Checkpoint Maths Scheme of Work

Year 3

Unit 9:   Shape, Space and Measures

Key Learning Outcomes
Pupils should be able to:
- use and interpret bearings
- draw the locus of a point that moves in two dimensions according to simple rules
- use measures of speed and other compound measures to solve problems
- use the formula for the volume of a sphere
- understand and apply pythagoras' theorem
- use sine, cosine and tangent ratios in right-angled triangles to solve problems in two dimensions

Links
The Checkpoint curriculum references are given in the Learning outcomes column.
IGCSE Syllabus Topics 10, 26, 30, 31, 32.
Chapter references in *Checkpoint Maths 11-14 (Book 3) by Ric Pimental and Terry Wall* are given in the Resources column.

Vocabulary
The vocabulary listed for Units 3 and 7 is assumed in addition to the words listed below.

Adjacent, average speed, bearing, chord, circumference, cosine, cross-section, diameter, hypotenuse, locus, metres per second, opposite, pi (π), Pythagoras' theorem, radius, region, sector, segment, sine, sphere, tangent.

Learning Outcomes		Suggested Teaching Activities	Resources
Sg1	Use and interpret bearings	Identify places on maps according to their bearings and distances from a given place, or according to their bearings from two different places. Plot a course for a ship steering between islands. Make a map of a desert island with instructions for finding the buried treasure. Find the treasure by drawing and measuring.	Ideas from: http://www.sailingissues.com/navcourse4.html *Checkpoint Maths 11-14 (Book 3) Chapter 4*
Sg5	Find the locus of a point that moves according to given rules.	Explain that the locus of a point is all the positions that the point can be in whilst still obeying the given rule. Start by identifying a few positions that obey a rule and progress until the locus can be predicted (either a line or an area). Describe the line or area in words and lead on to the recognised definitions. Practise accurate drawings of loci.	www.mathsnet.net/dynamic/cindy *Checkpoint Maths 11-14 (Book 3) Chapter 14*
Sm4	Understand and use measures of speed (and other compound measures such as density or pressure) to solve problems. Solve problems involving constant or average rates of change.	Demonstrate that units such as kph actually mean the distance in kilometres travelled in one hour. Show that if you take the 'per' to mean divide the units provide a useful hint about calculating the speed and what units of length and time to use. Calculate speeds using different units of length and time, and then naming the unit of speed. Continue this idea with other compound units. Discuss average speed for a journey. Use different journeys involving stopping and starting to highlight the concept. Solve problems and calculate average speeds in a variety of units.	*Checkpoint Maths 11-14 (Book 3) Chapter 2*

		Learning Outcomes	Suggested Teaching Activities	Resources
Sm5		Understand and apply the formula for the volume of a sphere in a variety of contexts.	Revise formulae to calculate the volume of prisms. Extend work to include the volume of a sphere. Ask pupils to estimate the volume of different spheres, e.g. a football, a tennis ball, etc.	*Checkpoint Maths 11-14 (Book 3) Chapter 18*
St1		Understand and apply Pythagoras' theorem.	Revise squares and square roots. Before using a formula for Pythagoras' theorem draw right-angled triangles, construct the squares on each side and deduce the relationship between the areas of these squares. Ensure that all students recognise the term hypotenuse and understand that it always refers to a side opposite a right angle in a triangle. Solve problems involving Pythagoras' theorem. Encourage the use of a diagram and the question 'Do I need to find the longest side (and hence the square with the largest area) or one of the shorter sides?' Experiment with non-right angled triangles and discover that Pythagoras' theorem is no longer true.	www.kyes-world.com/pythagor.htm *Checkpoint Maths 11-14 (Book 3) Chapter 3* *Checkpoint Maths 11-14 (Book 3) Chapter 19*
St2		Use sine, cosine and tangent ratios in right-angled triangles to solve problems in 2-D.	As a whole class activity ask students to draw several right-angled triangles as accurately as possible and measure the angles and sides. Use the terms hypotenuse, adjacent and opposite. Spend sufficient time to ensure that each student can identify these in relation to an angle. Collect the results from the students' triangles and make tables of ratios from the measured lengths and angles.	For worksheets on trigonometry follow the links at www.projects.ex.ac.uk/trol/trol/ *Checkpoint Maths 11-14 (Book 3) Chapter 9* *Checkpoint Maths 11-14 (Book 3) Chapter 10* *Checkpoint Maths 11-14 (Book 3) Chapter 13* *Checkpoint Maths 11-14 (Book 3) Chapter 15*

Learning Outcomes	Suggested Teaching Activities	Resources
	Observe that the ratios are relatively constant for the same angle, whatever the lengths of the sides. Use the table to predict the answers to problems. Solve problems using a calculator. Give sufficient graded examples on worksheets to ensure that the students are confident using all three ratios. Finish with mixed examples.	*Checkpoint Maths 11-14 (Book 3) Chapter 19*