SCHOOL OF THE NATIONS
聯國學校

# 2023-2025
# COURSE OUTLINE

## International Baccalaureate Mathematics
## Analysis and Approaches SL & HL
## Form 5 and Form 6

The School of the Nations course outline provides parents and students with information about the overall structure of the courses of study, the assessments and expectations.

## 1. Course Overview

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. These 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.

Mathematics is driven by abstract concepts and generalization. This mathematics is drawn out of ideas, and develops through linking these ideas and developing new ones. These mathematical ideas may have no immediate practical application. Doing such mathematics is about digging deeper to increase mathematical knowledge and truth. The new knowledge is presented in the form of theorems that have been built from axioms and logical mathematical arguments and a theorem is only accepted as true when it has been proven. The body of knowledge that makes up mathematics is not fixed; it has grown during human history and is growing at an increasing rate.

The side of mathematics that is based on describing our world and solving practical problems is often carried out in the context of another area of study. Mathematics is used in a diverse range of disciplines as both a language and a tool to explore the universe; alongside this its applications include analyzing trends, making predictions, quantifying risk, exploring relationships and interdependence.

While these two different facets of mathematics may seem separate, they are often deeply connected. When mathematics is developed, history has taught us that a seemingly obscure, abstract mathematical theorem or fact may in time be highly significant. On the other hand, much mathematics is developed in response to the needs of other disciplines.

The two mathematics courses available to Diploma Programme (DP) students express both the differences that exist in mathematics described above and the connections between them. These two courses might approach mathematics from different perspectives, but they are connected by the same mathematical body of knowledge, ways of thinking and approaches to problems. The differences in the courses may also be related to the types of tools, for instance technology, that are used to solve abstract or practical problems. The next section will describe in more detail the two available courses.

### International Mindedness

International-mindedness is a complex and multi-faceted concept that refers to a way of thinking, being and acting characterized by an openness to the world and a recognition of our deep interconnectedness to others.

Despite recent advances in the development of information and communication technologies, the global exchange of mathematical information and ideas is not a new phenomenon and has been essential to the progress of mathematics. Indeed, many of the foundations of modern mathematics were laid many centuries ago by diverse civilizations – Arabic, Greek, Indian and Chinese among others.

Mathematics can in some ways be seen as an international language and, apart from slightly differing notation, mathematicians from around the world can communicate effectively within their field. Mathematics can transcend politics, religion and nationality, and throughout history great civilizations have owed their success in part to their mathematicians being able to create and maintain complex social and architectural structures. Politics has dominated the development of mathematics, to develop ballistics, navigation and trade, and land ownership, often influenced by governments and leaders. Many early mathematicians were political and military advisers and today mathematicians are integral members of teams who advise governments on where money and resources should be allocated.

Science and technology are of significant importance in today's world. As the language of science, mathematics is an essential component of most technological innovation and underpins developments in science and technology, although the contribution of mathematics may not always be visible. Examples of this include the role of the binary number system, matrix algebra, network theory and probability theory in the digital revolution, or the use of mathematical simulations to predict future climate change or spread of disease. These examples highlight the key role mathematics can play in transforming the world around us.

One way of fostering international-mindedness is to provide opportunities for inquiry into a range of local and global issues and ideas. Many international organizations and bodies now exist to promote mathematics, and students are encouraged to access the resources and often-extensive websites of such mathematical organizations. This can enhance their appreciation of the international dimension of mathematics, as well as providing opportunities to engage with global issues surrounding the subject.

## 2. Course Aims

The aims of all DP mathematics courses are to enable students to:

1. develop a curiosity and enjoyment of mathematics, and appreciate its elegance and power
2. develop an understanding of the concepts, principles and nature of mathematics
3. communicate mathematics clearly, concisely and confidently in a variety of contexts
4. develop logical and creative thinking, and patience and persistence in problem solving to instil confidence in using mathematics
5. employ and refine their powers of abstraction and generalization
6. take action to apply and transfer skills to alternative situations, to other areas of knowledge and to future developments in their local and global communities
7. appreciate how developments in technology and mathematics influence each other
8. appreciate the moral, social and ethical questions arising from the work of mathematicians and the applications of mathematics
9. appreciate the universality of mathematics and its multicultural, international and historical perspectives
10. appreciate the contribution of mathematics to other disciplines, and as a particular "area of knowledge" in the TOK course
11. develop the ability to reflect critically upon their own work and the work of others
12. independently and collaboratively extend their understanding of mathematics.

## 3. Core Components

### 3.1 Creativity, Activity, Service (CAS)

The three strands of CAS are:

- Creativity - exploring and extending ideas leading to an original or interpretive product or performance
- Activity - physical exertion contributing to a healthy lifestyle
- Service - collaborative and reciprocal engagement with the community in response to an authentic need

CAS and mathematics can complement each other in a number of ways. Mathematical knowledge provides an important key to understanding the world in which we live, and the mathematical skills and techniques students learn in the mathematics courses will allow them to evaluate the world around them which will help them to develop, plan and deliver CAS experiences or projects.

An important aspect of the mathematics courses is that students develop the ability to systematically analyse situations and can recognize the impact that mathematics can have on the world around them. An awareness of how mathematics can be used to represent the truth enables students to reflect critically on the information that societies are given or generate, and how this influences the allocation of resources or the choices that people make. This systematic analysis and critical reflection when problem solving may be inspiring springboards for CAS projects.

Students may also draw on their CAS experiences to enrich their involvement in mathematics both within and outside the classroom, and mathematics teachers can assist students in making links between their subjects and students' CAS experiences where appropriate. Purposeful discussion about real CAS experiences and projects will help students to make these links.

The challenge and enjoyment of CAS can often have a profound effect on mathematics students, who might choose, for example, to engage with CAS in the following ways:

- plan, write and implement a "mathematics scavenger hunt" where younger students tour the school answering interesting mathematics questions as part of their introduction to a new school
- as a CAS project students could plan and carry out a survey, create a database and analyse the results, and make suggestions to resolve a problem in the students' local area. This might be, for example, surveying the availability of fresh fruit and vegetables within a community, preparing an action plan with suggestions of how to increase availability or access, and presenting this to a local charity or community group
- taking an element of world culture that interests students and designing a miniature Earth (if the world were 100 people) to express the trend(s) numerically.

### 3.2 Theory of Knowledge

The relationship between each subject and theory of knowledge (TOK) is important and fundamental to the DP. The theory of knowledge course provides an opportunity for students to reflect on questions about how knowledge is produced and shared, both in mathematics and also across different areas of knowledge. It encourages students to reflect on their assumptions and biases, helping them to become more aware of their own perspective and the perspectives of others and to become "inquiring, knowledgeable and caring young people" (IB mission statement).
As part of their theory of knowledge course, students are encouraged to explore tensions relating to knowledge in mathematics. As an area of knowledge, mathematics seems to supply a certainty perhaps impossible in other disciplines and in many instances provides us with tools to debate these certainties. This may be related to the "purity" of the subject, something that can sometimes make it seem divorced from reality. Yet mathematics has also provided important knowledge about the world and the use of mathematics in science and technology has been one of the driving forces for scientific advances.

Despite all its undoubted power for understanding and change, mathematics is in the end a puzzling phenomenon. A fundamental question for all knowers is whether mathematical knowledge really exists independently of our thinking about it. Is it there, "waiting to be discovered", or is it a human creation? Indeed, the philosophy of mathematics is an area of study in its own right.

### 3.3 Extended Essay

An EE in mathematics is intended for students who are writing on any topic that has a mathematical focus, it need not be confined to the theory of mathematics itself. Mathematical research is a long-term and open-ended exploration of a set of related mathematical problems that are based on personal observations. The answers to these problems connect to and build upon each other over time.

Mathematics essays are divided into six categories where students will demonstrate an in-depth analysis of a question or problem that has a mathematical focus. The investigation might, for example, focus on:

• the applicability of mathematics to solve both real and abstract problems

• the beauty of mathematics, as in, for instance, geometry or fractal theory

• the elegance of mathematics in the proving of theorems as in, for example, number theory

• the origin and subsequent development of a branch of mathematics over a period of time, measured in tens, hundreds or thousands of years

• the links between different branches of mathematics, or the way that branch of mathematics has been born, or has flourished, as a result of technology.

Students will be advised on the importance of formulating logical and coherent reasons for selecting a particular topic for the EE, the need to identify a well-thought-out research question and the requirement to search for the mathematical problems that require a solution.

A primary source of research in mathematics involves data-gathering, visualization, abstraction, conjecturing and proof. Throughout the EE students should communicate mathematically: describing their way of thinking; writing definitions and conjectures; using symbols, theorems, graphs and diagrams; justifying their conclusions; and reading mathematics

## 4. Course Content

| Syllabus Component | Recommended Teaching Hours | |
|---|---|---|
| | SL | HL |
| **Core content** | **150** | **240** |
| Topic 1—Number and Algebra | **19** | **39** |
| Topic 2—Functions | **21** | **32** |
| Topic 3—Geometry and Trigonometry | **25** | **51** |
| Topic 4—Statistics and Probability | **27** | **33** |
| Topic 5—Calculus | **28** | **55** |
| **Toolkit**<br>The toolkit and the mathematical exploration<br>Investigative, problem-solving and modelling skills development leading to an individual exploration. The exploration is a piece of written work that involves investigating an area of mathematics. | **30** | **30** |
| **Total teaching hours** | **150** | **240** |

## 5. IB Approaches to Teaching and Learning

Approaches to teaching and learning are deliberate strategies, skills and attitudes that permeate the IB teaching and learning environment.

**The approaches to *teaching* are:**

- focused on conceptual understanding
- developed in local and global contexts
- focused on effective teamwork and collaboration
- differentiated to meet the needs of all learners
- informed by formative and summative assessment

**The approaches to *learning* are:**

- Thinking skills
- Communications skills
- Social skills
- Self-management skills
- Research skills

## 6. IB Learner Profile

The aim of the IB programme is to develop internationally minded people who, recognizing their common humanity and shared guardianship of the planet, help to create a better and more peaceful world.

IB learners strive to be:

- Inquirers
- Knowledgeable
- Thinkers
- Communicators
- Principled
- Open-minded
- Caring
- Risk-Takers
- Balanced
- Reflective

The IB Learner Profile closely reflects the SON Learner Profile, identifying elements of identity which prepares world citizens who will become active, positive and conscientious participants in the advancement of society and in their own development. Each element is composed of a set of attitudes, qualities, understandings, skill and habits. These are incorporated in the teaching and learning process. The details of the SON Learner Profile can be found in the Student and Parent Handbook.

## 7. Grading

### 7.1 School Internal Grades

#### 7.1.1 *Academic Achievement*

The School's grading system for the IB Diploma Programme follows the IBO scale of 1 to 7. A student's performance in individual subjects is graded as follows:

| Grade | Interpretation |
|---|---|
| 7 | Excellent |
| 6 | Very Good |
| 5 | Good |
| 4 | Satisfactory |
| 3 | Basic Standard |
| 2 | Poor |
| 1 | Very Poor |

Note: Because of School's internal requirements such as attendance, timeliness and accuracy of homework, special projects, or performance on formative and summative tests in the classroom, students' performance may vary between School assigned grades and IB assessments.

#### *7.1.2 Effort*

Effort marks are given and recorded in the report cards for Forms 5 and 6 for all subjects.

| Grade | Descriptor |
|---|---|
| 5 | Consistently demonstrating a high degree of effort in all areas of the subject |
| 4 | Frequently demonstrating a high degree of effort in all areas of the subject |
| 3 | Generally demonstrating a significant degree of effort in all areas of the subject |
| 2 | Occasionally demonstrating effort in some areas of the subject |
| 1 | Rarely, if ever, demonstrating effort in some areas of the subject |

#### *7.1.3 Project Week (Form 5 only)*

The mid-year assessment is comprised of a full week of collaborative project-based learning. During the project week students develop various cross curricular soft skills. Assessment and reporting of learning is based on the following rubric.

| Project Week Assessment Rubric |
|---|

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| | | Emerging 萌芽 | | Achieving 實現中 | Excelling 優秀 | |
| **Collaboration**<br>**合作** | She/he demonstrates effective collaboration skills by:<br>• actively contributing to the group's processes of planning, decision making and action<br>• being sensitive and respectful towards others and as well as responsive to their needs<br>• actively listening to others' points of view and considering others' perspective willingly<br>• fully supporting and whole-heartedly applying the decisions of the group<br>• completing assigned tasks effectively and using feedback from others to improve work<br>• supporting others to achieve their goal<br>她/他通過以下方式展示有效的合作技能：<br>• 積極參與團隊的計劃、決策和行動流程<br>• 對他人善解人意和尊重，並回應他們的需求<br>• 積極傾聽他人的觀點，樂意地考慮他人的觀點<br>• 完全支持並全心全意地應用團隊的決定<br>• 有效完成分配的任務並利用他人的反饋改善工作成果<br>• 支持他人實現目標 | | | | | |
| **Organisation**<br>**組織** | She/he demonstrates effective organisation skills by:<br>• having a clear goal and a thought-through plan of how to achieve it<br>• being methodical and systematic in approach<br>• following through with assigned tasks in a timely manner<br>• monitoring progress and addressing challenges<br>• staying focused on tasks and remaining positive despite challenges<br>她/他通過以下方式展示有效的組織技能：<br>• 有一個明確的目標，並對如何實現目標有一個深思熟慮的計劃<br>• 方法有條理和系統化<br>• 及時完成分配的任務<br>• 監測進展並應對挑戰<br>• 專注於任務並在面臨挑戰時保持積極的態度 | | | | | |
| **Research and Critical Thinking**<br>**研究及批判性思維** | She/he demonstrates critical thinking skills by:<br>• striving to independently investigate and understand issues<br>• actively seeking answers to questions<br>• investigating the purpose, evidencing research and producing reasoning<br>• being open-minded and fair-minded when considering new ideas and perspectives<br>• making connections by looking for links between ideas and concepts<br>• seeking out reliable and accurate information through independent research<br>她/他通過以下方式展示批判性思維技能：<br>• 努力獨立調查和理解問題<br>• 積極尋求問題的答案<br>• 調查目的、證明研究和推理<br>• 在考慮新想法和觀點時保持開放和公正的態度<br>• 通過尋找想法和概念之間的聯繫來建立連結<br>• 通過獨立研究尋找可靠和準確的信息 | | | | | |
| **Presentation**<br>**報告及展示** | She/he demonstrates effective presentation skills by:<br>• ensuring the group's presentation/project uses relevant, well-chosen descriptions/facts/details<br>• ensuring the group's presentation/project includes all the required elements<br>• ensuring the presentation/project is well structured and coherent<br>• ensuring the presentation stays within the allocated frame<br>• keeping eye contact with the audience (most of the time)<br>• using a clear voice with appropriate tone and volume<br>• using appropriate language, demonstrating command of formal English<br>• responding to questions from the audience<br>她/他通過以下方式展示有效的報告技能：<br>• 確保小組的展示文稿/項目使用相關的、精心挑選的描述/事實/細節<br>• 確保小組的展示/項目包括所有必需的元素<br>• 確保展示/項目結構良好且連貫一致<br>• 確保展示文稿保持在分配的框架內 | | | | | |

| | | | | |
|---|---|---|---|---|
| | • 與觀眾保持目光接觸（大部分時間）<br>• 使用清晰的聲音和適當的語氣和音量<br>• 使用適當的語言，表現出對正式英語的掌握<br>• 回答觀眾的問題 | | | |
| **Reflection 學生反思** | She/he demonstrates effective reflection skills by:<br>• effectively analysing experiences to identify those which have led to growth/learning<br>• accurately identifying areas of strength and weakness<br>• generating creative solutions to problems/ways to improve in the future<br>• demonstrating the ability actively and effectively reflect with her/his team members<br>她/他通過以下方式展示有效的學生反思技能：<br>• 有效地分析經驗以確定那些經驗導致成長/學習<br>• 準確識別優勢和劣勢領域<br>• 為問題提出創造性的解決方案/未來改善的方法<br>• 展示積極有效地與團隊成員進行反思的能力 | | | |

### 7.2 IB Subject Grade Descriptors

The following outlines the IB subject specific grade descriptors:

| Grade | Descriptor |
|---|---|
| 7 | Demonstrates a thorough knowledge and comprehensive understanding of the syllabus; successfully constructs and applies mathematical arguments at a sophisticated level in a wide variety of contexts; successfully uses problem solving techniques in challenging situations; recognizes patterns and structures, makes generalizations and justifies conclusions; understands and explains the significance and validity of results, and draws full and relevant conclusions; communicates mathematics in a clear, effective and concise manner, using correct techniques, notation and terminology; demonstrates the ability to integrate knowledge, understanding and skills from different areas of the course; uses technology correctly in challenging situations—makes efficient use of calculator's functionality when required. |
| 6 | Demonstrates a broad knowledge and comprehensive understanding of the syllabus; successfully constructs and applies mathematical arguments in a variety of contexts; uses problem solving techniques in challenging situations; recognizes patterns and structures, and makes some generalizations; understands and explains the significance and validity of results, and draws relevant conclusions; communicates mathematics in a clear and effective manner, using correct techniques, notation and terminology; demonstrates some ability to integrate knowledge, understanding and skills from different areas of the course; uses technology correctly in routine situations—makes efficient use of calculator's functionality when required. |
| 5 | Demonstrates a broad knowledge and good understanding of the syllabus; applies mathematical arguments in performing routine tasks; successfully uses problem solving techniques in routine situations; successfully carries out mathematical processes in a variety of contexts, and recognizes patterns and structures; understands the significance of results and draws some conclusions; communicates mathematics effectively, using appropriate techniques, notation and terminology; demonstrates an awareness of the links between different areas of the course; makes use of calculator's functionality when required (this use may occasionally be inefficient). |

| | |
|---|---|
| 4 | Demonstrates a satisfactory knowledge of the syllabus; applies mathematical arguments in performing some routine tasks; uses problem solving techniques in routine situations; successfully carries out mathematical processes in straightforward contexts; shows some ability to recognize patterns and structures; has limited understanding of the significance of results and attempts to draw some conclusions; communicates mathematics adequately, using some appropriate techniques, notation and terminology; makes some use of calculator's functionality, but perhaps not always when required (this use may occasionally be inefficient ). |
| 3 | Demonstrates partial knowledge of the syllabus and limited understanding of mathematical arguments in performing some routine tasks; attempts to carry out mathematical processes in straightforward contexts; makes an attempt to use problem solving techniques in routine situations; communicates some mathematics, using some appropriate techniques, notation or terminology; occasionally uses calculator's functionality, but often inefficiently—does not always use it when required and may use an inefficient analytic approach. |
| 2 | Demonstrates limited knowledge of the syllabus; attempts to carry out mathematical processes at a basic level; communicates some mathematics, but often uses inappropriate techniques, notation or terminology; unable to use calculator correctly when required—questions exclusively requiring the use of the GDC are generally not attempted. |
| 1 | Demonstrates minimal knowledge of the syllabus; demonstrates little or no ability to use mathematical processes, even when attempting routine tasks; communicates only minimal mathematics and consistently uses inappropriate techniques, notation or terminology; is unable to make effective use of technology. |

## 8. Assessments

### 8.1 Assessment 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. Having followed a DP mathematics course, 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 abstract and real-world 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; use appropriate notation and terminology.

**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 from the real world, involving organizing and analyzing information, making conjectures, drawing conclusions, and testing their validity.

### 8.2 School-based Assessments

School-based assessments are ongoing and are intended to measure student learning and provide constructive feedback. These assessments include a variety of formative and summative assessments. Forms of assessment vary and may include but are not limited to assessment tools such as quizzes, topic tests, and observational evidence during lessons.

For details about the assessment policy please refer to the SON Assessment System (Policy) updated JUNE2023

#### *8.2.1 Weightages*

The following represents the percentage weight for each academic year:

| | Term 1 | Term 2 | Mid-Year Assessment | Term 3 | Final Exam |
|---|---|---|---|---|---|
| **Form 5** | 28% | 28% | Project Week<br>See passing criteria | 28% | 16% |
| **Form 6** | 30% | 30% | Mid-Year Exam<br>15% | N/A | 25% |

#### *8.2.2 Passing Criteria*

F5 Students whose total score is 23 points or above in the six IB Subject Groups will be promoted to the next level, along with:

- satisfactory completion of the Extended Essay requirements for DP year 1
- a final mark of a C or higher in Theory of Knowledge for year 1
- satisfactory completion of CAS (Creativity, Action & Service) activities for year 1
- a total of 12 HL points for students who are on the full diploma track
- no grade 2 or lower in any Higher Level (HL) subject
- the grade for project week is a 3 (out of 5) or higher

To graduate from Secondary at the end of F6, students must gain 23 points or above in the six IB Subject Groups, along with:

- completion of the Extended Essay
- a final mark of a C or higher in Theory of Knowledge
- completion of CAS (Creativity, Action and Service) activities
- a total of 12 HL points for students who are on the full diploma track
- no grade 2 or lower in any Higher Level (HL) subject

Should a student's academic performance falls below standard, the School reserves the rights of not registering a student for the full diploma track.

### 8.3 Official IBDP Assessments

#### *8.3.1 Internal Assessment*

Internal assessment is an integral part of the course and is compulsory for both SL and HL students. It enables students to demonstrate the application of their skills and knowledge and to pursue their personal interests without the time limitations and other constraints that are associated with written examinations. The internal assessment should, as far as possible, be woven into normal classroom teaching and not be a separate activity conducted after a course has been taught.

The internal assessment requirements at SL and at HL is an individual exploration. This is a piece of written work that involves investigating an area of mathematics. It is marked according to five assessment criteria.

| Presentation | Mathematical Communication | Personal Engagement | Reflection | Use of Mathematics | Total |
|---|---|---|---|---|---|
| 4 (20%) | 4 (20%) | 3 (15%) | 3 (15%) | 6 (30%) | 20 (100%) |

### *8.3.2 External Assessment Components*

*Assessment Objectives*

| Assessment Objectives | Paper 1 (%) | Paper 2 (%) | Paper 3 (%) (HL only) | Exploration (5) |
|---|---|---|---|---|
| **Knowledge and understanding** | 20-30 | 15-25 | 10-20 | 5-15 |
| **Problem solving** | 20-30 | 15-25 | 20-30 | 5-20 |
| **Communication and interpretation** | 20-30 | 15-25 | 15-25 | 15-25 |
| **Technology** | 0 | 25-35 | 10-30 | 5-25 |
| **Reasoning** | 5-15 | 5-10 | 10-20 | 5-25 |
| **Inquiry Approaches** | 10-20 | 5-10 | 15-30 | 25-35 |

**Paper 1:** Students are not permitted access to any calculator. Questions will mainly involve analytic approaches to solutions, rather than requiring the use of a GDC. The paper is not intended to require complicated calculations, with the potential for careless errors. However, questions will include some arithmetical manipulations when they are essential to the development of the question.

**Paper 2:** Students must have access to a GDC at all times. However, not all questions will necessarily require the use of the GDC.

**Paper 3:** Higher Level only – Problem solving questions

### *8.3.3 External Assessment Details - Standard Level*

**External assessment (3 hours)**
**Paper 1: No Technology Allowed**
Duration: 90 Minutes
Weighting: 40%
Marks: 80
Comprised of two sections

- Section A Compulsory short-response questions based on the syllabus.
- Section B Compulsory extended-response questions based on the syllabus.

**Paper 2: Technology Allowed – Graphical Display Calculator (GDC)**
Duration: 90 Minutes
Weighting: 40%
Marks: 80
Comprised of two sections

- Section A Compulsory short-response questions based on the syllabus.
- Section B Compulsory extended-response questions based on the syllabus.

### *8.3.3b External Assessment Details - Higher Level*

**External assessment (5 hours)**
**Paper 1: No Technology Allowed**
Duration: 120 Minutes
Weighting: 30%
Marks: 110
Comprised of two sections

- Section A Compulsory short-response questions based on the syllabus.
- Section B Compulsory extended-response questions based on the syllabus.

**Paper 2: Technology Allowed – Graphical Display Calculator (GDC)**
Duration: 120 Minutes
Weighting: 30%
Marks: 110
Comprised of two sections

- Section A Compulsory short-response questions based on the syllabus.
- Section B Compulsory extended-response questions based on the syllabus.

**Paper 3: Technology Allowed**

Duration: 60 Minutes
Weighting: 20%
Marks: 55
Two compulsory extended response problem-solving questions

## 9. Academic Integrity

Students are expected to uphold a high standard of academic honesty and integrity. All homework, assignments, tests and exams are expected to represent the student's own effort. All forms of cheating or copying on assignments, tests or exams, plagiarism and other forms of deception to obtain credit are universally recognized as improper and dishonest conduct. Such behaviour is not acceptable and marks will not be awarded for work that does not represent the students' personal effort. For details of the policy regarding academic integrity please refer to Student and Parent Handbook.

## 10. Late Submission of Work

Assignments and homework are an important component of the teaching-learning process and are expected to be completed with quality and submitted on time. Assignments and homework tasks will be posted Managebac.

The following policy will apply for late work submission:

**School-based Assessments**

Late submission of work may result in a lower effort grade.

**IB Official Assessments**

Students may receive a zero for a given component of work if it is not submitted by the assigned deadline. Missing any of the required component grades may result in 'no grade' in the official IB results.

## 11. Classroom Materials and Procedures

Students will need to bring the following items to their lessons unless otherwise specified by the teacher:

- notebook
- folders
- assigned textbook and workbooks
- pen, pencil, eraser, ruler, highlighter
- calculator and a graphical display calculator

Students will be informed in advance if any additional items, such as laboratory coats, safety goggles or other items are expected to be purchased.