Mathematics (Junior Secondary)

1. Introduction

The Department of Mathematics at HKUGAC strives to develop students' mathematical skills; their ability to communicate mathematics; their ability to reflect and evaluate; and their ability to develop and apply mathematical and technical knowledge. We aim to foster in our students a positive attitude, an appreciation of mathematics and its significance to everyday life. The programme will incorporate elements to increase intercultural awareness and cross-subject links.

The curriculums are designed based on the following.

S1 and S2	The guiding principles of curriculum design and assessment of mathematics education, which stipulated in Mathematics Education Key Learning Area Curriculum Guide (Primary 1 - Secondary 6) (2017).
S3	The syllabus for Key Stage 3 Mathematics, using the approaches which comply with the New Senior School Curriculum and Assessment Guides in Mathematics Education, the general guidelines set by the Curriculum Development Council and the Hong Kong Examinations and Assessment Authority in 2007.

1.2 Teaching Methods

Given students' diverse learning styles, we employ various teaching and assessment strategies to ensure that all of our students have an opportunity to learn and demonstrate their understanding.

The teacher will act as a resource for the student to learn to use. This will require them to take an active part in their own learning. Thus, they are encouraged to ask questions when there is a conflict between their understanding and the feedback that they obtain.

Local and international cultures, as well as the history of mathematics, are incorporated into the syllabus where possible. Throughout the six years of study, students will be assigned problem solving tasks, various projects and modelling assignments that will require them to apply their mathematical knowledge to applications involving problems from the real world. In line with the school's latest policy, the idea of global citizenship will permeate the curriculum through tasks and projects at different levels.

The use of e-resources and technology is incorporated into the curriculum in order to facilitate mathematical learning and assessment. Technology, whenever appropriate, is used in lessons for students to explore mathematical concepts, to be

assessed and to perform mathematical experiments. Learning materials are also provided online. STEM activities, wherever found closely related to the syllabus, are also included to help students integrate mathematical concepts with technology and engineering.

We will provide various levels of study groups to ensure that all students are given the academic opportunity and challenge to reach their potential. This is essential in developing students' abilities to express ideas clearly and to think critically, in order for them to become contributing members of society.

For higher ability students, we provide extra training for them to take part in the International Mathematical Olympiad.

In order to further foster the skill of critical thinking under the mathematics context, Philosophical Inquiry (PI) will also be incorporated in S1 and S2 Mathematics curriculum. Typical activities of PI will include argumentative reasoning through group discussions.

1.3 Assessment

Assessment will take various forms that incorporate skills acquisition, class participation, oral discussions, note-taking, worksheets, assignments, projects and written tests.

2. Aims & Objectives of Mathematics Education

The aims of mathematics are to enable students to:

- develop a positive attitude toward the continued learning of mathematics
- appreciate the usefulness, power and beauty of mathematics, and recognize its relationship with other disciplines in everyday life
- gain knowledge and develop understanding of mathematical concepts
- develop mathematics skills and apply them in daily life
- develop the ability to communicate mathematics with appropriate symbols and language
- develop the ability to reflect upon and evaluate the significance of their work and the work of others
- share ideas and experience and work cooperatively with others in accomplishing mathematical tasks/activities and solving mathematical problems
- develop patience and persistence when solving mathematical problems

- develop and apply information and communication technology skills in the study of mathematics
- appreciate the international dimensions of mathematics and its varied cultural and historical perspectives

At the end of the course, students should be able to:

- know and understand concepts, and demonstrate skills, from the branches of mathematics
- understand and use a variety of mathematical forms and have the ability to move confidently between them
- select and use appropriate mathematical knowledge, skills and techniques when investigating problems and justify their relationships
- recognize patterns and structures and describe them as relationships or general rules when investigating problems
- draw conclusions consistent with findings
- communicate mathematical facts, ideas, methods, results and conclusions using appropriate language and symbols
- reflect on their methods and processes and be able to consider possible alternative approaches
- evaluate the significance and reliability of their findings and findings of others

3. Curriculum

3.1 Mathematics Curriculum Framework

<table>
<tr><td colspan="3">9 Refined Generic Skills[#]
Basic Skills: Communication Skills, Mathematical Skills, IT Skills
Thinking Skills: Critical Thinking Skills, Creativity, Problem Solving Skills
Personal and Social Skills: Self-management Skills, Self-learning Skills, Collaboration Skills</td></tr>
<tr><td>Level</td><td>Dimensions</td><td>Units</td></tr>
<tr><td rowspan="3">S1</td><td>Number and Algebra</td><td>Basic Computation
Directed Numbers
Numerical Estimation
Basic Algebra (I)
Basic Algebra (II)
Percentages (I)</td></tr>
<tr><td>Measure, Shape and Space</td><td>Basic Geometry
Mensuration (I)
Rectangular Coordinate System (I)
Angles and Parallel Lines (I)
Congruence and Similarity (I)</td></tr>
<tr><td>Data Handling</td><td>Organization and Presentation of Data (I)</td></tr>
<tr><td rowspan="2">S2</td><td>Number and Algebra</td><td>Operations and Factorization of Polynomials
Identities
Algebraic Fractions and Formulae
Linear Equations in Two Unknowns
Rates, Ratios and Proportions
Approximation & Errors</td></tr>
<tr><td>Measure, Shape and Space</td><td>Angles and Parallel Lines (II)
Congruence and Similarity
Polygons
Pythagoras' Theorem and Irrational Numbers
Trigonometric Ratios</td></tr>
</table>

		Mensuration (II)
	Data Handling	Organization and Presentation of Data (II)
S3	Number and Algebra	Law of Indices Linear Inequalities in One Unknown Percentages (II) More about Factorisation of Polynomials
	Measure, Shape and Space	More on Deductive Geometry Quadrilaterals More about 3-D Figures Area and Volume (III) Applications in Trigonometry Coordinate Geometry of Straight Lines
	Data Handling	Introduction to Probability Measures of Central Tendency and Other Statistical Values

Remarks: # from "Ongoing Renewal of the School Curriculum – Focusing, Deepening and Sustaining" from CDC of EdB in December 2015.

3.2 Delivery Schedule

Time Frame	S1	S2	S3
September	Basic Computation Directed Numbers	Operations and Factorization of Polynomials, Identities	More about Factorisation of Polynomials, Laws of Indices
October	Directed Numbers Numerical Estimation	Algebraic Fractions and Formulae, Significant Figures	Percentages (II), Linear Inequalities in One Unknown
November	Basic Algebra (I) Basic Algebra (II)	Linear Equations in Two Unknowns, Organization and Presentation of Data (II)	Linear Inequalities in One Unknown More on Deductive Geometry,
December	Basic Geometry Mensuration (I)	Rates, Ratios and Proportions	Quadrilaterals
January	Mensuration (I) Rectangular Coordinate System (I)	Angles and Parallel Lines (II)	More about 3-D Figures Area and Volume (III)
February	Rectangular Coordinate System (I) Angles and Parallel Lines (I) [Find]	Congruence and Similarity (II), Polygons	Area and Volume (III),
March	Congruence and Similarity (I) Angles and Parallel Lines (I) [Proof]	Polygons Pythagoras' Theorem Trigonometric Ratios	Applications in Trigonometry Coordinate Geometry of Straight Lines
April	Angles and Parallel Lines (I) [Proof] Percentages (I)	Trigonometric Ratios, Approximation & Errors	Introduction to Probability
May	Percentages (I) Organization and Presentation of Data (I)	Mensuration (II)	Measures of Central Tendency & Other Statistical Values

June	Revision and Exam	Revision and Exam	Exam and T.S.A.
July	**Summer Holidays**	**Summer Holidays**	**Summer Holidays**

4. Assessing students

4.1 Formative and Summative Assessment

Formative assessment is an integral part of the learning experience that is designed to measure what students know and what they are learning as they go along; the objectives addressed by specific assessment tasks are shared with students, with feedback taking place. Formative assessment is carried out in various ways including project work, oral presentation, class discussions, homework assignments, and written tests in class or at home. Summative assessment is the judgment made by the teacher of the standard of achievement reached by each student at a particular point in time and at the end of the year.

4.2 Assessment Criteria

The students are assessed on four assessment criteria:
"Numerical and Algebraic Skills" (NAS);
"Spatial and Geometric Skills" (SGS);
"Data Handling Skills" (DHS) and
"Application of Mathematical Concepts and Skills" (AM).

Assessment Criteria	Topics involved	
	S1 Term 1	S1 Term 2
NAS	• Basic Computation • Directed Numbers • Numerical Estimation • Basic Algebra	• Percentages
SGS	• Basic Geometry • Mensuration (I)	• Rectangular Coordinate System (I) • Angles and Parallel Lines (I) • Congruence and Similarity (I)
DHS	Not assessed	• Organization and Presentation of Data (I)
AM	• Cross-topic assessment	Not assessed

Assessment Criteria	Topics involved	
	S2 Term 1	S2 Term 2
NAS	• Polynomials • Identities • Formulae • Significant figures • Linear Equations in Two Unknowns • Rates, Ratios and Proportions	• Approximation and Errors
SGS	Not assessed	• Angles and Parallel Lines (II) • Congruence and Similarity (II) • Polygons • Pythagoras' Theorem and Irrational Numbers • Trigonometric Ratios • Mensuration (II)
DHS	• Organization and Presentation of Data (II)	Not assessed
AM	• Cross-topic assessment	Not assessed

Assessment Criteria	Topics involved	
	S3 Term 1	S3 Term 2
NAS	• Factorization • Laws of Indices • Percentages • Inequalities	Not assessed
SGS	• Deductive Geometry • Quadrilaterals	• 3-D Figures • Area and Volume • Trigonometry • Coordinate Geometry
DHS	Not assessed	• Probability • Measures of Central Tendency
AM	• Cross-topic assessment	Not assessed

4.3 Components of Year Grade

	Weighting
Continuous Assessment[#]	60%
Exam	40%

[#] Continuous Assessment includes homework, projects, quizzes and unit tests, as well as other non-traditional modes of assessment.

4.4 Reference Level Descriptors and Boundaries

Level	Boundaries of Levels
5**	90% or above
5*	85% to 89%
5	75% to 84%
4	65% to 74%
3	50% to 64%
2	35% to 49%
1	34% or below

The marks are rounded off to the nearest %.
The actual boundaries may vary depending on the performance of students.

4.5 Requirement of Taking Extended Modules in S4

Based on our experiences of our graduates' past performances in the HKDSE, if students cannot achieve a satisfactory standard in the S3, they tend to struggle to keep up in the compulsory part and the extended module in mathematics. To help students focused on the compulsory part and obtain a better grade in the HKDSE, we have set the following benchmark and recommendations for those wishing to take the extended module in S4:

S3 year grade	65% or above	Students are highly encouraged to take the extended module.
	50% to 64%	Students are not recommended to take the extended module. If students would like to make a special request for taking the extended module in S4, they need to meet with their mathematics teachers and seek teachers' advice. In addition, a parent's letter is required for such a request.
	Below 50%	Students are forbidden to take the extended module.

5. Homework and Assignments

5.1 Parents' role

Parents are encouraged to talk to their children about their work in class, what they are currently learning and check the aims and objectives of the unit being studied. They should also discuss the results obtained by their children and to regularly check their diaries.

Homework is a valuable aid to help students make the most of their school experience. Homework consolidates, reinforces and strengthens concepts learnt in class, encourages students to develop responsibility, time management skills, and good study habits which help teachers assess the performance of students. Teachers will assign homework that is related appropriately to specific objectives at a suitable level of difficulty. A homework load of around 30 minutes will be assigned on the day of each mathematics lesson.

5.2 Homework Policy

As a measure to train students to be responsible for completing homework in a timely manner, late submission will result in zero marks given. Students who hand in homework late will be required to complete the unfinished work after school and the homework will receive their teachers' feedback as usual.

Homework assigned by teachers will be entered into eHomework on the eClass system, from where parents can access their child's homework progress and completion record.