Curriculum overview for MATH ANALYSIS AND APPROACHES, SL, **3mn**, School Year 2019/2020   Teachers: Marina Bilić
Maja Đerek

Unit title / Month	Concept(s)	Content	Objectives / Learning outcomes	Assessment tasks	ATL skills	Links to other subjects
Unit 1: **From patterns to generalisation** Ch: 1 September, October 7 weeks	Generalization, representation, modelling, equivalence, patterns, validity, systems	**Topics:** • Arithmetic sequences and series • Geometric sequences and series • Compound interest • The binomial theorem • Proofs **Skills:** • to use sigma notation • to model real-life situations using sequences • to find specific term in binomial expansion	• Knowledge and understanding • Problem solving • Communication and interpretation • Technology • Reasoning • Inquiry approach	• Progress test • Unit test • Quizzes	• Communication skills (understand, use and interpret math. notation) • Social skills (negotiate ideas) • Self-management skills (develop new skills, techniques and strategies for effective learning) • Thinking skills (draw reasonable conclusions and generalizations and test them) • Research skills (examine, select and reject sources)	**Links to other subjects**: Loans and repayments (economics) **International-mindedness**: The properties of "Pascal's triangle" have been known long before Pascal. **Aim 8:** Ethics behind borrowing/lending money**.** **TOK**: Is mathematical reasoning different from scientific reasoning/reasoning in other Areas of Knowledge?
Unit 2: **Representing relationships: functions** Ch: 2,3	Representation, relationships, quantity, equivalence, systems, patterns	**Topics:** • The equation of a straight line • Domain, range and graph of a function • Composite functions • Inverse function	• Knowledge and understanding • Problem solving • Communication and interpretation • Technology	• Progress test • Unit test • Quizzes • Semester exam	• Communication skills (use graphs to understand relationships) • Social-collaboration (work collaboratively in teams)	**Links to other subjects:** demand and supply curves (economics); graphical analysis (sciences); kinematics, projectile motion, radioactive

Time	Concepts	Topics / Skills		Assessment	ATL skills	Links
November, December, 9 weeks		• Identity function • The quadratic function • The reciprocal function • Rational functions • Odd and even functions • Exponential and logarithmic functions and their graphs • Transformations of graphs. **Skills:** • to graph a function; • to find the point of intersection using technology. • to solve equations and inequalities both graphically and analytically	• Reasoning • Inquiry approach		• Self-management-organisation skills (bring necessary equipment and supplies: GDC) • Thinking-critical thinking skills (use models and simulations to explore complex systems and issue) • Research skills (citation and referencing skills)	decay, (physics); reactions and activation energy (chemistry); growth curves (biology). **International-mindedness**: The development of functions by Descartes (France), Leibnitz (Germany), Euler (Switzerland) **Aim 8:** Is misleading use of "exponential growth" when used popularly? **TOK:** What role do "models" play in mathematics?
Unit 3: Measuring change: differentiation Ch: 4 January, February, March 5 weeks 7.1.- 24.4	Change, patterns, relationships, approximation, generalization, modelling, systems, quantity	**Topics:** • Derivative interpreted as gradient function and as rate of change • Tangents and normal • Rules of differentation: sum, product, quotient, chain • Increasing and decreasing functions • Local maximum and minimum points • The second derivative **Skills:**	• Knowledge and understanding • Problem solving • Communication and interpretation • Technology • Reasoning • Inquiry approach	• Progress test • Unit test • Quizzes	• Communication skills (adopt strategies appropriate for different situations) • Social-collaboration (work collaboratively) • Organization skills (managing time and tasks effectively) • Thinking skills (apply skills in unfamiliar situations)	**Links to other subjects:** Marginal cost, revenue, profit, (economics); Instantaneous velocity kinematics (physics); interpreting the gradient of a curve (chemistry) **International-mindedness:** Indian mathematicians attempted to explain division by zero.

					•Research skills (present and communicate resulting work)	**TOK:** Is infinitesimal behaviour applicable to real life? Is intuition a valid way of knowing in mathematics?
		•To find equations of tangents and normals •To test for maximum/minimum. •To find stationary points				
Unit 4: Relationships in space: geometry and trigonometry Ch: 6 April, May, June 8 weeks	Generalization, space, relationships, equivalence, representation, quantity	**Topics:** •The distance and midpoint in 3D •Volume and surface area •The angle between lines •The sine and cosine rule •The circle: radians, length of an arc, area of a sector. •The unit circle and trigonometric functions •Trigonometric equations •Double angle identities •The relationship between trig. ratios **Skills:** •To solve the ambiguous case for sine rule •To apply trigonometry •To determine amplitude and period of trig.fun •To solve trigonometric equations in a finite interval- graphically and analytically	•Knowledge and understanding •Problem solving •Communication and interpretation •Technology •Reasoning •Inquiry approach	•Progress test •Unit test •Quizzes •Year exam	•Communication skills (formulate arguments in a convincing manner and take full account of other viewpoints) •Social-collaboration (work collaboratively in teams during group work) •Organization skills (managing time and tasks effectively) •Research skills (comparing, contrasting and validating information)	**Links to other subjects:** Design technology; volumes of stars and inverse square law, (physics) **International-mindedness:** Why are there 360 degrees in a complete turn? Links to Babylonian mathematics. **TOK:** Which is a better measure of angle: radian or degree? What criteria can/do/should mathematicians use to make such decisions?

Curriculum overview for ANALYSIS AND APPROACHES, HL, **3mn, School Year 2019/2020**   **Teacher:**   **Jelena Gusić**

Unit title / Month	Concept(s)	Content	Objectives / Learning outcomes	Assessment tasks	ATL skills	Links to other subjects
Unit 1: From patterns to generalisation Ch: 1 September, October 7 weeks	Generalization, representation, modelling, equivalence, patterns, validity, systems	**Topics:** • Arithmetic sequences and series • Geometric sequences and series • Compound interest • The binomial theorem • Counting principles • Permutations and combinations • Partial fractions • Complex numbers in Cartesian form • Principle of mathematical induction **Skills:** • to use sigma notation • to model real-life situations using sequences • to find specific term in binomial expansion • to perform operations with complex numbers	• Knowledge and understanding • Problem solving • Communication and interpretation • Technology • Reasoning • Inquiry approach	• Progress test • Unit test • Quizzes	• Communication skills (understand, use and interpret math. notation) • Social skills (negotiate ideas) • Self-management skills (develop new skills, techniques and strategies for effective learning) • Thinking skills (draw reasonable conclusions and generalizations and test them) • Research skills (examine, select and reject sources)	**Links to other subjects**: Loans and repayments (economics) **International-mindedness**: The properties of "Pascal's triangle" have been known in a number of different cultures long before Pascal. **Aim 8:** Ethics behind borrowing/lending money**. TOK**: Is mathematical reasoning different from scientific reasoning/reasoning in other Areas of Knowledge? Is it possible to know about things of which we can have no experience (infinity)?
Unit 2:	Representation, relationships,	**Topics:** • The equation of a straight line	• Knowledge and understanding • Problem solving	• Progress test • Unit test • Quizzes	• Communication skills (use graphs to	**Links to other subjects:** demand and supply curves

| Representing relationships: functions Ch: 2,3 November, December, 9 weeks | quantity, equivalence, systems, patterns | •Domain, range and graph of a function •Composite functions •Inverse function •Identity function •The quadratic function •The reciprocal function •Rational functions •Absolute value functions •Polynomial functions •The factor and remainder theorems. •Sum and product of the roots of polynomial equations •Odd and even functions •Exponential and logarithmic functions and their graphs •Transformations of graphs. **Skills:** •to graph a function; •to find the point of intersection using technology. •to solve equations and inequalities both graphically and analytically | •Communication and interpretation •Technology •Reasoning •Inquiry approach | •Semester exam | understand relationships) •Social-collaboration (work collaboratively in teams) •Self-management-organisation skills (bring necessary equipment and supplies: GDC) •Thinking-critical thinking skills (use models and simulations to explore complex systems and issue) •Research skills (citation and referencing skills) | (economics); graphical analysis (sciences); kinematics, projectile motion, radioactive decay, (physics); reactions and activation energy (chemistry); growth curves (biology). **International-mindedness**: The development of functions by Descartes (France), Leibnitz (Germany), Euler (Switzerland) **Aim 8:** Is misleading use of "exponential growth" when used popularly? **TOK:** What role do "models" play in mathematics? |
| **Unit 3: Measuring change:** | Change, patterns, relationships, | **Topics:** •Concepts of a limit, continuity and | •Knowledge and understanding •Problem solving | •Progress test •Unit test •Quizzes | •Communication skills (adopt strategies | **Links to other subjects:** Marginal cost, revenue, profit, |

differentiation Ch: 4 January, February, March 5 weeks 7.1.- 24.4	approximation, generalization, modelling, systems, quantity	differentiability of a function at a point • Derivative interpreted as gradient function and as rate of change • Tangents and normal • Rules of differentiation: sum, product, quotient, chain • Increasing and decreasing functions • Local maximum and minimum points • The second derivative <u>Skills:</u> • To find derivative from the first principles • To find equations of tangents and normals • To test for maximum and minimum. • To optimize • To find stationary points	• Communication and interpretation • Technology • Reasoning • Inquiry approach		appropriate for different situations) • Social-collaboration (work collaboratively) • Organization skills (managing time and tasks effectively) • Thinking skills (apply skills in unfamiliar situations) • Research skills (present and communicate resulting work)	(economics); Instantaneous velocity kinematics (physics); interpreting the gradient of a curve (chemistry) **International-mindedness:** Indian mathematicians attempted to explain division by zero. **TOK:** Is infinitesimal behaviour applicable to real life? Is intuition a valid way of knowing in mathematics?
Unit 4: **Relationships in space: geometry and trigonometry** Ch: 6 April, May, June	Generalization, space, relationships, equivalence, representation, quantity	<u>**Topics:**</u> • The distance and midpoint in 3D • Volume and surface area • The angle between lines/planes • The sine and cosine rule • The circle: radians, length of an arc, area of a sector.	• Knowledge and understanding • Problem solving • Communication and interpretation • Technology • Reasoning • Inquiry approach	• Progress test • Unit test • Quizzes • Year exam	• Communication skills (formulate arguments in a convincing manner and take full account of other viewpoints) • Social-collaboration (work collaboratively in teams during group work)	**Links to other subjects:** Design technology; volumes of stars and inverse square law, vectors, forces (physics) **International-mindedness:** Why are there 360 degrees in a

| 8 weeks | | • The unit circle and trigonometric functions
• Trigonometric equations
• Reciprocal trigonometric ratios; the inverse trigonometric functions
• Compound angle identities
• Relationships between trigonometric functions and the symmetry properties of their graphs
Skills:
• To solve the ambiguous case for sine rule
• To apply trigonometry
• To determine amplitude and period of trig.fun
• To solve trigonometric equations in a finite interval- graphically and analytically
• To apply Pythagorean identities on trig.fun
• To determine domain and range of inverse and reciprocal trigonometric functions | | | • Organization skills (managing time and tasks effectively)
• Research skills (comparing, contrasting and validating information) | complete turn? Links to Babylonian mathematics.
TOK: Which is a better measure of angle: radian or degree? What criteria can/do/should mathematicians use to make such decisions? |