

# Checkpoint Maths Scheme of Work

## Year 2

### Unit 6: Shape, Space and Measures

#### Key Learning Outcomes

Pupils should be able to:

- use and interpret a variety of geometrical terms
- calculate unknown angles using geometrical properties; identify alternate and corresponding angles
- use a straight edge and compasses to complete standard constructions
- perform combined transformations; enlarge shapes given a centre and whole number scale factor
- convert one metric unit to another; read and interpret scales; use units of measurement appropriately
- use the 12-hour and 24-hour clock systems, and convert between them
- calculate using money; use given data to solve problems on personal and household finance
- calculate volumes and surface areas of cuboids; calculate lengths, surface areas and volumes in prisms.

#### Links

The Checkpoint curriculum references are given in the Learning outcomes column.

IGCSE Syllabus Topics 13, 14, 15, 16, 26, 27, 29, 31, 37.

Chapter references in *Checkpoint Maths 11-14 (Book 2)* by Ric Pimental and Terry Wall are given in the Resources column.

#### Vocabulary

The vocabulary listed for Unit 3 is assumed in addition to the words listed below.

Alternate angles, angle bisector, cent, centimetre, change (money), compasses, congruent, construction lines, corresponding angles, cube, cubic centimetre, cubic metre, cubic millimetre, cuboid, currency, day, degrees Celsius, degrees Fahrenheit, discount, dollar, edge (of a solid), equilateral, exchange rate, face (of a solid), gram, hour, interior angle, isosceles, kilometre, kilogram, litre, loss, metre, millimetre, minute, month, net, parallel, perpendicular, perpendicular bisector, prism, profit, sale price, second, simple interest, square based pyramid, square centimetre, square kilometre, square metre, straight edge, surface area, tax, tetrahedron, triangular prism, vertically opposite angles, year.

Learning Outcomes	Suggested Teaching Activities	Resources
<p>Sg1 Understand and use the vocabulary, notation and labelling conventions for lines, angles and shapes.</p> <p>Identify parallel and perpendicular lines; use and interpret the vocabulary of triangles, quadrilaterals and polygons.</p> <p>Know that the exterior angles of any polygon add up to <math>360^\circ</math>.</p> <p>Understand and use the formula for the sum of the interior angles of a regular polygon.</p> <p>Know the definition of a circle and the names of its parts.</p> <p>Know and use the formulae for the circumference and area of a circle.</p>	<p>Revise the words and properties already known, including acute and obtuse angles. Check that every student remembers how to use a protractor correctly and understands how to draw accurately and minimise experimental error.</p> <p>Practise estimating the sizes of angles and then checking with a protractor.</p> <p>Use protractors and tracing paper to find the angle properties of the triangles and quadrilaterals. Find the angle sums of polygons through practical work and the properties of angles in parallel lines.</p> <p>Challenge the class to identify quadrilaterals by their diagonals. For example, draw a quadrilateral whose diagonals are of unequal length but bisect each other at right angles.</p> <p>Collect examples of different sized cylinders (e.g. food tins). Ask students to measure the diameter and, using a piece of string, the circumference of each cylinder. Draw a graph of circumference vs. diameter to help find the rule linking the two quantities.</p> <p>Show that a circle can be sandwiched between two squares (one inside and one outside the circle) to estimate the area. Ask students to estimate the area and circumference before calculating the answers.</p>	<p><a href="http://www.mathsnet.net/shape/ks3index.html">www.mathsnet.net/shape/ks3index.html</a></p> <p><i>Checkpoint Maths 11-14 (Book 2) Chapter 22</i></p> <p>Site of interest <a href="http://yn.la.ca.us/eratosthenes/welcome.html">http://yn.la.ca.us/eratosthenes/welcome.html</a></p> <p><i>Checkpoint Maths 11-14 (Book 2) Chapter 3</i></p> <p><i>Checkpoint Maths 11-14 (Book 2) Chapter 8</i></p>
<p>Sg2 Know the sum of angles at a point, on a straight line and in a triangle</p> <p>Recognise vertically opposite angles.</p> <p>Identify alternate angles and corresponding angles; know and use angle properties of equilateral, isosceles</p>	<p>Let students experiment to find these angle relationships, first by using paper, pencil and measuring instruments and then using a computer or internet dynamic demonstrations.</p> <p>Experiment with congruent figures using tracing paper. Learn to recognise and confirm whether figures are congruent.</p>	<p><a href="http://www.mathsnet.net/dynamic/cindy">http://www.mathsnet.net/dynamic/cindy</a></p> <p><i>Checkpoint Maths 11-14 (Book 2) Chapter 13</i></p>

Learning Outcomes	Suggested Teaching Activities	Resources
<p>and right-angled triangles and special quadrilaterals to solve problems</p> <p>Know that if two 2-D shapes are congruent, corresponding sides and angles are equal.</p>		
<p>Sg3 Sg5</p> <p>Use a straight edge and compasses to construct:</p> <ul style="list-style-type: none"> <li>◆ the perpendicular bisector of a line segment</li> <li>◆ the bisector of an angle</li> <li>◆ the perpendicular from a point to a line</li> <li>◆ the perpendicular at a point on a line.</li> </ul> <p>Use a ruler and compasses to construct a triangle given three sides.</p> <p>Use a ruler and protractor to construct nets of simple 3-D shapes, e.g. cuboid, tetrahedron, square based pyramid, triangular prism.</p>	<p>Encourage accuracy. Leave construction arcs in the diagrams. Allow plenty of practice.</p> <p>Find examples of the use of these constructions, such as how to find the shortest distance 'as the crow flies' from a house to a road.</p> <p>Construct triangles given three sides, and then measure the angles in these triangles. Try to find a rule which has to be true in order to be able to construct a triangle out of three given lengths (the sum of any two of the sides must be greater than the third). Find out what happens if this is not so.</p> <p>Construct nets of simple solids on thin card and make up the corresponding 3-D shapes.</p>	<p>Dynamic examples at:  <a href="http://www.mathsnet.net/campus/construction/ipa3.html">http://www.mathsnet.net/campus/construction/ipa3.html</a>  <a href="http://www.mathsnet.net/dynamic/">http://www.mathsnet.net/dynamic/</a></p> <p><i>Checkpoint Maths 11-14 (Book 2) Chapter 3</i></p> <p><i>Checkpoint Maths 11-14 (Book 2) Chapter 9</i></p> <p><i>Checkpoint Maths 11-14 (Book 2) Chapter 10</i></p>
<p>Sg4</p> <p>Transform 2-D shapes by simple combinations of rotations, Reflections, translations and enlargements</p> <p>Recognise the line symmetry of a 2-D shape</p> <p>Recognise and state the order of rotational symmetry of a 2-D shape.</p>	<p>Investigate the combinations of transformations practically, perhaps by moving students round the classroom ('translate two steps towards the front, rotate 90 degrees clockwise' etc.) to discover that different combinations can lead to the same result. Try to find single transformations where possible.</p> <p>Discover what happens when transformations are not fully described.</p> <p>Draw transformations on graph paper, using co-ordinates to locate the shapes.</p>	<p><a href="http://www.mathsnet.net/transformations/index.html">http://www.mathsnet.net/transformations/index.html</a></p>

Learning Outcomes	Suggested Teaching Activities	Resources
<p>Sm1 Use units of measurement to estimate, calculate and solve problems in everyday contexts involving length, area, volume, capacity, mass, time and angle</p> <p>Convert from one metric unit to another; read and interpret scales on measuring instruments</p> <p>Use rough metric equivalents of imperial measures to solve problems.</p>	<p>Find personal units of measurement, such as width of finger is approximately 1cm, part of a frequently travelled journey is approximately 1km, a grain of sugar is approximately 1 cubic millimetre.</p> <p>Answer questions such as:          'How many grains of sugar are needed to fill a 5ml spoon?          Is it more or less than 5?'          'Do you multiply or divide by 1000 to convert cubic millimetres to millilitres?'          'What does a meter cube look like?          How many 1cm cubes would you need to fill it?          How many grains of sugar?'          'How many sheets of graph paper would you have to put up on the classroom notice board to have exactly 1 million small squares?'</p> <p>Estimate quantities and then compare with measured amounts. Calculate the area of the classroom, having measured in both centimetres and metres, and then compare the results.</p> <p>Use a variety of measuring instruments including scales, thermometers, stop watches and protractors.</p> <p>Revise units of measurement, and practise estimating. For example, what is the width of the classroom, the volume of a cube, the capacity of a glass, the mass of an item? Check using the relevant measuring instruments.</p> <p>Calculate, for example, the total mass of the dry ingredients in a recipe where some are in grams and some in kilograms. Use problems involving the length of TV programmes and the amount of videotape available to record them.</p>	<p><a href="http://www.ex.ac.uk/cimt/dictunit/dictunit.htm">http://www.ex.ac.uk/cimt/dictunit/dictunit.htm</a></p> <p><a href="http://www.nzmaths.co.nz/Measurement/">http://www.nzmaths.co.nz/Measurement/</a></p> <p>Find a metric/imperial converter at <a href="http://www.initium.demon.co.uk/converts/metimp.htm">www.initium.demon.co.uk/converts/metimp.htm</a></p> <p>More details at <a href="http://www.searchthingy.com/area.htm">www.searchthingy.com/area.htm</a></p> <p><i>Checkpoint Maths 11-14 (Book 2) Chapter 6</i></p>

Learning Outcomes		Suggested Teaching Activities	Resources
Sm2	<p>Understand and use the 12-hour and 24-hour clock systems.</p> <p>Use and interpret timetables.</p>	<p>Make a timetable for the school day, using both 12 and 24-hour clock systems. Take existing timetables such as for TV programmes or trains and convert them from one system to the other.</p> <p>Make a timetable for a school coach trip, visiting places of interest and returning by a certain time. Plan a trip using public transport.</p>	<p><a href="http://smard.cqu.edu.au/Database/Junior/Measurement/Time/jm_ti003.doc">http://smard.cqu.edu.au/Database/Junior/Measurement/Time/jm_ti003.doc</a></p> <p>Use a search engine such as <a href="http://www.google.com">http://www.google.com</a> to search for 'timetables'</p> <p><i>Checkpoint Maths 11-14 (Book 2) Chapter 1</i></p>
Sm3	<p>Calculate using money, including converting between different currencies.</p> <p>Solve simple problems involving personal and household finance, including simple interest, discount, profit, loss and tax.</p>	<p>Make use of the currency conversion graphs used earlier.</p> <p>Revise percentages. Find newspaper advertisements that make use of percentages. Use them in calculations.</p> <p>Devise a spreadsheet that will convert between several currencies.</p>	<p><i>Checkpoint Maths 11-14 (Book 2) Chapter 16</i></p>
Sm5	<p>Know and use the formula for the volume of a cuboid.</p> <p>Calculate volumes and surface areas of cuboids and shapes made from cuboids.</p> <p>Calculate lengths, surface areas and volumes in right prisms, including cylinders.</p>	<p>Use real cubes and cuboids to calculate surface area and volume, for example, boxes, steps, classrooms and corridors.</p> <p>Use nets of cuboids to investigate their surface area.</p> <p>Collect examples of prisms, including food tins. Use the labels on the tins to illustrate circumference and surface area.</p>	<p><i>Checkpoint Maths 11-14 (Book 2) Chapter 18</i></p> <p><i>Checkpoint Maths 11-14 (Book 2) Chapter 20</i></p> <p><i>Checkpoint Maths 11-14 (Book 2) Chapter 23</i></p> <p><i>Checkpoint Maths 11-14 (Book 2) Chapter 25</i></p>