IB Higher Applications and Interpretations U6

Mathematics teachers are striving for all students to develop an interest in studying the subject at a higher level. Students will be encouraged to explore the links between mathematics and other fields of study Students will develop an awareness of the relevance of mathematics to the world of work and to situations in society in general

"Mathematics knows no races or geographic boundaries; for mathematics, the cultural world is one country." **David Hilbert**

Students will learn:

Autumn Term

- Further differential
- calculus: derivatives of sine/cosine, application to kinematics
- ○ Integral calculus: definite integrals, areas

Spring Term

- Probability distributions:
- normal, Binomial

Knowledge, understanding & Skills

- Understanding of the concepts, principles and nature of mathematics
- Communicate mathematics clearly, concisely and confidently in a variety of contexts
- Develop a curiosity and enjoyment of mathematics, and appreciate its elegance and power
- Utilise logical and creative thinking, and patience and persistence in problem solving to instil confidence in using mathematics
- Employ and refine your powers of abstraction and generalization
- Take action to apply and transfer skills to alternative situations, to other areas of knowledge and to future developments in your local and global communities
- Appreciate the moral, social and ethical questions arising from the work of mathematicians and the applications of mathematics
- Reflect critically upon your own work and the work of others
- Independently and collaboratively extend your understanding of mathematics.

"If you cannot explain it simply, you don't understand it well enough" **Albert Einstein**

What does excellence look like?

Knowledge and understanding: recall ,select and use your knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts

Problem solving :recall ,select and use your 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 and 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 analysing information, making conjectures, drawing conclusions, and testing their validity

How can you enhance your learning at home?

Pearson Mathematics Analysis and Approaches Higher Level textbook will be extensively utilised.
Teacher also has copy of Oxford University Press textbook. Other publishers: Hodder and Haese.
Online resources:

- StudyIB.net
- RevisionVillage.com
- Kognity (subscription required)
- Enrichment: UKMT Senior Maths Challenge

How will we assess impact?

- Regular exposure to Exam-style questions
- Self-assessment
- Peer assessment
- Half-termly unit tests
- Past papers and PPE

- External examination requirements:
- Paper 1 (40%) = short and long-response questions; calculator not allowed
  Paper 2 (40%) = short and long-response questions; calculator required
  Internal assessment (20%) = coursework assessed by teacher and externally moderated by IB
- A graphical calculator is required for this course and we facilitate purchase of Casio CG50.

International Opportunities

- The first systematic effort to use transformations as the foundation of geometry was made by Felix Klein in the 19th century, under the name Erlangen programme.
- The term "**function**" was literally introduced by Gottfried Leibniz, in a 1673 letter, to describe a quantity related to points of a curve, such as a coordinate or curve's slope. Johann Bernoulli started calling expressions made of a single variable "functions." in 1698.
- The Persian poet and mathematician Omar Khayyam was probably familiar with the formula to higher orders, although many of his mathematical works are lost. The binomial expansions of small degrees were known in the 13th century mathematical works of Yang Hui and also Chu Shih-Chieh.

Wider Reading

- Read and comprehend articles concerning applications of mathematics and communicate your understanding
- "How to think like a mathematician" by Kevin Houston
- "How to study for a mathematics degree" by Lara Alcock
- "Alex's Adventures in Numberland" by Alex Bellos
  "Cabinet of Mathematical Curiosities" by Ian Stewart
- "The Num8er My5teries" by Marcus du Sautoy
- "How Many Socks Make a Pair?: Surprisingly Interesting Maths" by Rob Eastway
- "The Curious Incident of the Dog in the Night-time" by Mark Haddon
- "The Penguin Dictionary of Curious & Interesting Numbers" by David Wells
- "The Calculus Wars" by Jason Socrates Bardi
- "The Code Book" by Simon Singh
- "50 Mathematical Ideas You Really Need to Know" by Tony Crilly

Extra Challenge:

- podcast produced by Oxford university: http://podcasts.ox.ac.uk/series/secrets-mathematics
- Two interesting MOOCs:
  https://www.futurelearn.com/courses/recreational-math
  https://www.futurelearn.com/courses/flexagons
- Two more challenging MOOCs: https://www.coursera.org/learn/linear-algebra-machine-learning (requires knowledge of matrices)
  and https://www.coursera.org/specializations/introduction-data-science?action=enroll