UNIT 1 - ALGEBRA

ADV. MATHEMATICS 1.1

Content

- Quadratic Equations
- Quadratic Graphs
- The Quadratic Formula
- Coordinate Geometry
- Arithmetic Sequences and Series
- Geometric Sequences and Series
- The Binomial Expansion
- Functions

Resources & ICT

- Textbook
- Worksheets
- Calculators
- Autograph
- Active Maths activities
- Online resources from the BM website
- www.myimaths.com
- www.mathsnetalevel.com
- www.wolframalpha.com

Types of assessment

- Exercises from textbooks and worksheets
- Relevant questions from past papers
- Formative assessment of homework and test results
- Structured questioning during lessons
- Judgments based on class participation and effort

Students to Know

- Solving algebraic problems using a number of methods
- Sketching functions to a high standard
- Solving problems involving sequences and series

Students to Understand

- Connections between algebra and graphical representations
- How to approach problems using a variety of techniques
- The necessary standard to attain marks in an A Level standard exam question

Students to be able to Do

- Solve algebraic problems
- Understand new algebraic vocabulary
- Answer exam standard questions involving algebra

Cross curricular links

- Physics; formula, algebraic manipulation
- Chemistry; solving equations and manipulating expressions
- Economics; problem solving skills using a logical approach
- Art; infinite sums & fractal images
- Art; architecture (e.g. Zentrum Paul Klee in Bern)
- History; development of maths

Differentiation incl. EAL

- Extension tasks for gifted students
- Emphasis on vocabulary (especially for non native speakers of English)
- Group work and Academic Champions to encourage peer learning

Learning styles activities

- Students encouraged to approach tasks using different methods
- Individual guidance to improve understanding
- Lessons taught using a range of techniques

Zentrum Paul Klee in Bern, Switzerland

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Global citizenship, internationalism, local environment

- Links to countries where the mathematics at hand was first developed
- Sharing of ideas from students with different mathematical backgrounds
- Comparing the advantages and disadvantages of French, German and British algebraic notation and the development of symbols used in problem solving
- Using the Greek alphabet for variables and constants in advanced mathematics

UNIT 2 - CALCULUS

ADV. MATHEMATICS 1.1

Content

- Gradients of curves
- Differentiation
- Tangents and Normals
- Minimums and maximums
- Integration
- Area below a curve
- Volume of revolution

Resources & ICT

- Textbook
- Worksheets
- Calculators
- Autograph
- Active Maths activities
- Online resources from the BM website
- www.myimaths.com
- www.mathsnetalevel.com
- www.wolframalpha.com

Types of assessment

- Exercises from textbooks and worksheets
- Relevant questions from past papers
- Formative assessment of homework and test results
- Structured questioning during lessons
- Judgments based on class participation and effort

Students to Know

- Solving calculus problems using a number of methods
- Using accurate algebraic techniques to solve calculus problems
- Common sense approaches to answering integration questions involving area

Students to Understand

- Connections between differentiation and integration
- How to approach problems using a variety of techniques
- The necessary standard to attain marks in an A Level standard exam question

Students to be able to Do

- Solve calculus problems
- Understand new vocabulary
- Answer exam standard questions involving calculus

Cross curricular links

- Physics & Chemistry; rates of change in mechanics problems and in chemical reactions
- Economics; calculus in insurance calculations and analysis of economic growth
- Art; 3D modeling andcomputer graphics
- History; Newton vs Leibnitz and the development of calculus

Differentiation incl. EAL

- Extension tasks for gifted students
- Emphasis on vocabulary (especially for non native speakers of English)
- Group work and Academic Champions to encourage peer learning

Learning styles activities

- Students encouraged to approach tasks using different methods
- Individual guidance to improve understanding
- Lessons taught using a range of techniques

Global citizenship, internationalism, local environment

- Practical applications of Newtonian mechanics and calculus made by the Bernoulli brothers in Switzerland
- Links to countries where the mathematics at hand was first developed
- Sharing of ideas from students with different mathematical backgrounds
- Using the Greek alphabet for variables and constants in advanced mathematics

Office block in Lausanne, Switzerland

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BRILLANTMONT
International School

November-December - 6 weeks

www.brillantmont.ch

UNIT 3 - TRIGONOMETRY AND VECTORS

Content

- Trigonometrical functions and graphs
- Radians
- Sectors, Arcs and Segments
- Solving Trig Equations
- Vectors in two and three dimensions
- The angle between two vectors

Resources & ICT

- Textbook
- Worksheets
- Calculators
- Autograph
- Active Maths activities
- Online resources from the BM website
- www.myimaths.com
- www.mathsnetalevel.com
- www.wolframalpha.com

Types of assessment

- Exercises from textbooks and worksheets
- Relevant questions from past papers
- Formative assessment of homework and test results
- Structured questioning during lessons
- Judgments based on class participation and effort

Students to Know

- Solving trigonometrical equaltions
- Using calculators and graphical methods to find correct solutions
- How vectors can be represented in a variety of ways using mathematical notation
- Solving problems involving vectors in two and three dimensions

Students to Understand

- Connections between trigonometrical ratios and graphs
- Vector notation
- How to approach problems using a variety of techniques
- The necessary standard to attain marks in an A Level standard exam question

Students to be able to Do

- Solve trigonometry and vector problems
- Understand new vocabulary
- Answer exam standard questions involving trigonometry and vectors

Cross curricular links

- Physics; tracking motion using mathematical models
- Economics; modelling economic trends using trigonometry
- Geography; periodic motion and trigonometry to model tides
- Art; Computer graphics using vectors and fractal technology
- History; Indian and Arabic development of trigonometry

Differentiation incl. EAL

- Extension tasks for gifted students
- Emphasis on vocabulary (especially for non native speakers of English)
- Group work and Academic Champions to encourage peer learning

Learning styles activities

- Students encouraged to approach tasks using different methods
- Individual guidance to improve understanding
- Lessons taught using a range of techniques

Eulerstrasse in Basel, Switzerland

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Global citizenship, internationalism, local environment

- Indian Astrology and the development of astronomy leading to the use of trigonometry as a tool for monitoring the stars
- Leonhard Euler's contribution to trigonometry and mathematics during his time in Basel, Berlin and St Petersburg
- Vectors in air traffic control technology and global cooperation in organizing air travel
- Sharing of ideas from students with different mathematical backgrounds

January-February - 6 weeks

UNIT 4 - DATA & STATISTICAL DIAGRAMS

ADV.MATHEMATICS 1.1

Content

- Types of data
- Interpreting diagrams
- Constructing diagrams for discrete data
- Constructing diagrams for continuous data
- Measures of central tendency
- Quartiles and interquartile range
- Standard deviation and variance
- Use of formulae
- Calculator techniques

Resources & ICT

- Textbook
- Worksheets
- Calculators
- Autograph
- Active Maths activities
- Online resources from the BM website
- www.myimaths.com
- www.mathsnetalevel.com
- www.wolframalpha.com

Types of assessment

- Exercises from textbooks and worksheets
- Relevant questions from past papers
- Formative assessment of homework and test results
- Structured questioning during lessons
- Judgments based on class participation and effort

Students to Know

- The differences between different data types
- Using calculators to find statistics
- How to represent data in an appropriate diagram

Students to Understand

- How to interpret graphical representations
- What makes a misleading graph and how data should be presented to make it meaningful
- How to approach problems using a variety of techniques
- The necessary standard to attain marks in an A Level standard exam question

Students to be able to Do

- Calculate the mean median and mode from raw or grouped data
- Draw cumulative frequency diagrams, box plots, histograms and stem and leaf plots
- Understand new vocabulary
- Answer exam standard questions involving data and statistical diagrams

Cross curricular links

- Biology: accurate data to monitor species & environmental changes
- Chemistry, Physics & Economics; interpreting diagrams and representing data
- Geography; Human geography and national or global statistics
- Sports; quantifying athletic performance and modern techniques in training

Differentiation incl. EAL

- Extension tasks for gifted students
- Emphasis on vocabulary (especially for non native speakers of English)
- Group work and Academic Champions to encourage peer learning

Learning styles activities

- Students encouraged to approach tasks using different methods
- Individual guidance to improve understanding
- Lessons taught using a range of techniques
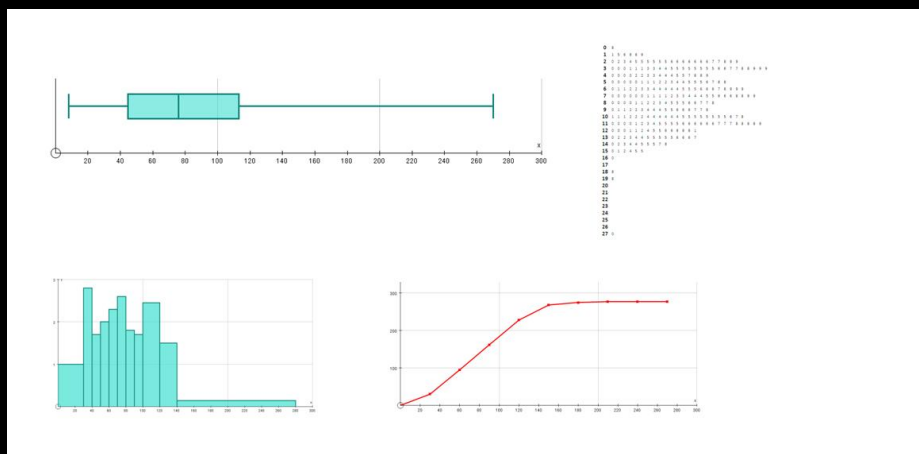
Global citizenship, internationalism, local environment

- The development of modern statistics by the Bernoulli brothers and the links with calculus
- How statistics is used (and misused) by organizations around the world
- Monitoring environmental changes and tracking the progress of global events using statistics

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February-March - 4 weeks

UNIT 5 - PROBABILITY & DISTRIBUTIONS

ADV. MATHEMATICS 1.1

Content

- Probability
- Venn and tree diagrams
- Conditional probability
- Discrete random variables
- Permutations
- Combinations
- Binomial distribution
- Normal distribution
- Suitable approximations to distributions

Resources & ICT

- Textbook, worksheets
- Calculators
- Autograph
- Active Maths activities
- Stopwatches & dice
- Online resources from the BM website
- www.myimaths.com
- www.mathsnetalevel.com
- www.wolframalpha.com

Types of assessment

- Exercises from textbooks and worksheets
- Relevant questions from past papers
- Formative assessment of homework and test results
- Structured questioning during lessons
- Judgments based on class participation and effort

Students to Know

- Basic probability concepts
- How to use distributions to interpret real life situations
- Formulae for permutations and combinations
- Continuous distributions

Students to Understand

- When to use appropriate methods
- The interpretation of statistics calculated
- How to use statistical tables to answer normal distribution questions

Students to be able to Do

- Calculate the expectation and variance
- Interpret probabilities and explain how they relate to the original questions
- Understand new vocabulary
- Answer exam standard questions involving data and probability

Cross curricular links

- Biology; normal distribution of plant and animal characteristics; predicting changes in behavior
- Geography; analysis of continuous data
- Economics; normal distribution as a tool to help manage fluctuating financial situations

Differentiation incl. EAL

- Extension tasks for gifted students
- Emphasis on vocabulary (especially for non native speakers of English)
- Group work and Academic Champions to encourage peer learning

Learning styles activities

- Students encouraged to approach tasks using different methods
- Individual guidance to improve understanding
- Lessons taught using a range of techniques

Insects on a tree in Brillantmont

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Global citizenship, internationalism, local environment

- Global data from the UN and WHO used during lessons
- Individual students investigating statistical data from their home countries
- Monitoring environmental changes and tracking the progress of global events using continuous distributions

March-April - 4 weeks