

MATHEMATICAL INTERPRETATIONS & LEVEL 1 - IB MATH APPLICATIONS & INTERPRETATIONS YEAR 1 FRAMEWORK

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INTRODUCTION

This course recognizes the increasing role that mathematics and technology play in a diverse range of fields in a data-rich world. As such, it emphasizes 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. This course is for students interested in social sciences, natural sciences, medicine, statistics, business, engineering, some economics, psychology, and design.

PRIOR LEARNING TOPICS

It is expected that all students have extensive previous mathematical experiences, but these will vary. In order to enroll in year one, CAISL's students are expected to have successfully completed Geometry and Algebra II. If a student is coming from another school, we expect equivalent courses.

EXPECTATIONS

INFORMATION TECHNOLOGY EXPECTATIONS

Graphic Display Calculator and Computer

Students are expected to use a graphic display calculator both in class and during assessments. The math department recommends the use of the TI – 84 plus model.

Students are also expected to use Geogebra or Excel to produce graphical representations or table of values. (Geogebra: <https://www.geogebra.org/?lang=pt-PT>)

PERFORMANCE INDICATORS

MATH PRACTICES

Explanations of Math Practices: By the end of the year students will be expected to problem solve, reason mathematically, and communicate efficiently according to grade level expectations. See link below: https://www.caislisbon.org/uploaded/Curriculum_links/Math/Math_Practice_Progressions_5-12.pdf

PROBLEM SOLVING

Make sense of problems and persevere in solving them
Look for and make use of structure (Deductive Reasoning)
Look for and express regularity in repeated reasoning (Inductive Reasoning)
Reason abstractly and quantitatively
Construct viable arguments and critique the reasoning of others
Model with mathematics
Use appropriate tools strategically
Attend to precision

MATH CONCEPTS

Number and Algebra

The student identifies, manipulates and classifies numbers. (Number and Number Sense)

The student develops, chooses and uses appropriate methods to solve problems. (Computation/ Estimation)

Standard Level Content:

Determine scientific notation, estimate percentage errors, and calculate basic units in the metric system.

Use the laws of exponents with integer exponents.

Use technology to solve: Systems of linear equations in up to 3 variables and polynomial equations.

Understand the concepts underlying certain financial transactions, including currency conversions, compound interest, mortgage amortization, interest and inflation rates, and investment schemes as well as evaluate numerically logarithms.

Understand how to convert currencies, calculate simple and compound interest, and calculate depreciation.

Advanced Study/ Higher Level:

Students wishing to pursue advanced study (including IB HL) will also study the following:

Represent abstract quantities using complex numbers in different forms to solve real-life problems.

Use matrices to organize data so that they can be manipulated, and relationships can be determined.

Use the concept of a limit to find the sum of an infinite series.

Convert between Cartesian, polar and exponential forms, by hand and with technology.

Calculate products, quotients and integer powers in polar or exponential forms.

Add sinusoidal functions with the same frequencies but different phase shift angles.

Functions

The student finds associations between two variables and represents these algebraically and graphically. (Functions)

Standard Level Content:

Use different representations of functions, symbolically and visually as graphs, equations and tables to provide different ways to communicate mathematical relationships.

Identify a function, domain, and range of a graph.

Identify that by changing the parameters of a trigonometric function the position, orientation and shape of the corresponding graph changes.

Use different representations of functions (linear, quadratic, exponential, cubic, direct/inverse variation, sinusoidal) which facilitate modelling and interpretation of physical, social, economic and mathematical phenomena, which support solving real-life problems.

Advanced Study/ Higher Level:

Students wishing to pursue advanced study (including IB HL) will also study the following:

Use composite functions and find the inverse function including domain restriction.

Perform transformations on all functions in the context of real world situations.

Use models of functions to calculate half-life, natural logarithmic models, logistic models and piecewise models.

Geometry and Trigonometry

The student has a developed sense of spatial awareness. (Geometry)

Standard Level Content:

Find the distance between two points in three-dimensional space, and their midpoint.

The size of an angle between two intersecting lines or between a line and a plane.

Understand the geometry of three-dimensional shapes, prisms, pyramids, spheres and cones.

Determine the area of various geometric figures.

Use relationships between the length of the sides and the size of the angles in a triangle to solve problems involving position, distance, angles and area.

In a circle, find the area of a sector and length of an arc.

Use the Voronoi diagram to navigate, path-find or establish an optimum position.

Advanced Study/ Higher Level:

Students wishing to pursue advanced study (including IB HL) will also study the following:

Use the definition of a radian and convert between degrees and radians as well as use radians to calculate areas of sectors and arc length.

Use the unit circle, the definition of $\cos \theta$, $\sin \theta$ and $\tan \theta$ and the Pythagorean identity.

Solve trigonometric equations graphically in a finite interval.

Transform points in two dimensions using matrices: reflections, horizontal and vertical stretches, enlargements, translations and rotations and the compositions.

Use vectors to determine position, change of position (movement) and force in two and three-dimensional space.

Use graph theory to represent networks and to model complex real-world problems

Use matrices to show the parameters or quantities of several linear equations simultaneously.

Calculus

The student represents words using variables and applies operations to these. (Algebra)

Standard Level Content:

Identify the links between the derivative and the rate of change and interpret the meaning of this in context.

Identify the relationship between the integral and area and interpret the meaning of this in context.

Find patterns in the derivatives of polynomials and their behavior of the function at any given point or instant.

Use the principles of calculus to approximate nature and areas in the physical world.

Optimize a function to find the largest or smallest value that a function and apply that value to a specific set of conditions to solve problems.

Find maximum and minimum points to solve optimization problems.

Identify and apply the idea that the area under a function on a graph has a meaning and has applications in space and time.

Advanced Study/ Higher Level:

Students wishing to pursue advanced study (including IB HL) will also study the following:

Use kinematics to describe the motion and direction of objects in closed systems in terms of displacement, velocity, and acceleration.

Model physical phenomena using differential equations and analytic and numeric methods to calculate optimum quantities.

Use phase portraits to visualize the behavior of dynamic systems.

ASSESSMENT

For students to receive a credit towards their High School Diploma and/or IB diploma, they must demonstrate proficiency on:

Summative assessments set by the class teacher which may take the form of

- in-class or out-of-class projects
- tests and quizzes which assess both knowledge and skill acquisition
- A final exam at the end of the year which covers material from the syllabus

FURTHER CURRICULAR EXPECTATIONS**Notebook**

- Math notebooks are an independent responsibility of the student.
- Students are expected to keep an organized notebook with notes from class, work done at home.

Scientific Writing

Students are expected to use the equation tool from word office to write all mathematical notation.