International Baccalaureate
# Middle Years Programme Subject Brief

Mathematics

From 2014

The IB Middle Years Programme (MYP) is designed for students aged 11 to 16. It provides a framework of learning that emphasizes intellectual challenge and encourages connections between studies in traditional subjects and the real world. The MYP focuses on "learning how to learn" through the systematic development of approaches to learning (ATL) skills for communication, collaboration, organization, self-management, reflection, research, informational literacy, media literacy, creative and critical thinking, and transfer of learning. It also fosters intercultural understanding and global engagement —essential qualities for young people today.

Interdisciplinary teaching and learning builds a connected curriculum that addresses the developmental needs of students and prepares them for further academic study and life in an increasingly interconnected world. The MYP uses concepts and contexts as starting points for meaningful integration and transfer of knowledge across eight subject groups.

For students seeking a formal qualification at the end of the programme's Year 5, the IB offers eAssessments that lead to the IB MYP certificate or course results for individual subject areas. To earn the MYP certificate, students must complete 2 hour on-screen examinations in each of the following: language and literature, individuals and society, sciences, mathematics and interdisciplinary learning; submit an ePortfolio in language acquisition and one of the following: design, arts or physical and health education; complete a moderated personal project; and complete school-based expectations for service as action (community service).
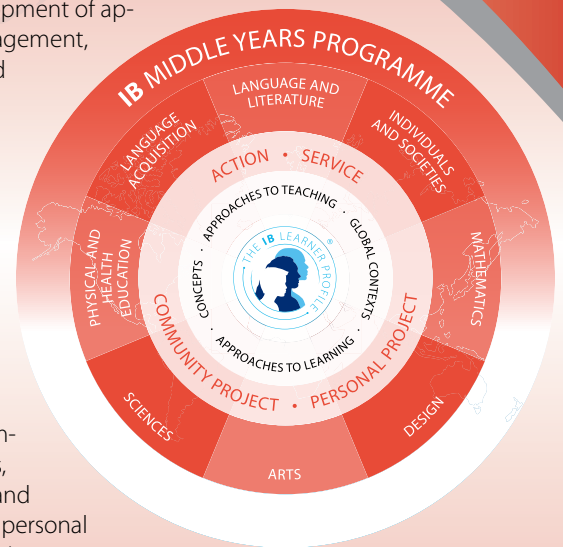
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I. Course description and aims

The framework for MYP mathematics outlines four branches of mathematical study.
1. Number
2. Algebra
3. Geometry and trigonometry
4. Statistics and probability

The study of mathematics is a fundamental part of a balanced education. It promotes a powerful universal language, analytical reasoning and problem-solving skills that contribute to the development of logical, abstract and critical thinking. The MYP mathematics and extended mathematics courses promote both inquiry and application, helping students to develop problem-solving techniques that transcend the discipline and are useful in the world outside school.

Mathematics in the MYP is tailored to the needs of students, seeking to intrigue and motivate them to want to learn its principles. Students should see authentic examples of how mathematics is useful and relevant to their lives and be encouraged to apply it to new situations.

The aims of MYP mathematics courses are to encourage and enable students to:
- enjoy mathematics, develop curiosity and begin to appreciate its elegance and power
- 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

- develop confidence, perseverance and independence in mathematical thinking and problem-solving
- develop powers of generalization and abstraction
- apply and transfer skills to a wide range of real-life situations, other areas of knowledge and future developments
- appreciate how developments in technology and mathematics have influenced each other; the moral, social and ethical implications arising from the work of mathematicians and the applications of mathematics; the international dimension in mathematics; and the contribution of mathematics to other areas of knowledge
- develop the knowledge, skills and attitudes necessary to pursue further studies in mathematics
- develop the ability to reflect critically upon their own work and the work of others.

II. Curriculum overview

For MYP mathematics, schools can develop courses at two level of challenge: **standard** and **extended**.

Standard mathematics aims to provide a sound knowledge of basic mathematical principles. **Extended mathematics** supplements the standard curriculum with additional topics and skills, providing greater breadth and depth of study.

The MYP promotes sustained **inquiry** in mathematics by developing **conceptual understanding** within **global contexts**.

Key concepts such as *form*, *logic* and *relationships* broadly frame the MYP curriculum.

Related concepts promote deeper learning grounded in specific disciplines. Examples of related concepts in MYP mathematics include equivalence, measurement, quantity and justification.

Students explore key and related concepts through MYP **global contexts.**
- Identities and relationships
- Orientation in space and time
- Personal and cultural expression
- Scientific and technical innovation
- Globalization and sustainability
- Fairness and development

The MYP curriculum framework offers schools flexibility to determine engaging, relevant, challenging and significant content that meets local and national curriculum requirements. This inquiry-based curriculum explores factual, conceptual and debatable questions in the study of mathematics.

The MYP requires at least 50 hours of teaching time for each subject area in each year of the programme. For students participating in MYP eAssessment, the IB recommends 70 hours of guided learning each year in MYP years 4 and 5.

III. Assessment criteria

Each mathematics objective corresponds to one of four equally weighted assessment criteria. Each criterion has eight possible achievement levels (1–8), divided into four bands with unique descriptors that teachers use to make judgments about students' work.

Criterion A: Knowing and understanding
Students select and apply mathematics to solve problems in both familiar and unfamiliar situations in a variety of contexts, demonstrating knowledge and understanding of the framework's branches (number, algebra, geometry and trigonometry, statistics and probability).

Criterion B: Investigating patterns
Students work through investigations to become risk-takers, inquirers and critical thinkers.

Criterion C: Communicating
Students use appropriate mathematical language and different forms of representation when communicating mathematical ideas, reasoning and findings, both orally and in writing.

Criterion D: Applying mathematics in real-life contexts
Students transfer theoretical mathematical knowledge into real-world situations and apply appropriate problem-solving strategies, draw valid conclusions and reflect upon their results.

IV. MYP eAssessment

Students seeking IB MYP course results or the IB MYP Certificate must demonstrate their achievement of the subject group's objectives by completing an end-of-course on-screen examination. On-screen examinations are formal external examinations, and are available in **mathematics** and **extended mathematics**.

On-screen examinations address all four branches of mathematical study and may include any topics or skills in the MYP mathematics framework.

Examination blueprints define the structure of tasks that simulate, replicate and sample formative internal assessments. In MYP mathematics courses, on-screen examinations comprise three tasks.

Task	Assessment criteria	Marks
Knowing and understanding	Assesses knowledge and understanding of mathematics and communication of the approaches/method used (criteria A and C).	40
Investigating patterns	Assesses investigative skills in mathematics and the interpretation of findings using appropriate communication techniques (criteria B and C).	40
Applying mathematics in real-life contexts	Assesses ability to apply mathematics in a real-life, likely global, context. Students may be required to produce pieces of extended writing to evaluate and justify the validity of mathematics models (criteria C and D).	40

MYP mathematics on-screen examinations are aligned with understanding and skills that prepare students for high levels of achievement in IB Diploma Programme courses in **mathematics**.

Sample question

From a video recording, a researcher notes how many cars pass through a junction in Mexico City over a period of minutes, creating a data table that is also visualized as a graph.

The data can be modelled using the equation
$$y = -0.05x^2 + x + 6$$
where y represents the number of cars and x represents the time period in minutes.
- **Use** the equation to **calculate** the number of cars passing through the junction during [an indicated period].
- **Comment** on the validity of the answer(s) to your calculations.
- Use the equation **solved** for x to find the time when there are no cars passing the junction [extended mathematics assessment only].