

Unit title	Key concept	Related concepts	Global context	Statement inquiry	Objectives	ATL skills	Content
Unit 1 <b>Numbers and Algebra</b> Ch: 1,2,4, 6 September, October, November  12 weeks	Relationships	Simplification Equivalence Models Generalization	Scientific and technical innovation: the natural world and its law	Relationships in natural world can be simplified by algebraic models.	A i, ii, iii B i, ii C i, ii, iii, iv	<ul style="list-style-type: none"> <li>• Communication skills (understand, use and interpret mathematical notation in algebra/algebraic expressions; make inferences and draw conclusions solving problems written literally)</li> <li>• Social- collaboration (manage and resolve conflict and work collaboratively in teams; listen actively to others; negotiate ideas with peers and teacher concerning equivalence)</li> <li>• Self-management - reflection skills (consider content, develop new skills, techniques and strategies for effective learning)</li> <li>• Thinking - critical thinking skills (recognize and evaluate propositions for number patterns, draw reasonable conclusions and generalizations and test them: evaluate evidence and arguments concerning equivalence)</li> <li>• Thinking - transfer (apply skills in unfamiliar situations)</li> </ul>	<p><b>Topics:</b></p> <ul style="list-style-type: none"> <li>- Forms of numbers</li> <li>- Number lines</li> <li>- Operations with algebraic expressions</li> <li>- Integer exponents</li> <li>- Linear equations and inequalities</li> <li>- Absolute value (extended)</li> </ul> <p><u>Knowing and understanding:</u></p> <ul style="list-style-type: none"> <li>- Expanding, simplifying and factoring algebraic expressions</li> <li>- Using substitution for evaluation and simplification of an expression/equation</li> <li>- Solving equations, inequalities algebraically and graphically</li> <li>- Using the laws of exponents</li> </ul> <p><u>Investigating patterns:</u></p> <ul style="list-style-type: none"> <li>- Discovering last digit of numbers written as product</li> <li>- Determining the general rule that represents numerical patterns</li> </ul> <p><u>Communicating:</u></p> <ul style="list-style-type: none"> <li>- Using different forms of numbers: integers, fractions, decimals, exponents, standard form, scientific notation</li> <li>- Translating sentences into algebraic expressions and vice versa</li> <li>- Solving problems written literally</li> </ul>

<p>Unit 2 <b>Coordinate Geometry and Simultaneous Equations</b> Ch: 8,19 December, January, February  8 weeks</p>	<p>Relationships</p>	<p>Representation Models</p>	<p>Scientific and technical innovation- the impact of scientific and technological advances on communities and environments</p>	<p>Patterns between variables and relationships can be represented visually</p>	<p>A i, ii, iii C i, ii, iii D i, ii, iii, iv</p>	<ul style="list-style-type: none"> <li>● Communication skills (Take effective notes in class; make inferences and draw conclusions relating equations of lines)</li> <li>● Social-collaboration (work collaboratively in teams during group work)</li> <li>● Self-management-organisation skills (bring necessary equipment and supplies: rulers)</li> <li>● Thinking-critical thinking skills (use models and simulations to explore complex systems and issues: equations of lines, applying in real-life contexts)</li> </ul>	<p><b>Topics:</b></p> <ul style="list-style-type: none"> <li>- The Cartesian plane</li> <li>- The distance formula</li> <li>- The midpoint formula</li> <li>- Equations of lines</li> <li>- Simultaneous equations</li> <li>- Simultaneous inequalities (extended)</li> </ul> <p><u>Knowing and understanding:</u></p> <ul style="list-style-type: none"> <li>- Calculating the distance between two points</li> <li>- Calculating the midpoint of a segment</li> <li>- Finding the equation of a straight line</li> <li>- Solving systems of equations algebraically and graphically</li> </ul> <p><u>Communicating:</u></p> <ul style="list-style-type: none"> <li>- Using coordinate system to present and inspect information</li> </ul> <p><u>Applying mathematics in real-life contexts:</u></p> <ul style="list-style-type: none"> <li>- Using equations of lines in real-life situations</li> </ul>
<p>Unit 3 <b>Trigonometry and Transformation Geometry</b> Ch: 13,16 February, March  5 weeks</p>	<p>Form</p>	<p>Patterns Space</p>	<p>Orientation in space and time- the relationships between, and the interconnectiveness of, individuals and civilizations, from personal, local and</p>	<p>Form in everyday life can be explored using geometry and trigonometry</p>	<p>A i, ii, iii C i, ii, iii D i, ii, iii, iv</p>	<ul style="list-style-type: none"> <li>● Communication skills (use and interpret a range of discipline-specific terms and symbols; trigonometric ratios, transformations)</li> <li>● Social-collaboration (exercise leadership and take on a variety of roles within groups)</li> <li>● Self-management-organisation skills (bring necessary equipment and supplies to class; calculators)</li> </ul>	<p><b>Topics:</b></p> <ul style="list-style-type: none"> <li>- Trigonometric ratios in right-angled triangles</li> <li>- Simple isometric transformations</li> <li>- Identical representation of transformations (extended)</li> </ul> <p><u>Knowing and understanding:</u></p> <ul style="list-style-type: none"> <li>- Using sine, cosine and tangent to relate angles and sides of right-angled triangles</li> <li>- Transforming figures by rotation, reflection, translation and enlarging</li> </ul>

			global perspectives			<ul style="list-style-type: none"> <li>● Reflection (identify strengths and weaknesses of personal learning strategies)</li> <li>● Research-Information literacy (use memory techniques to develop long term memory; trigonometric ratios)</li> <li>● Thinking-critical thinking skills (Identify obstacles and challenges)</li> <li>● Thinking-research (make connections between subject groups and disciplines)</li> </ul>	<p><u>Communicating:</u></p> <ul style="list-style-type: none"> <li>- Using and interpreting trigonometric ratios</li> <li>- Making connections between different forms of a same object</li> </ul> <p><u>Applying mathematics in real-life contexts:</u></p> <ul style="list-style-type: none"> <li>- Solving real-life situations using trigonometry</li> <li>- Designing geometrical patterns</li> </ul>
<p>Unit 4 <b>Further Algebra and Quadratic Equation</b> Ch: 9,11,18 March, April, May  8 weeks</p>	Logic	Generalization Simplification	Identities and relationships-identity; beliefs and values	Discovering mathematical identities and relationship leads to effective action	A i, ii, iii B i, ii, iii D i, ii, iii, v	<ul style="list-style-type: none"> <li>● Communication skills (organize and depict information logically; give and receive meaningful feedback)</li> <li>● Self-management-organisation skills (keep an organized and logical system of information files/notebooks)</li> <li>● Self-management-reflection (develop new skills, techniques and strategies for effective learning)</li> <li>● Affective skills (practice analysing and attributing causes for failure)</li> <li>● Thinking-critical thinking skills (test generalizations and conclusions, propose and evaluate a variety of solutions; select appropriate solutions)</li> </ul>	<p><u>Topics:</u></p> <ul style="list-style-type: none"> <li>- Factorization of algebraic expressions</li> <li>- Further factorization (extended)</li> <li>- Algebraic fractions</li> <li>- Quadratic equations</li> </ul> <p><u>Knowing and understanding:</u></p> <ul style="list-style-type: none"> <li>- Solving quadratic equations by formula</li> <li>- Performing operations with algebraic fractions</li> <li>- Factoring algebraic expressions</li> </ul> <p><u>Investigating patterns:</u></p> <ul style="list-style-type: none"> <li>- Discovering relations between coefficients of quadratic equations and their solutions</li> </ul> <p><u>Applying mathematics in real-life contexts:</u></p> <ul style="list-style-type: none"> <li>- Applying quadratic equations in geometry, physics and other real-life contexts</li> </ul>

<p>Unit 5 <b>Statistics</b> Ch: 10 May, June</p> <p>4 weeks</p>	<p>Relationships</p>	<p>Patterns Quantity Models</p>	<p>Scientific and technical innovation- the impact of environments on human activity; how humans adapt environments to their needs</p>	<p>Statistics are a powerful model to develop global perspective</p>	<p>A i, ii, iii B i, ii, iii C i, ii, iii, v D i, ii, iii, v</p>	<ul style="list-style-type: none"> <li>● Communication skills (use and interpret a range of discipline-specific terms and symbols)</li> <li>● Self-management-organisation skills (use appropriate strategies for organizing complex information; Select and use technology effectively and productively)</li> <li>● Research-Information literacy (collect and analyse data to identify solutions and/or make informed decisions)</li> <li>● Thinking-critical thinking skills (revise understanding based on new information and evidence)</li> </ul>	<p><b>Topics:</b></p> <p><u>Knowing and understanding:</u></p> <ul style="list-style-type: none"> <li>- Collecting data, constructing and interpreting graphs, drawing the line of best fit</li> <li>- Calculating the mean, median and mode; choosing the best measure of central tendency</li> <li>- Calculating the standard deviation</li> <li>- Histograms for continuous fixed interval groups (extended)</li> </ul> <p><u>Investigating patterns:</u></p> <ul style="list-style-type: none"> <li>- Discovering Investigating how transformation of data influences measures of central tendency</li> </ul> <p><u>Communicating:</u></p> <ul style="list-style-type: none"> <li>- Presenting data using pie charts, histograms, line graphs, scatter plots, box-and whisker-plots</li> <li>- Discussing and interpreting data using mean, mode, median, quartile, percentile</li> </ul> <p><u>Applying mathematics in real-life contexts:</u></p> <ul style="list-style-type: none"> <li>- Analysing real-life situations statistically</li> <li>- Using a line of best fit to discover relationships between phenomena</li> </ul>
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Unit title	Key concept	Related concepts	Global context	Statement inquiry	Objectives	ATL skills	Content
Unit 1 <b>Probability</b>  September, October  6 weeks	Relationships	Representation  Quantity	Fairness and Development	Establishing relationships represented by quantities allows the exploration of access to equal opportunities.	A: i, ii, iii B: i, ii, iii C: i, ii, iii, iv, v D: iii, v	<ul style="list-style-type: none"> <li>Thinking -critical thinking skills (Consider ideas from multiple perspectives; Draw reasonable conclusions and generalizations)</li> <li>Thinking -creative thinking skills (-Make guesses, ask “what if” questions and generate testable hypotheses; Use brainstorming and visual diagrams to generate new ideas; Consider multiple alternatives, including those that might be unlikely or impossible)</li> <li>Communication skills (Organize and depict information logically; Read critically and for comprehension)</li> <li>Self-management - organization skills (Use appropriate strategies for organizing complex information)</li> </ul>	<p><b>Topics:</b></p> <ul style="list-style-type: none"> <li>Experimental and theoretical probability</li> <li>Sample space</li> <li>Tree diagrams and Venn diagrams</li> <li>Probabilities of independent, mutually exclusive and combined events</li> <li>Probability of successive trials</li> </ul> <p><u>Knowing and understanding:</u></p> <ul style="list-style-type: none"> <li>Describing experimental and theoretical probability</li> <li>Finding probabilities of independent, mutually exclusive and combined events</li> </ul> <p><u>Investigating patterns:</u></p> <p>Discovering patterns in dice problems</p> <p><u>Communicating:</u></p> <p>Representing data to calculate probabilities using tree diagrams and Venn diagrams</p> <p><u>Applying mathematics in real-life contexts:</u></p> <p>Applying probability to make a fair decision</p>
Unit 2	Form	Models  Representation	Globalization and sustainability	Using a model to represent a form can give us a strategy in urban planning	A: i, ii, iii B: i, ii, iii	<ul style="list-style-type: none"> <li>Thinking -critical thinking skills (Evaluate evidence and arguments; Propose and evaluate a variety of solutions)</li> <li>Communication skills (Find information for disciplinary</li> </ul>	<p><b>Topics:</b></p> <ul style="list-style-type: none"> <li>Relations and functions</li> <li>Quadratic, cubic and rational functions,</li> <li>Maximum/minimum of functions</li> <li>Non-linear inequalities</li> </ul>

<p><b>Number plane graphs</b></p> <p>October, November, December</p> <p>9 weeks</p>					<p>C: i, ii, iii, iv, v</p> <p>D: i, ii, iii, iv, v</p>	<p>inquiries, using a variety of media, Structure information in summaries, essays and reports)</p> <ul style="list-style-type: none"> <li>● Self-management - organization skills (Select and use technology effectively and productively)</li> <li>● Research (Seek a range of perspectives from multiple and varied sources)</li> </ul>	<p>- Arithmetic and geometric sequences (extended)</p> <p><u>Knowing and understanding:</u></p> <ul style="list-style-type: none"> <li>- Graphing quadratic function by transformations, by vertex and intercepts</li> <li>- Using different forms of quadratic function (standard, vertex and intercepts form)</li> <li>- Finding equations of functions given graphically</li> <li>- Determining and interpreting maximum or minimum of the quadratic function</li> <li>- Graphing cubic and rational function by transformations</li> <li>- Solving non-linear inequalities</li> </ul> <p><u>Investigating patterns:</u></p> <ul style="list-style-type: none"> <li>- Investigating relationships between form of the formulas and their graphs (general form, x-intercepts form, vertex form)</li> </ul> <p><u>Communicating:</u></p> <ul style="list-style-type: none"> <li>- Representing functions using tables, graphs and formulas and move between different forms of representations</li> <li>- Explaining and justifying whether an arch is a parabola or not</li> <li>-Using notation and formulae for arithmetic and geometric sequences</li> </ul> <p><u>Applying mathematics in real-life contexts:</u></p> <ul style="list-style-type: none"> <li>- Applying quadratic function in modelling real-life phenomena</li> <li>- Justifying interpreting maximum/minimum</li> </ul>
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<p>Unit 3</p> <p><b>Geometry and Trigonometry</b></p> <p>January</p> <p>February</p> <p>March</p> <p>8 weeks</p>	<p>Systems</p>	<p>Change Models</p>	<p>Scientific and technical innovation</p>	<p>Understanding form and shape help us to create new and efficient products</p>	<p>A: i, ii, iii</p> <p>C: i, ii, iv, v</p> <p>D: i, ii, iii, iv, v</p>	<ul style="list-style-type: none"> <li>Thinking- transfer skills (Transfer current knowledge to learning of new technologies)</li> <li>Thinking-critical thinking skill (Use models and simulations to explore complex systems and issues;</li> <li>Research skills (Understand and use technology systems.)</li> <li>Self-management - Organization skills (Bring necessary equipment and supplies to class; Select and use technology effectively and productively)</li> </ul>	<p><b>Topics:</b></p> <ul style="list-style-type: none"> <li>Surface area and volume of a 3D object</li> <li>Sine and cosine rules</li> </ul> <p><u>Knowing and understanding:</u></p> <ul style="list-style-type: none"> <li>Determining surface area and volume of a 3D object</li> <li>Solving triangles using sine and cosine rule</li> <li>Solving some 3-dimensional problems using geometry and trigonometry</li> </ul> <p><u>Communicating:</u></p> <ul style="list-style-type: none"> <li>Representing a solid by its net and reversely</li> <li>Interpreting real-life data using sine and cosine rule</li> <li>Using mathematical language to Interpret trigonometric problems</li> </ul> <p><u>Applying mathematics in real-life contexts:</u></p> <ul style="list-style-type: none"> <li>Creating a new object using 3D geometry</li> <li>Applying sine and cosine rule in geometry</li> <li>Solving authentic real-life situations using sine and cosine rule</li> </ul>
<p>Unit 4</p> <p><b>INTERDISCIPLINARY UNIT</b></p>	<p>Relationships</p> <p>Communities</p>	<p>Patterns, Generalization</p>	<p>Orientation in space and time</p> <p>Exploration: The ways in which natural and human landscapes</p>	<p>Relationships between various communities are based on predictable patterns what helps us to understand</p>	<p>C: i, ii, iv, v</p> <p>D: i, ii, iii, iv, v</p> <p>Interdisciplinary: A, B, C, D</p>	<ul style="list-style-type: none"> <li>Communication skills - Communication - for students to communicate complete, coherent and concise mathematical lines of reasoning; (mathematics objective C.iv) they will need to use and interpret a range of disciplines-specific terms and symbols;</li> <li>Social skills – Collaboration - for students to support</li> </ul>	<p><b>Topics:</b></p> <ul style="list-style-type: none"> <li>constructing and interpreting frequency and relative frequency histogram with equal class width</li> <li>Influence of changing the class intervals on changing the shape of distribution</li> <li>-using median, mode, standard deviation and the mean, range and interquartile range</li> </ul>

<p><b>1 m<sup>2</sup> of our community</b></p> <p>April</p> <p>May</p> <p>7 weeks</p>			<p>could be understood</p>	<p>interactions in natural and human landscapes</p>		<p>each other in organizing data and using spreadsheets for summative assessment task they will need to help others to succeed;</p> <ul style="list-style-type: none"> <li>● Self-management skills – Reflection for students to evaluate the benefits and limitations of disciplinary and interdisciplinary knowledge and ways of knowing in predicting patterns or finding relationships (interdisciplinary objective D ii), they will need to consider the process of learning</li> <li>● Research skills - Information literacy - for students to evaluate the interdisciplinary perspectives (interdisciplinary objective A.ii), they will need to collect and analyse data to identify solutions and make informed decisions</li> <li>● Thinking skills -Critical thinking - for students to analyse disciplinary knowledge (biology objective C.v.) they will need to evaluate evidence and arguments;</li> </ul> <p>- Transfer skills - for students to analyse disciplinary knowledge (interdisciplinary objective A.i.) they need to combine knowledge, understanding and skills to create a product or solutions.</p>	<ul style="list-style-type: none"> <li>- making inferences about data, given mean and standard deviation</li> <li>- using chi-squared test</li> <li>- understanding the difference between a population and a sample</li> <li>- Using mathematical language for interpreting data and biology facts</li> <li>- Selecting and using technology effectively for graphical representation of data and statistical calculations</li> <li>- describing distribution patterns</li> <li>- making inferences about a relationship in the whole population by using data from sample of the population</li> <li>- applying chi-squared test formulas on analysing communities</li> <li>- quantities which represent different types of data distributions</li> </ul>
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<p>Unit 5</p> <p><b>Exponential function</b></p> <p>May</p> <p>June</p> <p>7 weeks</p>	<p>Relationships</p>	<p>Systems Change</p>	<p>Globalization and sustainability:</p> <p>How world is connected as whole</p>	<p>Discovering relationships can lead to understanding how systems are changing</p>	<p>A: i, ii, iii</p> <p>B: i, ii, iii</p> <p>C: i, ii, iv, v</p> <p>D: i, ii, iii, iv, v</p>	<ul style="list-style-type: none"> <li>● Self-management - Organization skills (Use appropriate strategies for organizing complex information; Practice dealing with change)</li> <li>● Thinking-Transfer skills (Apply skills and knowledge in unfamiliar situations; Compare conceptual understanding across multiple subject groups and disciplines; Make connections between subject groups and disciplines)</li> <li>● Communication skills (Make inferences and draw conclusions; Use and interpret a range of discipline-specific terms and symbols)</li> </ul>	<p><b>Topics:</b></p> <p>Exponential functions, its graph and properties</p> <p>Logarithms (extended)</p> <p><u>Knowing and understanding:</u></p> <ul style="list-style-type: none"> <li>-Solving exponential equations and inequalities</li> <li>-Solving logarithmic equations (extended)</li> <li>-Evaluating the logarithm of a number (extended)</li> <li>-Applying laws of logarithms (extended)</li> </ul> <p><u>Investigating patterns:</u></p> <p>Discovering properties of exponential function</p> <p>Discovering laws of logarithms (extended)</p> <p><u>Communicating:</u></p> <ul style="list-style-type: none"> <li>- Present exponential functions graphically</li> <li>-Present logarithmic functions graphically (extended)</li> <li>- Using asymptotes to advocate a nature of a function</li> </ul> <p><u>Applying mathematics in real-life contexts:</u></p> <ul style="list-style-type: none"> <li>-Applying exponential functions in-real life problems</li> <li>-Applying logarithmic functions in-real life problems (extended)</li> </ul>
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