Mathematics
Year 2

Course description 2019/2020

WHAT IS THE COURSE ABOUT?

Mathematics plays an essential role both within the school and in society. It promotes a powerful universal language, analytical reasoning and problem-solving skills that contribute to the development of logical, abstract and critical thinking. Mathematical knowledge provides an important key to understanding the world in which we live. This prevalence of mathematics in our lives, with all its interdisciplinary connections, provides a clear and sufficient rationale for making the study of this subject compulsory for students studying the full diploma.

Mathematics Standard Level is intended for the students who will expect to need a sound mathematical background as they prepare for future studies in subjects such as chemistry, economics, psychology and business administration.

Mathematics Higher Level is intended for the students who have an interest in Mathematics and will be expecting to include mathematics as a major component of their university studies, either as a subject in its own right or within courses such as physics, engineering and technology. Others may take this subject because they have a strong interest in mathematics and enjoy meeting its challenges and engaging with its problems.

This course outlines six branches of mathematical study: Algebra, Functions and equations, Circular functions and trigonometry, Vectors, Statistics and probability, and Calculus. and seventh for HL- Discrete mathematics.

AIMS:

The aims of teaching and studying Mathematics Sl and HL are 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.

OBJECTIVES:

Problem-solving is central to learning mathematics and involves the acquisition of mathematical skills and concepts in a wide range of situations, including non-routine, open-ended and real-world problems.

Students will be expected to demonstrate the following.

- **Knowledge and understanding**: recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts.
- **Problem-solving**: recall, select and use their knowledge of mathematical skills, results and models in both real and abstract contexts to solve problems.
- **Communication and interpretation**: transform common realistic contexts into mathematics; comment on the context; sketch or draw mathematical diagrams, graphs or constructions both on paper and using technology; record methods, solutions and conclusions using standardized notation.
- **Technology**: use technology, accurately, appropriately and efficiently both to explore new ideas and to solve problems.
- **Reasoning**: construct mathematical arguments through use of precise statements, logical deduction and inference, and by the manipulation of mathematical expressions.
- **Inquiry approaches**: investigate unfamiliar situations, both abstract and real-world, involving organizing and analysing information, making conjectures, drawing conclusions and testing their validity.

ASSESSMENT:

- **Unit test:** Unit tests are written after the completion of each unit. Duration of a test is 2 school hours.
- **Progress test:** Student's progress during the work on big units is assessed through 1 school hour tests, one per big unit.
- **Quiz:** Written approximately three times per month, containing short answer questions based on homework tasks with working time of 15 minutes each or less. Grade is given as the average result of three consecutive quizzes.
- **Semester/Mock Exam:** Two Papers (non-calculator and calculator) assess different course assessment objectives. Two grades are provided (P1 and P2) for each part of the exam.

- **Exploration:** Exploration is a report (at an appropriate level for the course) on exploration of a topic in which a student is genuinely interested. It is assessed according the IB criteria descriptors.

Throughout course teachers use **formative assessments** to determine students' strengths and limitations in accessing required content knowledge and skills, provide needed support in making progress and to allow for students to actively engage in and reflect on their educational experience in each class. While preparing students for the summative assessments, teachers use a variety of formative assessments to scaffold student development of content knowledge and skills.

All pieces of work will be marked on the 1 to 7 grading scale.

GRADING SCALE:

grades	unit and progress tests (%)	quizzes (%)	semester and mock exams (%)
7	90-100	90-100	88-100
6	80-89	80-89	76-87
5	70-79	70-79	64-75
4	60-69	60-69	52-63
3	45-59	50-59	40-51
2	30-44	40-49	25-39
1	0-29	0-39	0-24

At the end of the year the class grade is calculated as follows:

SL	HL
Class grades - 60% Mock exam Paper 1 - 20% Mock exam Paper 2 - 20%	Class grades - 60% Mock exam Paper 1 - 16% Mock exam Paper 2 - 16% Mock exam Paper 3 - 8%

IMPLEMENTATION:

DP Year 2: The school offers 5 lessons per week (SL) and 6 lessons per week (HL)

TOPICS:

UNIT 1	**Probability**	The aim of this topic is to introduce basic concepts. It is expected that most of the calculations required will be done using technology, but explanations of calculations by hand may enhance understanding. The emphasis is on understanding and interpreting the results obtained, in context.
UNIT 2	**Calculus**	The aim of this topic is to introduce students to the basic concepts and techniques of differential and integral calculus and their applications.
UNIT 3	**Random variables**	The aim of this topic is to introduce basic concepts of discrete and continuous random variables and their probability distributions.
UNIT 4	**Vectors**	The aim of this topic is to provide an elementary introduction to vectors, including both algebraic and geometric approaches, to introduce the use of vectors in two and three dimensions, and to facilitate solving problems involving points, lines and planes The use of dynamic geometry software is extremely helpful to visualize situations in three dimensions.
UNIT 5 – HL only	**Discrete mathematics**	The aim of this option is to provide the opportunity for students to engage in logical reasoning, algorithmic thinking and applications.

Textbooks:

- Haese and others: Mathematics for International student, Mathematics SL, Haese mathematics, 2012;
- Haese and others: Mathematics for International student, Mathematics HL (Core), Haese mathematics, 2012;
- Haese and others: Mathematics for International student, Mathematics HL (Options), Haese mathematics, 2012

[i]

---

[i] Document adapted from:
https://resources.ibo.org/data/d_5_matsl_gui_1203_2_e.pdf
https://resources.ibo.org/data/d_5_mathl_gui_1206_6_e.pdf