IB Higher Analysis & Approaches L6

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**

What are we learning?

- **Autumn term**
  Algebra
- Functions: classification of, operations with,
- transformation
  Sequences and series: arithmetic, geometric,
- counting principles,
- Binomial theorem
  Exponential and logarithmic
- functions
- Proof
- **Spring term**
  Trigonometric functions and
- equations
  Geometry and
- trigonometry: radians,
- ratios, identities
  Complex numbers: form,
- operations, powers and
- Roots
- Statistics: sampling,
- correlation, linear regression
- **Summer Term**
- Internal assessment
- Probability: theoretical, experimental,
- representations,
- independent, conditional
- Differential calculus: limits,
- derivatives, optimisation

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

Knowledge, understanding & Skills

- Understand coherence and progression in mathematics and how different areas of mathematics are connected
- Reason logically and recognise incorrect reasoning
- Generalise mathematically
- Construct rigorous mathematical proof
- Use your skills and techniques to solve challenging problems that require you to decide on the solution strategy and communicate the mathematical rationale for these decisions clearly
- Recognise when mathematics can be used to analyse and solve a problem in context
- Represent situations mathematically and understand the relationship between problems in context and mathematical models that may be applied to solve them
- Read and comprehend mathematical arguments, including justifications of methods and formulae, and communicate your understanding
- Use technology such as calculators and computers effectively and recognise when your use may be inappropriate

What does excellence look like?

- Knowledge and understanding :recall, select and use your knowledge of mathematical facts, concepts and techniques
- Problem solving: recall ,select and use your knowledge of mathematical skills, results and models to solve problems
- Communication and interpretation: sketch or draw mathematical diagrams, graphs or constructions both on paper and using technology, record methods, solutions and conclusions using appropriate notation
- Technology: use technology to explore new ideas and to solve problems
- Reasoning: construct mathematical arguments by the manipulation of mathematical expressions
- Inquiry approaches: investigate unfamiliar situations; involving organizing and analysing information then drawing conclusions

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

- **External examination requirements:**
- **Paper 1 (30%) = short and long-response questions; calculator not allowed**
  Paper 2 (30%) = short and long-response questions; calculator required
- **Paper 3 (20%) = extended response problem- solving 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