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| **UNIT 19: Congruence, similarity and vectors** |

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**SPECIFICATION REFERENCES**

R6 express a multiplicative relationship between two quantities as a ratio or a fraction

R12 compare lengths, areas and volumes using ratio notation; make links to similarity (including trigonometric ratios) and scale factors

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

G6 apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides … and use known results to obtain simple proofs

G7 identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement (including fractional scale factors)

G19 apply the concepts of congruence and similarity, including the relationships between lengths in similar figures

G24 describe translations as 2D vectors

G25 apply addition and subtraction of vectors, multiplication by vectors by a scalar, and diagrammatic and column representations of vectors

**PRIOR KNOWLEDGE**

Students will have used column vectors when dealing with translations.

Students can recall and apply Pythagoras’ Theorem on a coordinate grid.

Students should be able to recognise and enlarge shapes and calculate scale factors.

Students know how to calculate area and volume in various metric measures.

Students should be able to measure lines and angles and using compasses, ruler and protractor, and construct standard constructions.

**KEYWORDS**

Vector, direction, magnitude, scalar, multiple, parallel, collinear, ratio, column vector, congruence, side, angle, compass, construction, shape, volume, length, area, volume,   
scale factor, enlargement, similar, perimeter,

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| **19a. Similarity and congruence in 2D**  (R6, R12, G5, G6, G7, G19) | **Teaching time**  6–8 hours |

**OBJECTIVES**

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

* Use the basic congruence criteria for triangles (SSS, SAS, ASA and RHS);
* Solve angle problems involving congruence;
* Identify shapes which are similar; including all circles or all regular polygons with equal number of sides;
* Understand similarity of triangles and of other plane shapes, use this to make geometric inferences, and solve angle problems using similarity;
* Identify the scale factor of an enlargement of a shape as the ratio of the lengths of two corresponding sides;
* Understand the effect of enlargement on perimeter of shapes;
* Solve problems to find missing lengths in similar shapes;
* Know that scale diagrams, including bearings and maps are ‘similar’ to the real-life examples.

**POSSIBLE SUCCESS CRITERIA**

Understand similarity as one shape being an enlargement of the other.

Recognise that all corresponding angles in similar shapes are equal in size when the corresponding lengths of sides are not equal in size.

Use *AB* notation for describing lengths and  notation for describing angles.

**OPPORTUNITIES FOR REASONING/PROBLEM SOLVING**

Using scale diagrams, including bearings and maps, provides a rich source of real-life examples and links to other areas of mathematics.

**COMMON MISCONCEPTIONS**

Students may incorrectly believe that all polygons are regular or that all triangles have a rotational symmetry of order 3.

Often students think that when a shape is enlarged the angles also get bigger.

**NOTES**

Use simple scale factors that are easily calculated mentally to introduce similar shapes.

Reinforce the fact that the sizes of angles are maintained when a shape is enlarged.

Make links between similarity and trigonometric ratios.