أكاديمية جيمز العالمية – دبي
GEMS World Academy
DUBAI

COURSE SYLLABUS
Standard Math Year 4/Grade 9
MIDDLE YEARS PROGRAMME
2019 2020

COURSE OVERVIEW

Math MYP4 is the fourth course in a five year integrated math program which incorporates the study of number, algebra, geometry and trigonometry, probability and statistics and discrete math. The course includes a review of numbers and focuses on Algebra, Trigonometry and Polynomials.

LEARNING OUTCOMES

The aims of all MYP subjects state what a teacher may expect to teach and what a student may expect to experience and learn. These aims suggest how the student may be changed by the learning experience.
The aims of MYP mathematics 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
- appreciate the moral, social and ethical implications arising from the work of mathematicians and the applications of mathematics
- appreciate the international dimension in mathematics through an awareness of the universality of mathematics and its multicultural and historical perspectives
- appreciate 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.

Unit 1 – Numbers
Approximate Length: 4 Weeks

The ability to work with numbers is an essential skill in mathematics. Students are expected to have an understanding of number concepts and to develop the skills of calculation and estimation. Students should understand that the use of numbers to express patterns and to describe real-life situations goes back to humankind's earliest beginnings, and that mathematics has multicultural roots.

Some topics that will be discussed, but not limited to:

Rounding

- **Convert** to standard form e.g. a ×
- 10n , 1≤ a <10 , k ∈ Z.
- **Round** to the nearest (3) **significant figure** and decimal places(**all answers on summative need to be rounded to 3 significant figures)**
- **Using** appropriate forms of rounding to estimate results

Indices , percentage and Surds

- **Brief review** of index laws
- **Evaluate and solve** negative and fractional indices, both numeric and algebraic
- **Solve** functions involving indices (Finding unknown values only. No graphing required) **by applying** index laws
- **Apply** knowledge of exponential functions to solve for real life problems involving growth & decay, depreciation
- **Perform** all operations with surds: addition, subtraction, multiplication and division

- **Simplify** surd e.g. 8=22
- **Identify** irrational numbers in surd form
- **Rationalise** the denominator
- **Solve** absolute value equations

Sets and Venn Diagrams

- **Set notation**
- **Introduce** terminology (element, null set, universal set, subset, union, intersection, etc.)
- Shading areas
- **List** elements in a set
- **Place** elements in a set (up to 3 circles)
- Problem **solving** using sets (worded questions involving algebra)

Unit 2 – Algebra
Approximate Length: 8 Weeks

Algebra is an abstraction of the concepts first used when dealing with number and is essential for further learning in mathematics. Algebra uses letters and symbols to represent numbers, quantities and operations, and employs variables to solve mathematical problems.
Students who wish to continue studying mathematics beyond the MYP will require knowledge of concepts and skills in algebra. Teachers should assist students' understanding of algebra by using real-life contexts for the application of algebraic knowledge and skills in problem-solving situations. To develop deeper problem-solving understanding, algebra topics can be linked to modelling, representations and connections.

Some topics that will be discussed, but not limited to:

Algebra Skills Review

- **Revision** of expansion Laws
- **Revision** of factorization(diff of two squares, perfect square)
- **Factorising** and **expanding** special products (diff of two squares, the perfect square, and
- (x - 4)2)
- **Factoring** Quadratic Trinomials (monic, **teach non-monic** with a common factor, **non-monic without a common factor**)
- **Factorise non-monic quadratic by using** four term expressions by grouping
- **Solve** using the quadratic formula
- **Solve** equations involving algebraic fractions
- **Simplify** complex algebraic fractions (+,-,/,x with algebraic expressions in the denominator and with quadratics

Linear Functions (review)

- **Review** Linear functions, distance, midpoint, slope, forms of a line (slope-intercept and general)
- **Problem Solving** with linear functions
- **Finding** the point of intersection by graphing using GDC, elimination and substitution
- **Graphing** systems of linear inequalities on a Cartesian Plane and shading in/out the region that is required

Quadratic Functions

- **Introduce** 'x-intercept/ solution/ root/ zeros' and 'vertex/turning point/ minimum or maximum'
- **Look** for quadratic relationships in real life
- **Identify** key features using GDC
- **Graph** on the Cartesian Plane
- **Find** key points manually (Axis of Symmetry, intercepts, Vertex)
- **Discuss** the different forms of quadratic equations, general, factorised form
- **Identify** the key properties when in this form (intercepts, roots, vertex)

Unit 3 – Geometry and Trigonometry
Approximate Length: 9 Weeks

The study of geometry and trigonometry enhances students' spatial awareness and provides them with the tools for analysing, measuring and transforming geometric quantities in two and three dimensions.

Some topics that will be discussed, but not limited to:

Geometry
Triangles

- **Review**: angles with parallel lines: corresponding angles & parallel lines, alternate angles & parallel lines, co-interior angles & parallel lines
- **Introduce and identify** congruent triangles, find corresponding side lengths
- **Understand** the proofs for similar triangles finding missing sides and angles using congruence and similar triangles

Measurement

- **Conversion** of units of area, volume and capacity
- **Review** Area and perimeter of basic shapes(square, rect, triangle, rhombus, parallelogram, kite, trapezium and circle)
- **Find** the length of an arc (degrees only)
- **Find** the perimeter of sectors
- **Find** the area of a sector (degrees only)
- **Calculate** the surface area of cones, spheres and pyramids
- **Find** the volume of cones, spheres and pyramids

Trigonometry

- **Review**:Trigonometric ratios in right angled triangles - SOHCAHTOA and finding sides & angles and Pythagorean theorem
- **Identify** pythagorean triples (investigation)
- **Solve** 3-dimensional problem solving involving right angle triangles
- **Solve** practical word problems involving right angled triangles and including angle of elevation and depression and 3D problems

Unit 4 – Probability and Statistics
Approximate Length: 8 Weeks

This branch of mathematics is concerned with the collection, analysis and interpretation of quantitative data and uses the theory of probability to estimate parameters, discover empirical laws, test hypotheses and predict the occurrence of events.
Through the study of statistics, students should develop skills associated with the collection, organization and analysis of data, enabling them to present information clearly and to discover patterns. Students will also develop critical-thinking skills, enabling them to differentiate between what happens in theory (probability) and what is observed (statistics).
Students should understand both the power and limitations of statistics, becoming aware of their legitimate use in supporting and questioning hypotheses, but also recognizing how statistics can be used to mislead as well as to counter opinions and propaganda.
Students should use these skills in their investigations and are encouraged to use information and communication technology (ICT) whenever appropriate.

Some topics that will be discussed, but not limited to:

Statistics

- **Review**: creating a survey, what makes a good survey etc
- **Review:**Mean, median and mode (choose the best measure of central tendency, continuous and discrete data)using GDC
- **Find** the standard deviation from GDC
- **Complete** a cumulative frequency table and curve (ogive)
- **Find** the Q1, median and Q3 from cumulative frequency curve and GDC
- **Review: Compare, graph** and **interpret** two sets of data from Box and whisker plots
- **Review: Draw** and **interpret** stem and leaf diagrams
- **Find** mean, median and mode from a stem and leaf
- **Compare** two sets of data on a stem and leaf diagram

Probability

- **Calculate** experimental Probability and compare to theoretical
- **Calculate** probabilities from tables
- **Calculate** combined events theoretical probability
- **Calculate** compound events
- **Calculate** probability from sets and Venn diagrams
- **Calculate probabilities** with & without replacement

ASSESSMENT

In the MYP Students will be evaluated using formative and summative assessments.

Formative Assessment: Tasks and assignments that allow the teacher to regularly judge the effectiveness of both teaching and learning processes. This may include teacher observation and oral, written or products of student effort. Examples: class activities, homework and quizzes.

Summative Assessment: The judgment made by the teacher of the standard of achievement reached by the student at the end of a unit of work. Examples: Investigations, presentations, real-life problems, unit tests.

All assessments will be graded by using a criterion-referenced approach using the "Criterion Objectives" listed below. Each assessment will be developed with the IB standards in mind and the objectives applied against the students submitted assessment task. The best-fit approach is applied to ensure the most valid, fair and reliable grade is determined using the IB Grade Boundaries and 7 point scale.

Criterion A: Knowing and understanding

Knowledge and understanding are fundamental to studying mathematics and form the base from which to explore concepts and develop skills. This objective assesses the extent to which students can select and apply mathematics to solve problems in both familiar and unfamiliar situations in a variety of contexts.

In order to reach the aims of mathematics, students should be able to:

i. select appropriate mathematics when solving problems in both familiar and unfamiliar situations
ii. apply the selected mathematics successfully when solving problems
iii. solve problems correctly in a variety of contexts.

Criterion B: Investigating Patterns

Investigating patterns allows students to experience the excitement and satisfaction of mathematical discovery. Working through investigations encourages students to become risk-takers, inquirers and critical thinkers. The ability to inquire is invaluable in the MYP and contributes to lifelong learning.

In order to reach the aims of mathematics, students should be able to:

i. select and apply mathematical problem-solving techniques to discover complex patterns
ii. describe patterns as general rules consistent with findings
iii. prove, or verify and justify, general rules.

Criterion C: Communicating

Mathematics provides a powerful and universal language. Students are expected to use appropriate mathematical language and different forms of representation when communicating mathematical ideas, reasoning and findings, both orally and in writing.

In order to reach the aims of mathematics, students should be able to:

i. use appropriate mathematical language (notation, symbols and terminology) in both oral and written explanations
ii. use appropriate forms of mathematical representation to present information
iii. move between different forms of mathematical representation
iv. communicate complete, coherent and concise mathematical lines of reasoning
v. organize information using a logical structure.

Criterion D: Applying Mathematics in real-life contexts

MYP mathematics encourages students to see mathematics as a tool for solving problems in an authentic real-life context. Students are expected to transfer theoretical mathematical knowledge into real-world situations and apply appropriate problem-solving strategies, draw valid conclusions and reflect upon their results.

In order to reach the aims of mathematics, students should be able to:

i. identify relevant elements of authentic real-life situations

ii. select appropriate mathematical strategies when solving authentic real-life situations
iii. apply the selected mathematical strategies successfully to reach a solution
iv. justify the degree of accuracy of a solution
v. justify whether a solution makes sense in the context of the authentic real-life situation.

STUDENTS RESPONSIBILITIES

Academic Honesty

GWA maintains very strict guidelines towards maintaining academic honesty as followed by IB students globally.

1. First offense: A student who submits plagiarized work will be required to meet with the teacher to discuss the offense.
    - The teacher will notify the parents and the MYP Coordinator by email of the offense.
    - The student will be required to repeat the assessment for **formative feedback purposes only.**(The summative cannot be graded as it was not the students' work.)
2. Second offense: The teacher will notify the parents and the appropriate Assistant Principal (6-8; 9-12).
    - An interview will take place and the assessment will receive a grade of (0). The assessment will be completed for **formative purposes only.**

Late Assessment Policy

When assessing students at GWA it is important for teachers to be able to provide students and their parents with a grade that, as much as possible, reflects their ability in a course. It is also important for students to meet reasonably established timelines to complete their assessments. In order to achieve this goal, the following procedures for the submission of summative assessments has been established:

1. Teachers will post the due date on ManageBac with at least two (calendar) weeks lead time for students to complete the assessment.
2. Submission of the assessment by students on the due date. If a deadline cannot be met, in order for the work to be evaluated, students must: provide a doctor's note, or provide a note from a parent explaining special family circumstances, or have established an extension with the teacher at least two days in advance. Such extensions will be given at the teacher's discretion.
3. MYP students must adhere to published deadlines. Students who do not meet IB Diploma Programme deadlines will follow these steps:
    - Detention(s) until the assessment is completed
    - Parent meeting to discuss behavior concern
    - After 3 offenses: Parents contacted and additional detentions and/or an in-school suspension until the assessment is completed. Students must make up all worked missed during the suspension.
4. Repeated failure to meet deadlines will result in narrative comments addressing these concerns in report cards and letters of recommendation to other schools.

5.

APPENDIX

Classroom Expectations:

- Be on time
- BE PREPARED – have all books and supplies ready when class begins
- Bring your own electronic device
- LISTEN when others are speaking
- Exhibit MYP learner profile characteristics

Materials:

- Math Notebook
- Laptops
- Pencils
- Erasers
- Graphic Display Calculator

Resources:

- Mathematics for the MYP4/5 (Oxford)
- Khan Academy http://www.khanacademy.com
- MyiMaths