

Group 5: Mathematics

Levels Offered:

- **Mathematics HL (Higher Level)**
- **Mathematics SL (Standard Level)**
- **Mathematical Studies SL (Standard Level)**

The nature of mathematics can be summarized in a number of ways: for example, it can be seen as a well-defined body of knowledge, as an abstract system of ideas, or as a useful tool. For many people it is probably a combination of these, but there is no doubt that mathematical knowledge provides an important key to understanding the world in which we live.

Mathematics can enter our lives in a number of ways: we buy produce in the market, consult a timetable, read a newspaper, time a process or estimate a length. Mathematics, for most of us, also extends into our chosen profession: artists need to learn about perspective; musicians need to appreciate the mathematical relationships within and between different rhythms; economists need to recognize trends in financial dealings; and engineers need to take account of stress patterns in physical materials.

Scientists view mathematics as a language that is central to our understanding of events that occur in the natural world. Some people enjoy the challenges offered by the logical methods of mathematics and the adventure in reason that mathematical proof has to offer. Others appreciate mathematics as an aesthetic experience or even as a Cornerstone of philosophy.

This prevalence of mathematics in our lives provides a clear and sufficient rationale for making the study of this subject compulsory within the IB Diploma Programme.

Mathematics is a compulsory subject for the IB and there are three different courses that can be studied. Higher Level is a challenging and rigorous course for those with a very strong interest and ability in Mathematics; Standard Level is a demanding academic course; Mathematical Studies enables pupils to continue their study of Mathematics post-16 and is recommended for non-specialist Mathematicians.

Course Description / Topics covered:

IB (Key stage five)

Students will study one of the three IB courses: Mathematics Higher Level, Mathematics Standard Level and Mathematical Studies Standard Level. The course students will follow in Mathematics depends to a great extent on whether they sat GCSE in Year 10 or in Year 11, and on the recommendation of their Year 11 Mathematics teacher.

Mathematics Higher Level: (240 hours of teaching time)

Mathematics HL caters to students with a superior understanding of mathematical concepts and ideas. Commonly, these mathematically gifted students will be aiming to complete a university course rich in mathematical content.

Mathematics HL will be a rigorous course which will require students to fully appreciate the underlying concepts of the topics. Students will be continually challenged and stretched and will be expected to use elegant and concise mathematical notation when expressing their ideas. Students will frequently be engaged in tangential and independent study, for example in relation to, and preparation for, worldwide mathematical competitions.

Mathematics Standard Level: (150 hours of teaching time)

Mathematics SL caters to students who have a substantial understanding of mathematical concepts and are interested in extending their appreciation of applications. Commonly, these students will find Mathematics SL supporting subject areas within their IB framework such as Economics, Business, the Sciences and ICT and in future university studies.

The IB DP mathematics standard level (SL) course focuses on introducing important mathematical concepts through the development of mathematical techniques. The intention is to introduce students to these concepts in a comprehensible and coherent way, rather than insisting on the mathematical rigour required for mathematics HL. Students should, wherever possible, apply the mathematical knowledge they have acquired to solve realistic problems set in an appropriate context.

The aims of all mathematics courses in group 5 are to enable students to:

- enjoy mathematics, and develop an appreciation of the elegance and power of mathematics
- develop an understanding of the principles and nature of mathematics
- communicate clearly and confidently in a variety of contexts
- develop logical, critical and creative thinking, and patience and persistence in problem-solving
- employ and refine their powers of abstraction and generalization
- apply and transfer skills to alternative situations, to other areas of knowledge and to future developments
- appreciate how developments in technology and mathematics have influenced each other
- appreciate the moral, social and ethical implications arising from the work of mathematicians and the applications of mathematics
- appreciate the international dimension in mathematics through an awareness of the universality of mathematics and its multicultural and historical perspectives
- appreciate the contribution of mathematics to other disciplines, and as a particular “area of knowledge” in the TOK course

Mathematical Studies Standard Level: (150 hours of teaching time)

Mathematical Studies caters to students who have an appreciation for mathematics but may find some difficulties with the technicality and concepts involved in Mathematics SL. It is designed for students with varied mathematical backgrounds and abilities.

This course is designed to build students' confidence whilst providing an insight into the applications of mathematics in real world situations from a practical point of view. Mathematics Studies will give students the skills to solve problems by formulating mathematical arguments and to analyse data efficiently and accurately, interpreting results and summarizing their ideas. Students taking this course are well prepared for a career in social sciences, humanities, languages or arts.

Topics include:

- Numbers and algebra
- Sets, logic, and probability
- Functions
- Geometry and trigonometry
- Statistics
- Introductory differential calculus
- Financial mathematics

Assessment:

Internal Assessment: Mathematics Exploration

- 20% of final grade

SYLLABUS OUTLINE

Mathematics HL

The course consists of the study of seven core topics and one option topic. Total 240 hrs

Core syllabus content 190 hrs

Requirements

All topics in the core are compulsory. Students must study all the sub-topics in each of the topics in the syllabus as listed in this guide. Students are also required to be familiar with the topics listed as presumed knowledge (PK).

Topic 1—Algebra 20 hrs

Topic 2—Functions and equations 26 hrs

Topic 3—Circular functions and trigonometry 22 hrs

Topic 4—Two variable stats 12

Topic 5—Vectors 22 hrs

Topic 6—Statistics and probability 40 hrs

Topic 7—Calculus 48 hrs

Option syllabus content 40 hrs

Requirements

Students must study all the sub-topics in one of the following options as listed in the syllabus details.

Topic 8—Statistics and probability 40 hrs

Topic 9—Sets, relations and groups 40 hrs

Topic 10—Series and differential equations 40 hrs

Topic 11—Discrete mathematics 40 hrs

In our school we have provided Statistics Option twice.

Mathematics-Exploration: 20 % of Final Grade 10 hrs

One pieces of work, based on different areas of the syllabus, Mathematics exploration on topic of students Personal Interest.

Mathematics SL

The course consists of the study of seven topics. Total 150 hrs

Syllabus content 140 hrs

Requirements

All topics are compulsory. Students must study all the sub-topics in each of the topics in the syllabus as listed in this guide. Students are also required to be familiar with the topics listed as presumed knowledge (PK).

Topic 1—Algebra 8 hrs

Topic 2—Functions and equations 24 hrs

Topic 3—Circular functions and trigonometry 16 hrs

Topic 4—Statistic basics

Topic 5—Vectors 16 hrs

Topic 6—Statistics and probability 30 hrs

Topic 7—Calculus 36 hrs

Mathematics Exploration is 20 % of Grade 10 hours.

Mathematical Studies SL

The course consists of the study of eight topics. Total 150 hrs

Requirements

All topics are compulsory. Students must study all the sub-topics in each of the topics in the syllabus as listed in this guide. Students are also required to be familiar with the topics listed as presumed knowledge (PK).

Syllabus content 130 hrs

Topic 1—Introduction to the graphic display calculator 3 hrs

Topic 2—Number and algebra 14 hrs

Topic 3—Sets, logic and probability 20 hrs

Topic 4—Functions 24 hrs

Topic 5—Geometry and trigonometry 20 hrs

Topic 6—Statistics 24 hrs

Topic 7—Introductory differential calculus 15 hrs

Topic 8—Financial mathematics 10 hrs

Personal Project 20 hrs

The project is an individual piece of work involving the collection of information or the generation of measurements, and the analysis and evaluation of the information or measurements.

Mathematical Methods (Studies) SL

The mathematical methods standard level (SL) syllabus consists of the study of six **core** topics and one **option**. Total 150 hrs

Part I: Core 105 hours

All topics in the core are compulsory. Candidates are required to study all the sub-topics in each of the six topics in this part of the syllabus as listed in the Syllabus Details.

- 1 Number and algebra 10 hours
- 2 Functions and equations 25 hours
- 3 Circular functions and trigonometry 15 hours
- 4 Vector geometry 15 hours
- 5 Statistics and probability 20 hours
- 6 Calculus 20 hours

Part II: Options 35 hours

*Candidates are required to study all the sub-topics in **one** of the following options as listed in the*

Syllabus Details.

- 7 Statistical methods 35 hours
- 8 Further calculus 35 hours
- 9 Further geometry 35 hours

Portfolio 10 hours

Three assignments, based on different areas of the syllabus, representing the following three activities:

- ⇒ mathematical investigation
- ⇒ extended closed-problem solving
- ⇒ mathematical modelling.

External Assessment

- 80% of final grade

Mathematics HL; Paper 1(Non GDC) - 30%, Paper 2(GDC) - 30%, Paper 3 (GDC) - 20%, * Paper 3 Option offered in our school are Statistics and Calculus.

Mathematics SL; Paper 1(Non GDC) - 40% , Paper 2(GDC) - 40%

Mathematical Studies; Paper 1(GDC) - 40%, Paper 2(GDC) - 40%

Resources and Texts:

IB Mathematics Higher Level Course Book: Oxford IB Diploma Programme

IB Mathematics Higher level Statistics option.

IB Mathematics Standard Level Course Book: Oxford IB Diploma Programme

IB Mathematical Studies Standard Level Course Book: Oxford IB Diploma Programme

Teacher(s) to speak to:

Mr. A. Singh (Head of Department), Ms. K. Wong, Ms. A. Wong & Ms. S. Cheung