MATHEMATICS MYP Subject Group Overview 2021

Year 6

Unit Title, Duration & Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
10 weeks (appx. 40 hours) NUMBER UNIT	**Key:** Form **Related:** Equivalence, representation	Identities and relationships **Area of exploration:** Number, methods; products, processes and solutions	***Numbers can be represented in different forms but still be equivalent.***	**A Criterion** – Knowing and Understanding **B Criterion** – Patterns	Communication Students use appropriate forms of mathematical representation to present information Self-Management- Students monitor their progress, seek and respond to feedback from teachers to assist them in consolidating strengths, addressing weaknesses and fulfilling their potential.	**Criteria A: Knowledge and Understanding** Students take a knowledge and understanding test on basic number skills and representing parts of a whole in multiple forms. Students are required to produce fractions of equivalence, to solve a problem or demonstrate they are of the same value (link the Statement of Inquiry). Students are also given the opportunity to reflect how they interpret the statement of inquiry. Questions are both familiar and unfamiliar situations. **Criteria B: Investigating Patterns** Mathematical investigations of some complexity that allow students: • to choose their own mathematical techniques • to reason from the specific patterns to general rules For this task students are given a series of pentagonal numbers and demonstrate their ability to apply their learnt patterning skills. Students Demonstrate their thinking and solutions in multiple forms - e.g. table of values, words, mathematical working and in some cases algebra (extension students). When developing their patterning skills, students are encouraged to connect the equivalence of each form. Assessment tasks could have a variety of solutions and should enhance independent mathematical thinking. Students learn patterning skills throughout this unit (an application of their basic number skills) and have applied them to discover and communicate patterns in square and triangular numbers.

Australian Curriculum Standards:

Identify and describe properties of prime, composite, square and triangular numbers (ACMNA122)
Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers (ACMNA123)
Investigate everyday situations that use integers. Locate and represent these numbers on a number line (ACMNA124)
Compare fractions with related denominators and locate and represent them on a number line (ACMNA125)
Solve problems involving addition and subtraction of fractions with the same or related denominators (ACMNA126)
Find a simple fraction of a quantity where the result is a whole number, with and without digital technologies (ACMNA127)
Add and subtract decimals, with and without digital technologies, and use estimation and rounding to check the reasonableness of answers (ACMNA128)
Multiply decimals by whole numbers and perform divisions by non-zero whole numbers where the results are terminating decimals, with and without digital technologies (ACMNA129)
Multiply and divide decimals by powers of 10 (ACMNA130)
Make connections between equivalent fractions, decimals and percentages (ACMNA131)
Continue and create sequences involving whole numbers, fractions and decimals.
Describe the rule used to create the sequence (ACMNA133)

Unit Title, Duration & Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
10 weeks (40 hours) MEASUREMENT	**Key:** Relationships **Related:** Measurement and space	**Global context:** Orientation in space and time **Area of exploration:** Measurement and maps	***Measurements are used to quantify relationships between two or more objects / phenomena.***	**C Criterion** – Communication **D Criterion** – Applying mathematics in real-life contexts.	Self-Management: Students develop Organisation skills E.g. Managing time and tasks effectively Plan short- and long-term assignments to meet deadlines keep an organized and logical system of information files/notebooks, use appropriate strategies for organizing complex information	**Criterion C & D: Applying mathematics in real-life contexts** Students produce a floor plan design for a Zoo using measurement features developed over the learning unit. ***Elements of Criterion C:*** Students need to communicate clearly through their maps how scale is used to represent the measurement of each enclosure. Students need to develop an organised table of the different types of animals, and the space they require. ***Elements of Criterion D:*** Students need to identify the authentic elements of designing enclosures, such as practical enclosures for the animals, as well as practical pathways and facilities for the visitors. Students apply their selected mathematical strategies to make decisions around area allocation, and describe whether or not their proposal makes sense in a real life context. In their report, students communicate how the allocation of spaces influences the other spaces (Link to Statement of Inquiry).

Australian Curriculum Standards

Connect decimal representations to the metric system   **ACMMG135**

Convert between common metric units of length, mass and capacity (ACMMG136)

Solve problems involving the comparison of lengths and areas using appropriate units ACMMG137

Unit Title, Duration & Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
8 weeks (32 hours) GEOMETRY	**Key**: Logic **Related**: Patterns, relationships	**Global context:** Scientific and technical innovations. **Area of exploration:** Geometry	*Problem solving strategies help us recognise patterns and relationships and logically communicate them to others*	**A Criterion** -Knowledge and understanding **B Criterion** – Investigating Patterns	THINKING Apply mathematical problem-solving techniques to recognize patterns: Students Itemise the multiple strategies that are relevant to the learning unit. Students practices using a table of values when competing number investigations	Patterning Investigation- Euler's Rule Criterion B – Investigating patterns During class time students develop their problem solving strategies and ability to recognise patterns and relationships as well as skills to logically communicate/prove these (Statement of Inquiry). This assessment task provides the opportunity to demonstrate these skills by discovering the relationship between the edges, faces and vertices of 2D and 3D shapes (Euler's Rule). Students make predictions with the relationship discovered, and verify these predictions with actual 3D solids. **Criterion A** – Geometry Test Students take a knowledge and understanding test on geometry skills. Students are required to recognise relationships previously taught in the unit, such as angle around a point, angles in quadrilaterals and triangles,, in order to find unknowns. Students show logical communication to convince the text reader that their thinking is correct. Questions are both familiar and unfamiliar situations.

Australian Curriculum Standards

Investigate, with and without digital technologies, angles on a straight line, angles at a point and vertically opposite angles. Use results to find unknown angles (ACMMG141)

Elaborations

- identifying the size of a right angle as 90° and defining acute, obtuse, straight and reflex angles
- measuring, estimating and comparing angles in degrees and classifying angles according to their sizes

- investigating the use of rotation and symmetry in the diagrammatic representations of kinship relationships of Central and Western Desert people
- recognising and using the two alternate conventions for naming angles

Investigate combinations of translations, reflections and rotations, with and without the use of digital technologies (ACMMG142)
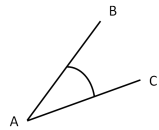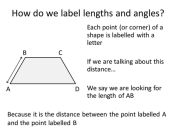
Elaborations

- designing a school or brand logo using transformation of one or more shapes
- understanding that translations, rotations and reflections can change the position and orientation but not shape or size

Introduce the Cartesian coordinate system using all four quadrants (ACMMG143)

Elaborations

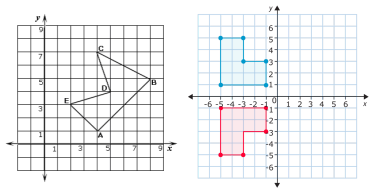- understanding that the Cartesian plane provides a graphical or visual way of describing location

Naming conventions and introduce the labelling of vertices

Vocabulary: polygon, prism, angle, vertex, line, edge, face ….

Work with shapes on a cartesian plane and use this for rotation, translation, reflection

Vocabulary: cartesian plane, x-axis, y-axis, rotation, translation, reflection, origin,

Describe probabilities using fractions, decimals and percentages (ACMSP144)

Conduct chance experiments with both small and large numbers of trials using appropriate digital technologies (ACMSP145)

Compare observed frequencies across experiments with expected frequencies (ACMSP146)

Interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables (ACMSP147)

Interpret secondary data presented in digital media and elsewhere (ACMSP148)

Unit Title, Duration & Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
9 weeks (36 hours)

STATISTICS AND PROBABILITY | **Key:**Logic

Related: Relationships | **Global context:** Fairness and development

Area of exploration: Probability | Reviewing relationships between theoretical and experimental probability allows us to logically assess the likelihood of a situation. | **C Criterion** – Communication **D Criterion** – Applying mathematics in real-life contexts. | **Communication**

I.Communication skills Exchanging thoughts, messages and information effectively through interaction Use appropriate forms of writing for different purposes and audiences **Thinking** VIII. Critical-thinking skills Analysing and evaluating issues and ideas Gather and organize relevant information to formulate an argument Interpret data Draw reasonable conclusions and generalizations | **Criterion C & D: Applying mathematics in real-life contexts**

Students investigate the probabilities of a game in order to produce a strategy that allows them to win more often, proving this through collected data. Students then when create a report on their winning strategy

Elements of **Criteria C** – Students develop a report with a logical structure. The report requires appropriate mathematical language pertaining to both experimental and theoretical probability. Students organise their data in a table provided. They need to make coherent lines of reasoning when relating experimental and theoretical probability.

Criteria D – Applying mathematics in real-life contexts

Students need to identify relevant elements, such as the game to be played such as the rules and strategy. Students apply mathematical strategies to correctly calculate the theoretical and experimental probabilities of the chosen game. Students select the number of trials in the probability experiment and then reflect on the degree of accuracy in the experiment conducted. |

Describe probabilities using fractions, decimals and percentages (ACMSP144)

Conduct chance experiments with both small and large numbers of trials using appropriate digital technologies (ACMSP145)

Compare observed frequencies across experiments with expected frequencies (ACMSP146)

Interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables (ACMSP147)

Interpret secondary data presented in digital media and elsewhere (ACMSP148)

Year 7

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Term 1 10 weeks (42 hours) Numbers and relationships	**Key**: Relationships **Related**: Patterns	Identities and Relationships **AOE:**Identifying relationships and patterns in numbers help us to solve problems.	*"Understanding relationships helps us to make decisions."*	Criterion A: Knowledge and Understanding Criteria B: Investigating Patterns	Communication skills: Organisation by using tables to order ideas, and ordering ideas after learning during reflection so that process can be shown.	**Criterion A -** Test on factors, multiples, indices, order of operations, and integers. Students take a knowledge and understanding test on skills in number operations. They are required to demonstrate their understanding of the order of operations, finding factors and multiples, operations with positive and negative integers. Students are given the opportunity to show in problems that there can be more than one way of solving them. They are also asked to consider how knowing these relationships will help them make decisions in later life (statement of inquiry). Questions are both familiar and unfamiliar situations. **Criterion B** - Investigating Patterns In this task, students are given data that relates reaction time, mass, speed and braking distance. Students are given a table that outlays how these four variables change over three stages. Students are required apply mathematical strategies to tabulate the rest of the data. Students choose two variables to apply mathematics strategies to find a rule, and describe their rule. Students are given the opportunity to verify their rule using mathematical statements and triangulating their statements with an extension of the data or a graph. Students are asked to consider how the relationship between the variables would be helpful to make decisions when riding a bike. (statement of inquiry).

Content:

Order of operations. BODMAS: Communicating mathematically. Does the story match the maths? Apply the associative, commutative and distributive laws to aid mental and written computation. Class/group discussion. Can you write a mathematical sentence to tell a story? How do we make sure the maths is done in the order that the story was told? Why do we need a universal/global method of communicating mathematics?

Number patterns - multiplication patterns, factors, prime factor tree

Multiplication Patterns: Discuss strategies to multiply numbers quickly, easily, and successfully. Compare multiplication tables. Identify lowest common multiples. Recognise numbers that are in multiple patterns.

Divisibility Rules: Discuss strategies to quickly determine if a number is divisible by another number. List factors of numbers. Compare factors of different numbers. Identify highest common factors.

Factor trees: Show how numbers can be broken down into expanded form showing the product of its factors.

Investigate index notation and represent whole numbers as products of powers of prime numbers.

Index notation. vs expanded notation. What factors are present in numbers and how can they be represented using index notation (factor trees and prime factors)

Investigate squares and square roots. Relationships between squares and square roots, cubes and cubed roots.

Compare, order, add and subtract integers. Using number lines. Exploring negative numbers. Discuss situations where positive and negative numbers are added and subtracted. Practice adding and subtracting positive and negative numbers.

How can relationships between variables be understood better or more efficiently if we find patterns first? Identifying patterns, following patterns, describing patterns, verifying patterns.

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
TERM 2 8 Weeks Fair Share	**Key:** Identity **Related:** Form, Equivalence, Relationships	Identity and relationships AOE: Identifying signs and symbols can help interpret fractions, decimals, and percentages Identity of an amount in a form can help you identify fairness.	Identity can be represented using signs and symbols.	**C Criterion** – Communication **D Criterion** – Applying mathematics in real-life contexts.	Research Skills- Students use referencing and formatting tools to create a presentation style suitable to context and intention, Reference and format appropriately. Student recognise the use of information form authors and show evidence of the synthesis of information.	**Criterion C & D: Applying mathematics in real-life contexts: Best Buy task** Students are going away for school camp. This task requires the students to research non-perishable food that is suitable for camp. They are required to conduct a unit price analysis of several brand/ size options of the food they are choosing to take. Students need to weigh up their unit price analysis against authentic life elements, such as packaging, waste, sustainability, quality, practicality of bulk buying etc. Students communicate their findings in a logically structured report. They are required to move between the representation of their summary table and making references to the table when discussing the accuracy of their solution.

Content:

Compare fractions, add and subtract fractions (different denominators), multiply and divide fractions, find fractions of an amount, convert fractions to decimals to percentages, compare unit price, best buy, using ratios.

Compare fractions using equivalence. Locate and represent positive and negative fractions and mixed numbers on a number line (ACMNA152)

Solve problems involving addition and subtraction of fractions, including those with unrelated denominators (ACMNA153)

Multiply and divide fractions and decimals using efficient written strategies and digital technologies (ACMNA154)

Express one quantity as a fraction of another, with and without the use of digital technologies (ACMNA155)

Round decimals to a specified number of decimal places (ACMNA156)

Connect fractions, decimals and percentages and carry out simple conversions (ACMNA157)

Find percentages of quantities and express one quantity as a percentage of another, with and without digital technologies. (ACMNA158)

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
TERM 3 8 Weeks Perspective Geometry	KEY: Perspective Related: Space	Orientation in Space and Time AOE: Shapes can change given different perspectives in space and time.	*Perspectives of space are shaped by our experience of the world*	C Criterion – Communicating D Criterion – Applying mathematics in real-life contexts.	Communication Skills: *Exchanging thoughts, messages and information effectively through interaction*	**Perspective report** **Criterion C & D: Applying mathematics in real-life contexts:** Best Buy task Students have been investigating 3D perspective art in the real world. The scenario is that students choose a brand to create a 3D advertisement for. Students produce orthographic and isometric designs for the advertisement. They produce a logically structured report, and are required to move between multiple representations including pictures, diagrams and tables. Students must discuss the accuracy of their advertisement in terms of the limitations of isometric and orthographic drawings, as well as the practicality of their ads in a real world environment.

Content: Geometry

Translations, reflections, rotational symmetry, coordinate geometry, different views of prisms, area of a rectangle, triangle parallelogram, volume of rectangular prism.

Draw different views of prisms and solids formed from combinations of prisms (ACMMG161)

Solve problems using ratio and scale factors in similar figures (ACMMG22)

Know different 2D shapes and the language used to describe them.
Know how to draw Orthographic views of 3D models
Know how to create 3D shapes from orthographic views
Know how to draw isometric views of 3D models
Know how to draw square views of 3D models
Know how to calculate scale factors for enlargements and reductions

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
TERM 4 10 weeks Investigating unknowns	KEY:Relationships Related: Patterns and Generalisations	Identities and Relationships	Patterns help identify relationships from which generalisations can be made.	**B Criterion** – Investigating Patterns **A Criterion** - Knowledge and Understanding	Self -management: Reflecting: students identify and choose a range of learning strategies appropriate to specific tasks and describe work practices that assist their learning	. Criteria A - Algebra test including combining like-terms, substituting into expressions, and solving equations Students take a knowledge and understanding test on skills in algebra. They are required to demonstrate their understanding in simplifying, solving and substitution. Questions include single step and two step equations, substituting two or more variables, or combining like terms. Questions vary in complexity and present both familiar and unfamiliar situations. **Criterion B** – Investigating Patterns In this task, students are given the scenario of setting up tables at a conference. They are given the opportunity to explore the patterns they see in the table arrangements, such as row length, width, number of tables or number of people. Students choose two variables to apply mathematics strategies to find a rule. Students can verify a rule by providing examples of larger table arrangements and their corresponding number sentences. Students are asked to consider how generalising their rule would help to make decisions in organising a much larger event (statement of inquiry).

Content: Algebra

Apply the associative, commutative and distributive laws to aid mental and written computation (ACMNA151)
Patterns and algebra

Introduce the concept of variables (unknowns or pronumerals) as a way of representing numbers using letters (ACMNA175)
Create algebraic expressions and evaluate them by substituting a given value for each variable (ACMNA176)
Extend and apply the laws and properties of arithmetic to algebraic terms and expressions (ACMNA177)

Year 8

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Geometry

12 Weeks

40hrs | Key: Logic

Related: Justification | Identities and relationships | *Properties and relationships can be applied to logically justify (prove) the identity of an object.* | **A Criterion –** Knowledge and Understanding

B Criterion – Investigating Patterns | **Communication**

Skill needed: Clearly communicate steps of logic and mathematical working when solving problems

Skills needed: From a pattern, describe a pattern with respect how the pattern progresses (e.g increases by two each time), or a general rule (predicting a pattern based with respect to its iteration)

Skill needed: Students need to be able to show an answer with reasoning for why it is an appropriate and correct solution. | **Criteria A** Students apply their knowledge of the geometric relationships to solve problems ranging in complexity and write simple mathematical proofs of congruence demonstrating their understanding of the studied properties and how they can be used to prove identity (statement of inquiry)

Criteria B Students apply patterning skills to identify properties of polygons in order to prove a relationship or the internal angles of polygons (statement of inquiry). presenting their findings in a logical report under test conditions. |

Content

Define congruence of plane shapes using transformations (ACMMG200)

Develop the conditions for congruence of triangles (ACMMG201)

Establish properties of quadrilaterals using congruent triangles and angle properties, and solve related numerical problems using reasoning (ACMMG202)

Classify triangles according to their side and angle properties and describe quadrilaterals (ACMMG165)

Demonstrate that the angle sum of a triangle is 180° and use this to find the angle sum of a quadrilateral (ACMMG166)

Identify corresponding, alternate and co-interior angles when two straight lines are crossed by a transversal (ACMMG163)

Investigate conditions for two lines to be parallel and solve simple numerical problems using reasoning (ACMMG164)

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Measurement 10 weeks 40 hours	Key: Relationships Related: Scale, model, measurement	Orientation in space and time	**Relationships of space can be demonstrated in scale models.**	**C Criterion:** Investigation and report **D Criterion**: Investigation and report	***Thinking*** **Skill needed:** Students have multiple strategies to problem solve, so can select a strategy that will generate an appropriate answer in new contexts. **Skill needed:** Students consider elements of the context and describe how the elements are relevant. Students begin to write paragraphs to introduce their context. By the end of Yr8 students also state the relevant mathematics that will be used to solve the problem, outlining why this is the case. **Skill needed:** Students need to be able to show an answer with reasoning for why it is an appropriate and correct solution.	**Criteria C & D** Students apply the skills learnt throughout this unit (area and volume calculations, estimation and approximation, reasonableness of solution) to produce a **scale model** design that demonstrates the relationship of space within the spacecraft known as the International Space Station. Students construct a logically sequenced report that outlays the design of their module. They are required to apply appropriate formulas and units, and detail how their scale model shows how the spaces relate to each other (statement of inquiry). Students are required to produce tables, graphs, scale drawings, working out, and move effectively between these representations in their report. Students must consider the authentic elements? How does a scale model allow us to evaluate a design for reasonableness. What do astronauts need to survive? How often does more supply arrive, and how can their design account for enough space? a

Content

Choose appropriate units of measurement for area and volume and convert from one unit to another (ACMMG195)

Find perimeters and areas of parallelograms, trapeziums, rhombuses and kites (ACMMG196)

Investigate the relationship between features of circles such as circumference, area, radius and diameter. Use formulas to solve problems involving circumference and area (ACMMG197)

Develop formulas for volumes of rectangular and triangular prisms and prisms in general. Use formulas to solve problems involving volume (ACMMG198)

Solve problems involving duration, including using 12- and 24-hour time within a single time zone (ACMMG199)

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Probability & Statistics 10 Weeks 33 hours	Key: Logic Related: Justification	Identities and relationships	**Collected data can be _logically_ analysed and manipulated to demonstrate relationships and _justify_ viewpoints.**	**A Criterion –** Knowledge and Understanding **C Criterion:** Investigation and report **D Criterion:** Investigation and report	**Communication** Clearly communicate steps of logic and mathematical working when solving problems students will be able to represent the same information in multiple perspectives **:s**elect and use either table, graph, display, or equation for to present information from mathematical scenarios	**Criteria A** Students apply their knowledge of the probability to solve problems ranging in complexity and to demonstrate their understanding of the studied properties and how they can be used to prove identity. **(experimental probability involves reasoning with data and logical analysis).** **Criteria C & D** Students apply the skills learnt throughout this unit (mean, median, mode, various types of data and representation) to produce an infographic. In this task students will **logically analyse data** to represent opinions of their year level in various representations. They will consider methods of data **manipulation** to attempt to bias a view point to produce a report that demonstrates that data can be used to justify a viewpoint and manipulated to demonstrate bias..

Content

Solve problems involving the use of percentages, including percentage increases and decreases, with and without digital technologies (ACMNA187)

Identify complementary events and use the sum of probabilities to solve problems (ACMSP204)

Describe events using language of 'at least', exclusive 'or' (A or B but not both), inclusive 'or' (A or B or both) and 'and'. (ACMSP205)

Represent events in two-way tables and Venn diagrams and solve related problems (ACMSP292)

Investigate techniques for collecting data, including census, sampling and observation (ACMSP284)

Explore the practicalities and implications of obtaining data through sampling using a variety of investigative processes (ACMSP206)

Explore the variation of means and proportions of random samples drawn from the same population (ACMSP293)

Investigate the effect of individual data values, including outliers, on the mean and median (ACMSP207)

List all outcomes for two-step chance experiments, both with and without replacement using tree diagrams or arrays. Assign probabilities to outcomes and determine probabilities for events (ACMSP225)

Calculate relative frequencies from given or collected data to estimate probabilities of events involving 'and' or 'or' (ACMSP226)

Investigate reports of surveys in digital media and elsewhere for information on how data were obtained to estimate population means and medians (ACMSP227)

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Linear Functions

8 Weeks

27 hours | Key: Relationships

Related: Patterns | Scientific and technical innovation | *Algebraic relationships and patterns are essential for all technological inventions and innovations.* | **A Criterion** – Knowledge and Understanding

B Criterion – Investigating Patterns | **Communication:**

Students **justify** relationships and/or general rules with multiple examples (B.iii)

: From a pattern, students describe a pattern with respect how the pattern progresses (e.g increases by two each time), or a general rule (predicting a pattern based with respect to its iteration)

Thinking:

Students Itemise the multiple strategies that are relevant to the learning unit. Evaluate the appropriateness of | **A Criterion** – Students apply their knowledge of the linear functions to solve problems ranging in complexity and to demonstrate their understanding of linear relationships and how these can represent patterns on the cartesian plane.

B Criterion – **Criteria B**
Students apply patterning skills to prove a relationship between visual representations presenting their findings in a logical report under test conditions. |

| | | | | | strategies in different contexts. When encountering unfamiliar problems, consider problems solving practices that may be appropriate to situations (e.g Trial and Improve, round then estimate/ make problem simpler then estimate). | |

Content

Extend and apply the distributive law to the expansion of algebraic expressions (ACMNA190)

Factorise algebraic expressions by identifying numerical factors (ACMNA191)

Simplify algebraic expressions involving the four operations (ACMNA192)

Plot linear relationships on the Cartesian plane with and without the use of digital technologies (ACMNA193)

Solve linear equations using algebraic and graphical techniques. Verify solutions by substitution (ACMNA194)

Year 9						
Unit Title, Duration and Hours	**Key and Related Concepts**	**Global Context**	**Statement of Inquiry**	**Mathematics Objectives**	**Approaches to Learning Skills**	**Assessment Task including the relationship of the task to the statement of inquiry.**
Linear Modeling 10 Weeks 40 hours	Key: Form Related: Models, Representation	Scientific and Technical Innovation	*"Modeling relationships allows us to compare and contrast predictions for theoretical values, with actual values"*	**A Criterion –** Knowledge and Understanding	**Thinking-** Students itemise the multiple strategies that are relevant to the learning unit. They evaluate the appropriateness of strategies in different contexts. When encountering unfamiliar problems, students can use multiple problem solving practices that may be appropriate to situations (e.g Trial and Improve, round then estimate/ graph and tabulate/make problem simpler to estimate etc).	**Criteria A** Students apply their knowledge of linear relationships to solve problems ranging in complexity and familiarity. Students are given opportunities to apply their knowledge to authentic problems such as comparing how rates or start up fees affect the cost of products or service. In real life problems, students use linear models to make predictions (statement of inquiry), and compare how other variables may impact on future values.

Content

Solve problems involving simple interest (ACMNA211 - Scootle)

Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate problems (ACMNA208 - Scootle)

Sketch linear graphs using the coordinates of two points and solve linear equations (ACMNA215 - Scootle)

Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations (ACMNA296 - Scootle)

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
10 weeks (40 hours) Similarity of triangles, Pythag, and Trig	**Key:** Logic/Relationships **Related:** Justification	**Global Context:** identities and relationships **AOE:** application of old thinking in modern practice	**Statement of Inquiry:** *Mathematical relationships can be used to predict unknown quantities using measured values.*	**B Criterion:** Pythagorean triple patterning task **C Criterion:** Investigation and report **D Criterion:** Investigation and report	**Thinking** Select and apply mathematical problem solving techniques to discover complex patterns (B.i) Students need to create table/graph to suit the scenario given. **Communicating** Student use appropriate mathematical language (notations, symbols and terminologies) in both oral and written explanations. practice/learn how to structure a mathematical report, conventions (tables, graphs,...) and communicate mathematically. Students correctly justify their answers/solutions with proper reasoning, explain the reasonableness of their solutions and identify the limitations of their solutions. Students select and use multiple appropriate forms of mathematical representation to present information	**Criterion B** In this patterning task, students investigate the length of pythagorean triples (whole numbers, where one shorter side is an odd number. Students apply their mathematical strategies to make generalisation to how the sides relate to each other and further how the sides relate to stage number. Students use the relationships discovered to predict values for higher level triples (statement of inquiry), and use mathematical reasoning to verify these predictions. Students are required to justify if their rule is correct. **Criterion C & D** In this task, students apply their learning in trigonometry, to evaluate whether the schools local goals posts are regulation size for an actual Australian Rules Football (AFL) game. **Elements of D** After being given a measuring tape and clinometer, students must identify the authentic elements that will allow them to collect valid data. They make decisions in fair testing, validity and the use of multiple trials. They select and apply mathematical strategies to reach a solution (i.e the height of the fence posts) and justify the degree of accuracy that their calculations are produced. Student how their knowledge of Trigonometry allowed them predict values, too high for them to measure (Statement of inquiry) **Elements of C** Students construct logically sequenced reports, with trigonometric language and broader mathematical language used throughout. They are required to move between representations (tables, graphs, working etc) in order to maximise their intended meaning for the audience.

Content

Use the enlargement transformation to explain similarity and develop the conditions for triangles to be similar (ACMMG220 - Scootle)

Investigate Pythagoras' Theorem and its application to solving simple problems involving right angled triangles (ACMMG222 - Scootle)

Use similarity to investigate the constancy of the sine, cosine and tangent ratios for a given angle in right-angled triangles (ACMMG223 - Scootle)

Apply trigonometry to solve right-angled triangle problems (ACMMG224 - Scootle)

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Mathematics Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Algebra and exponentials **Statement of Inquiry**	**Key:** Relationship **Related:** Model, Measurement.	Scientific and Technical Innovation	*"Relationships can be represented in models of equivalence, that help us understand the world."*	**A Criterion:** Knowledge and Understanding test **B Criterion** Patterning Tasks	<u>Thinking</u> Select and apply mathematical problem solving techniques to discover complex patterns (B.i) Students need to create table/graph to suit the scenario given. **Communication:** Students verify and justify relationships and/or general rules using algebraic substitution/ equations to verify patterns	**Criterion B** To discover the algebraic rule for growth in a snowflake fractal. Modelling the patterns in a snowflake fractal. Students model the pattern in order to discover the relationship between the number of sides in a growing fractal and the initial stage, the length of each side in a growing fractal and the initial stage forming an exponential relationship.

Content

Apply index laws to numerical expressions with integer indices (ACMNA209 - Scootle)

Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate problems (ACMNA208 - Scootle)
Express numbers in scientific notation (ACMNA210 - Scootle)
Extend and apply the index laws to variables, using positive integer indices and the zero index (ACMNA212 - Scootle)
Apply the distributive law to the expansion of algebraic expressions, including binomials, and collect like terms where appropriate (ACMNA213 - Scootle)
Calculate areas of composite shapes (ACMMG216 - Scootle)
Calculate the surface area and volume of cylinders and solve related problems (ACMMG217 - Scootle)
Solve problems involving the surface area and volume of right prisms (ACMMG218 - Scootle)

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Statistics **10 weeks** **40 hours**	**Key:** Relationship **Related:** representation and generalisation	Fairness and development	**Statement of Inquiry** Displaying data allows us to make visual representations and generalisations of relationships. Choices for data displays affect the way data is understood which has implications for positioning people in certain ways.	**C Criterion:** Investigation and report **D Criterion:** Investigation and report	**Communication** **Students** use of **multiple** appropriate forms of mathematical representation to present information (C.ii) Students develop knowledge of various forms of data representation and where that representation is the most relevant display to maximise/position understanding for the information : Students will independently choose and display data in various types of representation (for examples tables/graphs/equations/pictures).	**Criteria C & D** Students are given large sets of cohort data collected with respect to miscellaneous P.E activities. Aftera first examination of the data, students propose a question that requires statistical analysis. **Elements of C-** Students must apply their mathematical strategies to analyse the data, and develop data displays in a logically structured report. They are required to move between representations of data display, tables, spread sheet, and any broader statistical analysis researched. **Elements of D-** Students must decide on which elements of the data are authentically relevant. One decided they must apply select mathematical strategies to perform analysis and produce data displays. Students must justify the degree of accuracy in their analysis, and consider how the formation of their data displays may position the reader to reach certain conclusions (statement of inquiry).

Content:

Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly and from secondary sources (ACMSP228 - Scootle)

Construct back-to-back stem-and-leaf plots and histograms and describe data, using terms including 'skewed', 'symmetric' and 'bi modal' (ACMSP282 - Scootle)

Compare data displays using mean, median and range to describe and interpret numerical data sets in terms of location (centre) and spread (ACMSP283 - Scootle)

Year 10 Standard

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Algebra Skill Builder 9 weeks (appx. 36 hr)	**Key**: Relationships **Related**: Form	Identities and Relationships	Relationships can be expressed using algebra and their form can be adjusted to highlight relationships of interest.	Criteria A	Self Management Resilience Practise 'bouncing back' after adversity, mistakes and failures **V Reflection skills** (Re)considering the process of learning; choosing and using ATL skills ● Develop new skills, techniques and strategies for effective learning ● Consider content (What did I learn today? What don't i yet understand? What questions do I have now?) ● Consider personal learning strategies (What can I do to become a more efficient and effective learner? How can I become more flexible in my choice of learning strategies? What factors are	Students undertake an A Criterion test to demonstrate that they can express relationships in algebraic forms and move between various algebraic forms.

					important for helping me learn well?	

Content

Factorise algebraic expressions by taking out a common algebraic factor (ACMNA230)

Simplify algebraic products and quotients using index laws (ACMNA231)

Apply the four operations to simple algebraic fractions with numerical denominators (ACMNA232)

Expand binomial products and factorise monic quadratic expressions using a variety of strategies (ACMNA233)

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Linear Modelling 9 weeks (appx. 36hr)	**Key**: Relationships **Related**: Model **AoE**: Profit and loss (running a business)	Globalization and sustainability (how is everything connected)	Mathematical modelling of relationships leads to a better understanding of possible solutions.	Criteria C Criteria D	**COMMUNICATION** Reading, writing and using language to gather and communicate information. - Write for different purposes - Organize and depict information logically - Structure information in reports	**Criteria B** Students explore the patterns and relationships in systems of equations where coefficients increase by a set amount e.g. 2x+4y=6 and 10x+12y=14 **Criteria C and D** Students model the relationships between and within expenses and revenue by constructing equations and modelling the break-even point of a fictitious business, producing a mathematical report.

Content

Solve problems involving linear equations, including those derived from formulas (ACMNA235)

Solve linear simultaneous equations, using algebraic and graphical techniques, including using digital technology (ACMNA237)

Solve problems involving parallel and perpendicular lines (ACMNA238)

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Bivariate data 9 weeks (appx. 36 hr)	**Key:** Relationships **Related:** Model, patterns	Identities and Relationships	*"Collection and display of data can visually demonstrate relationships from which models and patterns can be derived"*	Criteria B Criteria C Criteria D	**Self-Management** **Managing time and tasks effectively** IOrganisation Skills Bring necessary equipment and supplies to class Keep an organized and logical system of information files/notebooks Select and use technology effectively and productively	**Criteria B** In this patterning task, students gather data for on mean average high temperatures, and for cities in Australia. Students select and apply mathematical techniques to discover possible relationships. Students attempt to verify this pattern to other parts of Australia, and consider the applicability of their pattern in other areas of the world. Students justify the degree of accuracy of the pattern, and the utituly of making a generalisation (statement of inquiry). **Criteria C and D** Students collect data and use various tools to model the relationship between two variables of their choice producing a mathematical report to communicate their findings. **Elements of C** Students are required to develop a logically sequenced report. They are expected to move fluently between representations such as graphs, tables of their data and scale models. Students apply both statistical language and broader mathematical language. **Elements of D** Students are required to identify authentic elements of their task- such as understanding what constitutes an appropriate level of data. They must apply mathematical strategies to conduct statistical analysis on their two variables. Students need to justify the reasonableness of their findings, as well their choice of data displays in visually demonstrating data displays (statement of inquiry).

Content

Use scatter plots to investigate and comment on relationships between two numerical variables (ACMSP251)

Investigate and describe bivariate numerical data where the independent variable is time (ACMSP252)

Evaluate statistical reports in the media and other places by linking claims to displays, statistics and representative data (ACMSP253)

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Trigonometry 8 weeks (appx. 32 hr)	**Key:** Relationships **Related:** Measurement	Identities and Relationships	*The relationship between spaces can be identified in more than one way*	Criteria A: Knowing and Understanding	**Communication** Communication skills Reading, writing and using language to gather and communicate information (Read critically and for comprehension, Understand and use mathematical notation, Make effective summary notes for studying)	**Criteria A-** Students complete a knowledge and understanding test Students use their knowledge of the relationships within right angled triangles to solve simple problems using trigonometric ratios to find the measure of unknown side lengths and angles before moving on to more complex problems involving true bearings with real-life contexts to triangulate the location of objects in relation to one another (statement of inquiry)

Content

Solve right-angled triangle problems including those involving direction and angles of elevation and depression (ACMMG245)

Formulate proofs involving congruent triangles and angle properties (ACMMG243)

Apply logical reasoning, including the use of congruence and similarity, to proofs and numerical exercises involving plane shapes (ACMMG244)

Year 10 Extension

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Parabolas! 12 weeks(48 hours)	**Key: Form** **Related:** Representations. Patterns. Systems. Models. Methods.	**Global Context:** Scientific & Technical Innovations. **Area of Exploration**: Parabolas exist in everyday life, we just need to look for them.	Representing patterns with equivalent forms can lead to understanding systems better, and improving systems, models and methods.	**B Criterion** – Investigating Patterns **C Criterion** – Communicating **D Criterion** – Applying mathematics in real-life contexts.	**COMMUNICATION** Students appropriate mathematical language (notation, symbols and terminology) in both oral and written explanations Student**s** fluently use appropriate mathematical language (notation, symbols and terminology) in both oral and written explanations **THINKING** Students identify relevant elements of authentic real-life situations Students will research the context in detail and consider all relevant details which will affect the investigation. Construct and sequence detailed paragraphs, in a structured format. Make in-text citations to sources used for relevant information.	**Criteria B** In this patterning task students investigate how changing quadratic functions has an effect on their respect graph. Student apply mathematical strategies to from a generalisation about components of quadratic equations, in vertex from $y= m(x-dn)^2-p$ Students need to verify and justify their generalisations with their graph and tabulated models. **Criteria C and D** Shooting Basketballs Report Student model quadratics in order to investigate the elements of effective basketball shots. **Elements of C** Students are required to develop a logically sequenced report that embeds language for quadratics and broader mathematical language. Students are expected to effectively move between representations (graphs, pictures, models, tables etc) to build a convincing argument for their basketball shot. **Elements of D** Students need to select mathematical strategies to model the trajectory of their basketball. Thay are required to identify which form of quadratics is most appropriate to use. they must select and apply appropriate mathematical strategies to find the quadratic equation.

Content

Factorizing quadratic expressions where the coefficient of x^2 is 1, including difference of two squares.

Factorizing quadratic expressions where the coefficient of x^2 is not 1.

Finding the axis of symmetry and the vertex of a quadratic function

Expressing a quadratic function in three different forms: standard, factorized and vertex.
Finding a quadratic function given three distinct points on its graph.
Finding function to model a real-life parabola.
Understanding how many unique points define an object in a given dimension of space.
Solving quadratic equations algebraically and graphically.
Solving real-life problems by creating and using quadratic models.

Factorise algebraic expressions by taking out a common algebraic factor (ACMNA230
Simplify algebraic products and quotients using index laws (ACMNA231
Investigate the concept of a polynomial and apply the factor and remainder theorems to solve problems (ACMNA266)
Describe, interpret and sketch parabolas, hyperbolas, circles and exponential functions and their transformations (ACMNA267)
Apply understanding of polynomials to sketch a range of curves and describe the features of these curves from their equation (ACMNA268)
Factorise monic and non-monic quadratic expressions and solve a wide range of quadratic equations derived from a variety of contexts (ACMNA269)

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Logarithms! (Rational relationships) **6 Weeks (24 hours)**	**Key:** Relationships **Related:** Representations. Model. Change	**Global Context:** Scientific & Technical Innovations. **Area of Exploration:** Logarithms help us to solve certain problems; We just need to know when it is time to use them.	*"Generalising changes in quantity helps establish relationships that can model duration, frequency and variability."*	**A Criterion –** Knowing & Understanding	**Self-management** Keeping valuable information you research / learn organised Independently use a strategy to organise notes using a structured note-taking approach	**Criterion A** Students take a knowledge and understanding test to demonstrate their learning in Logarithms. They are given the opportunity to relate their understanding of index law to the logarithm laws. They also apply log law understandings to real life models that incorporate variables of duration, frequency, and variability, such as cooling chemical or modelling insect population (statement of inquiry)

Content
Evaluating logarithms with & without a calculator.
Writing an exponential statement as a logarithmic statement.
Solving Exponential Equations.
Writing & solving exponential equations from real-life situations.
Using natural logarithms.
Drawing graphs of logarithmic functions.
Finding the inverse of an exponential function.
Justifying algebraically & graphically that a logarithmic function and corresponding exponential function are mutual inverses.
Identifying & applying function transformations on graphs of logarithmic functions.
Developing laws of logarithms.
Using the laws of logarithms to simplify expressions & solve equations.
Proving the laws of logarithms.
Proving the change of base formula.

Define rational and irrational numbers and perform operations with surds and fractional indices (ACMNA264
Use the definition of a logarithm to establish and apply the laws of logarithms (ACMNA265

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Which triangle is just right for you? A measurement topic. **10 Weeks (40)**	**Key:** Relationships **Related:** Model, Generalisations	**Global Context:** Orientation in Space & Time **Area of Exploration**: Models, methods; products, processes and solutions Conceptual Understanding: Relationship between objects in the real world can be discovered and modelled.	*Generalised relationships from simple models can be applied to delineate complex models.*	**C Criterion** – Communicating **D Criterion** – Applying mathematics in real-life contexts.	**THINKING** Students select appropriate mathematics when solving problems in both familiar and some unfamiliar situations. They Itemise the multiple strategies that are relevant to the learning unit, and Evaluate the appropriateness of strategies in different contexts.	**Criteria C and D** Yr 6/7 Playground task. 10A students are required to produce a plan to redevelop an irregular vacant piece of land at the school. The land will be repurposed into a new playground. **Elements of C** Students are required to develop a logically sequenced report that details the playground design. They are expected to move fluently between representations such as graphs, tables and scale models. Students apply both trigonometric language and broader mathematical language. **Elements of D** Students are required to identify authentic elements of their task- such as understanding the materials needed or how to organize the playground to avoid overcrowding. They must apply mathematical strategies gained from the trigonometry unit to their plan. Students need to justify the reasonableness of their design against authentic elements.

Content

Establish the sine, cosine and area rules for any triangle and solve related problems (ACMMG273 - Scootle)

Use the unit circle to define trigonometric functions, and graph them with and without the use of digital technologies (ACMMG274 - Scootle)

Apply Pythagoras' Theorem and trigonometry to solving three-dimensional problems in right-angled triangles (ACMMG276 - Scootle)

Unit Title, Duration and Hours	Key and Related Concepts	Global Context	Statement of Inquiry	Objectives	Approaches to Learning Skills	Assessment Task including the relationship of the task to the statement of inquiry.
Statistics **8 Weeks (32)**	**Key:** Relationships **Related:** Model, Patterns	**Global Context:** Identities and Relationships **Area of Exploration**: How to stand out from the crowd.	*Generalizing and representing relationships can help to clarify trends among individuals, populations, and the natural world*	**A Criterion** – Knowing & Understanding	**THINKING:** Students investigate the act of interpolating and extrapolating values in data sets. Students consider boundaries and constraints by which their rules are applicable. Students select and apply mathematical problem solving techniques to discover complex patterns Students select appropriate techniques which best suits the scenario given. Students explore patterns using the graphics calculator (graph, statistics, equations and tables.	**Criterion A** Students take a knowledge and understanding test to demonstrate their learning in bivariate statistics. Students are required to select and apply mathematical strategies such as measures of spread, measures of center, graphing bivariate data, correlation, causation and lines of best fit. In a variety of familiar and unfamiliar problems, students are exposed to real world problems involving trends amongst individuals or populations (statement of inquiry). **Criterion B** In this patterning task, students gather data for on mean average high temperatures, and for cities in Australia. Students select and apply mathematical techniques to discover possible relationships. Students attempt to verify this pattern to other parts of Australia, and consider the applicability of their pattern in other areas of the world. Students justify the degree of accuracy of the pattern, and the utituly of making a generalisation (statement of inquiry).

Content

Determine quartiles and interquartile range (ACMSP248

Use scatter plots to investigate and comment on relationships between two numerical variables (ACMSP251

Investigate and describe bivariate numerical data where the independent variable is time (ACMSP252

Evaluate statistical reports in the media and other places by linking claims to displays, statistics and representative data (ACMSP253

Making inferences about data, given the mean and standard deviation.

Using different forms of the standard deviation formula.

Understanding the normal distribution.

Making inferences about normal distribution.

Using standard deviation and mean.

Drawing a scatter plot for bivariate data.

Drawing line of best fit by eye(regression line).

Understanding & interpreting the correlation between two sets of data.

Using technology to obtain the equation of a line of best fit.