size of given angles.

Convert fluently between metric units of length.

Use bearings in a real-life context to describe the bearing between two towns on a map.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Interpreting scale drawings and maps involving lengths that need to be measured (rather than given in the problem).

**COMMON MISCONCEPTIONS**

Some pupils may use the wrong scale of a protractor. For example, they measure an obtuse angle as 60° rather than as 120°.

Often 5 sides only are drawn for a cuboid.

**NOTES**

This is a very practical topic, and provides opportunities for some hands-on activities.

Drawing 3D shapes in 2D using isometric grids isn’t an explicit objective but provides an ideal introduction to the topic and for some students provides the scaffolding needed when drawing 3D solids.

Whilst not an explicit objective, it is useful for students to draw and construct nets and show how they fold to make 3D solids, allowing students to make the link between 3D shapes and their nets. This will enable students to understand that there is often more than one net that can form a 3D shape.