

## GROUP 5 – MATHEMATICS

- 1. Mathematics: analysis and approaches:  
(In BISC offered as HL course)**
- 2. Mathematics: applications and interpretation  
(In BISC offered as SL course)**

### **What is the difference between Mathematics: analysis and approaches and Mathematics: applications and interpretation?**

**“Mathematics: analysis and approaches** is for students who enjoy developing their mathematics to become fluent in the construction of mathematical arguments and develop strong skills in mathematical thinking. They will also be fascinated by exploring real and abstract applications of these ideas, with and without technology. Students who take Mathematics: analysis and approaches will be those who enjoy the thrill of mathematical problem solving and generalization.” (Mathematics: analysis and approaches guide. First assessment 2021)

Students **are not allowed to use a calculator** in exam Paper 1.

BISC offers this subject on Higher Level only.

**“Mathematics: applications and interpretation** is for students who are interested in developing their mathematics for describing our world and solving practical problems. They will also be interested in harnessing the power of technology alongside exploring mathematical models. Students who take Mathematics: applications and interpretation will be those who enjoy mathematics best when seen in a practical context.” (Mathematics: applications and interpretation guide. First assessment 2021)

Students **are allowed to use a Graphic Display Calculator** in all exam papers.

BISC offers this subject on Standard Level only.

### **What prior knowledge is needed?**

Mathematics is a linear subject, and so it is expected that students will have studied the subject for at least 10 years. The following list of topics is considered to be prior learning for both courses.

#### **Number and algebra:**

Number systems: natural numbers  $\mathbb{N}$ ; integers,  $\mathbb{Z}$ ; rationals,  $\mathbb{Q}$ , and irrationals; real numbers,  $\mathbb{R}$ , SI (Système International) units for mass, time, length, area and volume and their derived units, eg. speed.

Rounding, decimal approximations and significant figures, including appreciation of errors.

Definition and elementary treatment of absolute value (modulus),  $a$ .

Use of addition, subtraction, multiplication and division using integers, decimals and fractions, including order of operations.

Prime numbers, factors (divisors) and multiples.

Greatest common factor (divisor) and least common multiples (HL only).

Simple applications of ratio, percentage and proportion.

Manipulation of algebraic expressions, including factorization and expansion.

Rearranging formulae.

Calculating the numerical value of expressions by substitution.

Evaluating exponential expressions with simple positive exponents.

Evaluating exponential expressions with rational exponents (HL only).

Use of inequalities,  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ , intervals on the real number line.

Simplification of simple expressions involving roots (surds or radicals).

Rationalising the denominator (HL only).

Expression of numbers in the form  $a \times 10^k$ ,  $1 \leq a < 10$ ,  $k \in \mathbb{Z}$ .

Familiarity with commonly accepted world currencies.

Solution of linear equations and inequalities.

Solution of quadratic equations and inequalities with rational coefficients (HL only).

Solving systems of linear equations in two variables.

Concept and basic notation of sets. Operations on sets: union and intersection.

Addition and subtraction of algebraic fractions (HL only).

### **Functions**

Graphing linear and quadratic functions using technology.

Mappings of the elements of one set to another. Illustration by means of sets of ordered pairs, tables, diagrams and graphs.

### **Geometry and trigonometry**

Pythagoras' theorem and its converse.

Mid-point of a line segment and the distance between two points in the Cartesian plane.

Geometric concepts: point, line, plane, angle. Angle measurement in degrees, compass directions.

The triangle sum theorem.

Right-angle trigonometry, including simple applications for solving triangles. Three-figure bearings.

Simple geometric transformations: translation, reflection, rotation, enlargement.

The circle, its centre and radius, area and circumference. The terms diameter, arc, sector, chord, tangent and segment.

Perimeter and area of plane figures. Properties of triangles and quadrilaterals, including parallelograms, rhombuses, rectangles, squares, kites and trapezoids; compound shapes

Familiarity with three-dimensional shapes (prisms, pyramids, spheres, cylinders and cones).

Volumes and surface areas of cuboids, prisms, cylinders, and compound three-dimensional shapes.

### **Statistics and probability**

The collection of data and its representation in bar charts, pie charts, pictograms, and line graphs.

Obtaining simple statistics from discrete data, including mean, median, mode, range.

Calculating probabilities of simple events.  
Venn diagrams for sorting data.  
Tree diagrams.

### Calculus

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

(Based on:

Mathematics: analysis and approaches guide. First assessment 2021

Mathematics: applications and interpretation guide. First assessment 2021)

## IMPORTANT!

All students are required to have one of the following models of a Graphic Display Calculator.

- TI-84 Plus CE
- TI-84 Plus C Silver Edition
- TI-84 Plus Silver Edition
- TI-84 Plus



## Mathematics: analysis and approaches HL

- What is the nature of the subject?

The course puts a strong emphasis on acquiring the ability to construct, communicate and justify correct mathematical arguments, not forgetting the need of appropriate and creative use of technology, e.g. Graphic Display Calculator or computer software. It includes topics that are part of traditional pre-university courses (e.g. functions, trigonometry, calculus) as well as those in which students develop skills of mathematical investigation, making conjectures and constructing proofs (e.g. sequences and series, proofs). It is designed for future analytical experts for the world of innovations, which more and more depend on deep understanding of mathematics.

- **What requirements are there to choose Mathematics: analysis and approaches HL?**

Requirements to enter Higher Level course are to achieve a grade A\* in the IGCSE exam or pass the Entry Test with a mark of 77.5%. The entry test is based on the prior knowledge topics.

- **How is it useful apart from enabling you to get an ID diploma?**

Studying Mathematics will enable you to communicate efficiently in various contexts; develop logical, critical and creative thinking; develop patience and persistence in problem solving; improve your ability of abstraction and generalisation; apply and transfer skills to alternative situations and other areas of knowledge; appreciate the contribution to other disciplines, particularly in the TOK course.

## **Mathematics: applications and interpretation SL**

- **What is the nature of the subject?**

The course prides itself on being practical and therefore it is focusing on topics that are often used as applications of mathematics or in mathematical modelling. However the course also includes topics that are traditionally part of a pre-university mathematics course such as calculus and statistics to give students better understanding of all the further concepts. . Students will develop their mathematical thinking by solving practical problems and using technology to justify conjectures.

**A Graphical Display Calculator is required and allowed for all parts of the final exam**

- **What requirements are there to choose Mathematics: applications and interpretation SL?**

IGCSE grade A\* - C or equivalent is recommended.

- **How is it useful apart from enabling you to get an ID diploma?**

Studying Mathematics will enable you to communicate efficiently in various contexts; develop logical, critical and creative thinking; develop patience and persistence in problem solving; improve your ability of abstraction and generalisation; apply and transfer skills to alternative situations and other areas of knowledge; appreciate the contribution to other disciplines, particularly in the TOK course.