GEMS EDUCATION
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Today, Tomorrow, Together.

Course Outline

Mathematics Year 9

Overview

The Mathematics Syllabus at GEMS Wesgreen International Secondary School aims to support students to develop their ability to calculate accurately, to reason and solve problems through application of knowledge and transferable skills. Throughout the year we cover and extend objectives as the focus is on providing a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

Learning Outcomes

The aims of all subjects state what a teacher may expect to teach and what a student may expect to experience and learn. These aims suggest how the student may be changed by the learning experience.
The aims of the Mathematics Syllabus are to encourage and enable students to:

- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- reason mathematically by following a line of enquiry, conjecturing relationships, and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Chapter Overviews

Term 1

Chapter 1 – Significant figures, powers and standard form **Approximate length: 8 hours**

In this chapter the students will learn all four operations using standard form.

<u>Specific National Curriculum Objectives Covered:</u>

- Use and understand powers of 10.
- Use the prefixes associated with powers of 10.
- Understand the effect of multiplying and dividing by any integer power of 10.
- Use negative indices.

- Work out powers of fractions.
- Write numbers using standard form.
- Order numbers written in standard form.
- Calculate with numbers written in standard form.

Chapter 2 – 2D shapes and 3D solids **Approximate length: 9 hours**

In this chapter the students will learn to calculate area and volume of 2D and 3D shapes/solids.

Specific National Curriculum Objectives Covered:

- Sketch nets of 3D solids.
- Calculate the surface area of prisms.
- Calculate the volume of right prisms.
- Calculate the circumference of a circle.
- Solve problems involving circles or prisms.
- Use appropriate apparatus (including pairs of compasses) to identify and draw the diameter and radius of a circle.
- Identify the circumference, arc and sector of a circle.
- Calculate the area of a circle.
- Solve problems involving circles.
- Calculate the volume and surface area of a cylinder.
- Use Pythagoras' theorem in right-angled triangles.

Chapter 3 – Quadratics **Approximate length: 8 hours**

In this chapter the students will learn identify the kind of a sequence and to find the nth term of the sequences; factorise quadratic expressions and solve quadratic equations.

Specific National Curriculum Objectives Covered:

- Use the nth term to generate a linear and quadratic sequence.
- Find the nth term of an arithmetic sequence.
- Recognise and continue geometric sequences.
- Solve problems involving geometric sequences.
- Multiply pairs of brackets.
- Square a linear expression.
- Use quadratic identities.
- Factorise quadratic expressions into two brackets.
- Solve quadratic equations by factorising.

Chapter 4 – Constructions **Approximate length: 8 hours**

In this chapter the students will learn to draw accurate nets of solids using constructions and solve problems using accurate diagrams.

Specific National Curriculum Objectives Covered:

- Draw accurate nets of 3D solids.
- Construct triangles using a ruler and compasses.
- Construct nets of 3D solids using a ruler and compasses.
- Draw accurate nets of 3D solids.
- Bisect a line using a ruler and compasses.
- Construct perpendicular lines using a ruler and compasses.
- Bisect angles using a ruler and compasses.
- Draw accurate diagrams to solve problems.

Term 2

Chapter 5 – Inequalities, Equations and Formulae **Approximate length: 9 hours**

In this chapter the students will learn algebraic manipulations; substitution into expressions; solving complex equations and rearranging the formulae.

Specific National Curriculum Objectives Covered:

- Substitute values into expressions and formulae involving powers, roots and brackets.
- Write expressions and formulae involving more than one variable.
- Solve problems involving formulae and expressions.
- Solve linear inequalities and represent the solution on a number line.
- Multiply both sides of an inequality by a negative number.
- Use index laws with zero and negative powers.
- Distinguish between expressions, identities, equations and formulae.
- Expand and factorise expressions involving powers.
- Construct and solve complex equations.
- Change the subject of a formula.

Chapter 6 – Collecting and analysing data **Approximate length: 7 hours**

In this chapter the students will learn to collect data using sampling methods, analyse this and present using various tools in statistics.

Specific National Curriculum Objectives Covered:

- Identify sources of primary and secondary data.
- Choose a suitable sample size.
- Understand how to reduce bias in sampling and questionnaires.
- Identify a random sample.

- Design a good questionnaire.
- Design and use data collection sheets and tables.
- Estimate the mean and range from a grouped frequency table.
- Construct and use a line of best fit to estimate missing values.
- Identify and explain outliers in data.
- Identify further lines of enquiry.
- Construct and use frequency polygons.

Chapter 7 – Multiplicative Reasoning **Approximate length: 5 hours**

In this chapter the students will learn to solve problems involving proportion; understand and use column vectors in translations, perform enlargements using positive/ negative/ fractional scale factor; calculate percentage change and reverse percentage.

Specific National Curriculum Objectives Covered:

- Recognise data sets that are in proportion.
- Set up equations that show direct proportion.
- Use algebra to solve problems involving proportion.
- Understand and use column vectors in translations.
- Work out the scale factor of an enlargement.
- Enlarge shapes using positive scale factors about a centre of enlargement.
- Describe an enlargement on a coordinate grid.
- Enlarge 2D shapes using a negative whole number scale factor.
- Enlarge 2D shapes using a fractional scale factor.
- Understand that the scale factor is the ratio of the lengths of corresponding sides.
- Find an original value using inverse operations.
- Calculate percentage change.

Chapter 8 – Scale drawing and measures **Approximate length: 8 hours**

In this chapter the students will learn to draw scaled diagrams using bearings; solve problems using similarity and congruence.

Specific National Curriculum Objectives Covered:

- Use scales in maps and plans.
- Use and interpret maps.

- Measure and use bearings.
- Draw diagrams to scale using bearings.
- Draw diagrams to scale.
- Use and interpret scale drawings.
- Identify congruent and similar shapes.
- Use congruence to solve problems in triangles and quadrilaterals.
- Use similarity to solve problems involving 2D shapes.

Term 3

Chapter 9 – Accuracy and measures **Approximate length: 6 hours**

In this chapter the students will learn to solve problems involving rates of change and compound measures; find upper and lower bounds.

Specific National Curriculum Objectives Covered:

- Solve problems involving rates of change.
- Convert units with compound measures.
- Calculate density and pressure.
- Solve problems involving compound measures.
- Understand the effect of rounding.
- Find upper and lower bounds.

Chapter 10 – Graphical solutions **Approximate length: 9 hours**

In this chapter the students will learn to draw and solve linear/ simultaneous/ quadratic graphs.

Specific National Curriculum Objectives Covered:

- Draw graphs with equation $y = mx + c$.
- Draw graphs with equation $ax + by = c$.
- Identify parallel lines.
- Understand and draw graphs of quadratic functions.
- Identify quadratic graphs and their features.
- Solve problems using quadratic graphs.
- Solve a pair of simultaneous equations.
- Rearrange equations of graphs to find the gradient and y-intercept.
- Find the equation of the line between two points.
- Solve more complex simultaneous equations.
- Solve simultaneous equations by drawing graphs.

Chapter 11 – Trigonometry **Approximate length: 6 hours**

In this chapter the students will learn to use the trigonometric ratios to solve problems involving right angled triangles to find missing sides and angles.

Specific National Curriculum Objectives Covered:

- Use conventions for naming the sides of a right-angled triangle.
- Work out the tangent of any angle.
- Use the tangent ratio to work out an unknown side of a right-angled triangle.
- Work out the sine of any angle.
- Use the sine ratio to work out an unknown side of a right-angled triangle.
- Work out the cosine of any angle.
- Use the cosine ratio to work out an unknown side in a right-angled triangle.
- Use the trigonometric ratios to work out an unknown angle in a right-angled triangle.
- Use trigonometry to solve problems involving missing lengths and angles.

Chapter 12 – Probability **Approximate length: 7 hours**

In this chapter the students will learn to use correct set notations; present the possible outcomes using sample space and Venn diagrams.

Specific National Curriculum Objectives Covered:

- Use correct set language and notation.
- Sort and compare sets of data using Venn diagrams.
- Use correct set language and notation.
- Present the possible outcomes of single events, or two successive events using lists, tables, Venn diagrams and sample space diagrams.
- Identify mutually exclusive outcomes and events.
- Find the probabilities of mutually exclusive outcomes and events.
- Use tree diagrams to find the probabilities of two or more events.
- Compare experimental and theoretical probabilities.
- Compare probabilities.
- Solve problems involving probability.

Textbooks Maths Progress International Year 9

Assessment

Formative: Throughout the chapters, the students will complete end of chapter assessments, quizzes and problem-solving activities which will allow the teacher to assess the students' progress and inform their planning.

Summative: At the end of each term, we will complete internal assessments which will be based on certain chapters. Students will also complete standardized tests such as the GL. This allows us to measure the students' attainment throughout the term and year.