Mathematics Applications and Interpretation SL

Nature of the Subject

Mathematics has been described as the study of structure, order and relation that has evolved from the practices of counting, measuring, and describing objects. Mathematics provides a unique language to describe, explore, and communicate the nature of the world we live in as well as being a constantly building body of knowledge and truth in itself that is distinctive in its certainty. There two aspects of mathematics, a discipline that is studied for its intrinsic pleasure and a means to explore and understand the world we live in, are both separate yet closely linked.

This course recognises the increasing role that mathematics and technology play in a diverse range of fields in a data-rich world. As such, it emphasises the meaning of mathematics in context by focusing on topics that are often used as applications or in mathematical modelling. To give this understanding a firm base, this course also includes topics that are traditionally part of a pre-university mathematics course such as calculus and statistics.

The course is focusing on developing mathematics for describing our world and solving practical problems. The course makes extensive use of technology to allow students to explore and construct mathematical models. Mathematics Applications and Interpretation will develop mathematical thinking, often in the context of a practical problem and using technology to justify conjectures.

Distinction between Higher and Standard Level

Higher level course not offered.

Syllabus outline

The course deals with the five big areas of mathematics, compulsory for all students. Some topics are taught more in depth according to their applications.

Syllabus component
Topic 1—Number and algebra
Topic 2—Functions
Topic 3— Geometry and trigonometry
Topic 4—Statistics and probability
Topic 5 —Calculus
The toolkit and the mathematical exploration Investigative, problem-solving and modeling skills development leading to an individual exploration. The exploration is a piece of written work that involves investigating an area of mathematics.

Prior Learning

It is expected that most students embarking on a DP mathematics course will have studied mathematics for at least 10 years. There will be a great variety of topics studied, and differing approaches to teaching and learning. Thus, students will have a wide variety of skills and knowledge when they start their mathematics course. Most will have some background in arithmetic, algebra, geometry, trigonometry, probability and statistics. Some will be familiar with an inquiry approach, and may have had an opportunity to complete an extended piece of work in mathematics. Students may be unfamiliar with certain Prior Learning topics, but it is anticipated that there may be other topics in the syllabus itself which these students have already encountered. For a more extensive analysis on the prior learning you can visit the IBDP guide on page 25-26.

Assessment Objectives

Having followed the Diploma Programme course in Mathematics Applications and Interpretation, students will be expected to:

- Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts.
- Recall, select and use their knowledge of mathematical skills, results and models in both abstract and real-world contexts to solve problems.
- 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; use appropriate notation and terminology.
- Use technology accurately, appropriately and efficiently both to explore new ideas and to solve problems.
- Construct mathematical arguments through use of precise statements, logical deduction and inference and by the manipulation of mathematical expressions.

- Investigate unfamiliar situations, both abstract and from the real world, involving organizing and analyzing information, making conjectures, drawing conclusions, and testing their validity.

Teaching Approach

Despite the attitude that mathematics is all around us and everything can be described through its use, this structural interconnection of mathematics and real-world is neither self-evident nor easily established. Let us call the process of translating a real-world problem into mathematics mathematicalization. The students should be introduced into mathematicalization slowly, progressively, methodically and systematically passing from very simple examples/cases to more complex ones. The variety of topics in the syllabus creates a conducive environment to this end.

The teaching approach in the IB course is characterized by inquiry-based learning, group work, collaboration, and the development of Approaches to Learning (ATL) skills. Students are actively encouraged to explore mathematical concepts through questioning and the investigation of real-world problems, creating a dynamic and engaging learning experience.

Integral to the course is the incorporation of technology, both through calculators and online tools, to enhance the exploration of mathematical concepts. Students are equipped with the skills to leverage technology effectively, enabling them to analyze data, model mathematical scenarios, and visualize abstract concepts. This integration not only aligns with modern technological advancements but also equips students with valuable skills applicable to real-world problem-solving.

Group work and collaboration remain essential aspects of the course, fostering teamwork and communication skills. Students collaborate on projects, utilizing technology to enhance their problem-solving capabilities. This collaborative environment enhances both mathematical understanding and technological proficiency.

The emphasis on skills, including critical thinking, research, communication, and self-management, remains a cornerstone of the curriculum. These skills, combined with the integration of technology, empower students to apply mathematical concepts in diverse contexts, cultivating a well-rounded skill set.

Independence is promoted as students take ownership of their learning journey, making choices about the depth and breadth of their exploration. The approach continues to nurture curiosity, inspiring students to ask questions, seek solutions, and appreciate the relevance of mathematics in the world around them. In summary, the course adopts a holistic and student-driven approach, leveraging technology to build not only mathematical proficiency but also essential skills for the ever-evolving landscape of problem-solving and innovation.

Why students might choose this subject

Choosing IB Math Applications SL can be a strategic decision for students interested in a more applied and practical approach to mathematics. This course emphasizes the

real-world applications of mathematical concepts, making it an ideal choice for those pursuing fields such as economics, social sciences, or natural sciences. With a focus on inquiry-based learning, collaborative projects, and the integration of technology, IB Math Applications SL equips students with valuable problem-solving skills relevant to today's dynamic and technology-driven environments. The course strikes a balance between mathematical rigour and practical utility, making it an excellent choice for individuals who appreciate hands-on learning and seek a solid foundation in applied mathematics.

Course Assessment

The **final Diploma grade** in the subject is determined by **two** assessment components:

1. Internal assessment:

The Internal Assessment (IA) in IB Math Applications involves a student-led investigation into a mathematical topic of their choice, showcasing the application of mathematical concepts to solve a real-world problem. Students are encouraged to select a topic aligned with their interests and career aspirations. The IA is an opportunity for students to demonstrate their understanding of mathematical techniques, utilise technology effectively, and communicate their findings coherently. The assessment typically involves a written report, detailing the problem, the mathematical methods employed, data analysis, and a reflection on the implications of their findings. The IA allows students to showcase their analytical and problem-solving skills, providing a personalised and practical dimension to their mathematical studies. This component is internally assessed by the teacher and externally moderated by the IB and counts towards 20% of the final Diploma grade.

2. External assessment: Written examinations

Students are required to sit two 90 minutes examinations at the end of their IB2 year. Each paper has a different style of questions; the first paper (Paper 1) assesses quick thinking and fast calculations, whereas the second paper (Paper 2) assesses student’s problem solving skills in complex situations. Use of technology is allowed in both examinations. The externally assessed component counts towards 80% of the final Diploma grade.