

**Term 1: Unit 1 [Patterns & Algebra]**

**Year 10 Australian Curriculum Achievement Standard:**

By the end of Year 10, students recognise the connection between simple and compound interest. They solve problems involving linear equations and inequalities. They make the connections between algebraic and graphical representations of relations. Students solve surface area and volume problems relating to composite solids. They recognise the relationships between parallel and perpendicular lines. Students apply deductive reasoning to proofs and numerical exercises involving plane shapes. They compare data sets by referring to the shapes of the various data displays. They describe bivariate data where the independent variable is time. Students describe statistical relationships between two continuous variables. They evaluate statistical reports.

Students expand binomial expressions and factorise monic quadratic expressions. They find unknown values after substitution into formulas. They perform the four operations with simple algebraic fractions. Students solve simple quadratic equations and pairs of simultaneous equations. They use triangle and angle properties to prove congruence and similarity. Students use trigonometry to calculate unknown angles in right-angled triangles. Students list outcomes for multi-step chance experiments and assign probabilities for these experiments. They calculate quartiles and inter-quartile ranges.

**Unit Overview:**

In this unit students will develop the essential skills of algebra required to be successful throughout the year. They will focus on the mechanics of manipulating expressions and equations to develop fluency and accuracy. Applications include: solving & substitution for linear equations, simplifying, factorising, distributive law across a range of contexts and application of other algebraic principles to real life contexts.

**Assessment Overview:**

Core - Patterns & Algebra	Plus - Patterns & Algebra
<p><b>Item [1] - Patterns &amp; Algebra (Exam)</b>  <b>Scheduled</b> - Week 9 Exam Block  <b>Length</b> - 60 Minutes</p> <p><b>Key Skill/s:</b></p> <ul style="list-style-type: none"> <li>• <b>Factorise</b> algebraic expressions by taking out a common algebraic factor.</li> <li>• <b>Simplify</b> algebraic products and quotients using index laws.</li> <li>• <b>Apply</b> the four operations to simple algebraic fractions with numerical denominators.</li> <li>• <b>Expand</b> binomial products and factorise monic quadratic expressions using a variety of strategies</li> <li>• <b>Substitute</b> values into formulas to determine an unknown</li> <li>• <b>Solve</b> problems involving linear equations, including those derived from formulas</li> <li>• <b>Connect</b> the compound interest formula to repeated applications of simple interest using appropriate digital technologies</li> </ul> <p><b>Conditions:</b>                      Assessment is one in-class exam.                      Students will work <b>INDIVIDUALLY</b> following test protocols.  <i>Refer to KSHS Test protocol</i></p>	<p><b>Item [1] - Patterns &amp; Algebra (Exam)</b>  <b>Scheduled</b> - Week 9 Exam Block  <b>Length</b> - 90 Minutes</p> <p><b>Key Skill/s:</b></p> <ul style="list-style-type: none"> <li>• <b>Factorise</b> algebraic expressions by taking out a common algebraic factor.</li> <li>• <b>Simplify</b> algebraic products and quotients using index laws.</li> <li>• <b>Apply</b> the four operations to simple algebraic fractions with numerical denominators.</li> <li>• <b>Expand</b> binomial products and factorise monic quadratic expressions using a variety of strategies</li> <li>• <b>Substitute</b> values into formulas to determine an unknown</li> <li>• <b>Solve</b> problems involving linear equations, including those derived from formulas</li> <li>• <b>Connect</b> the compound interest formula to repeated applications of simple interest using appropriate digital technologies</li> <li>• <b>Define</b> rational and irrational numbers and perform operations with surds and fractional indices</li> <li>• <b>Use</b> the definition of a logarithm to establish and apply the laws of logarithms</li> <li>• <b>Solve</b> simple exponential equations</li> </ul> <p><b>Conditions:</b>                      Assessment is one in-class exam.                      Students will work <b>INDIVIDUALLY</b> following test protocols.  <i>Refer to KSHS Test protocol</i></p>

Guaranteed Vocabulary:	Design Question Four Strategy	Design Question Five Strategy	21 <sup>st</sup> Century Skill:
<p><b>Technical Vocabulary:</b> Pronumeral, Formula, Equation, Coefficient, Quadratic, Term/s/Like terms</p> <p><b>Procedural Vocabulary:</b> Substitution, Factorise, Solve, Find Simplify, Evaluate, Calculate, Define</p> <p><b>Conventions &amp; Symbols:</b> Multiplication of pronumerals: <math>ab</math>, <math>a(2+b)</math></p>	<p>Students will primarily be <b>practising</b> exercises with routinely set homework and <b>feedback</b> structure.</p> <p>Students will <b>practice</b> a variety of questions and contexts through textbook examples</p> <p>Students will be encouraged to write their own questions and these can be swapped with other students to increase <b>engagement/collaboration</b></p>	<p>Students will <b>investigate</b> real world scenarios through algebraic applications.</p> <p>Using the reading as a mathematician to interpret word problems and develop strategies to <b>solve</b> them.</p>	<p><b>Critical thinking:</b> analytical thinking, problem-solving, decision-making, reasoning, reflecting &amp; evaluating, intellectual flexibility</p> <p><b>Creative thinking,</b> curiosity &amp; imagination, identifying alternatives, seeing or making new links</p> <p><b>Communication:</b> effective oral and written communication, using language, symbols and texts</p> <p><b>Collaboration and teamwork:</b> participating &amp; contributing</p> <p><b>Personal and social skills:</b> management (self, career, time, planning and organising), character (resilience, mindfulness, open- and fair-mindedness, self-awareness)</p>
Guaranteed Skills/Language Features:	Reading Comprehension Skill & Strategy	Cognitive Verbs	ICT to Enhance learning:
<p>Expand single set of brackets.</p> <p>Expand and simplify multiple sets of brackets.</p> <p>Substitute into linear equations.</p> <p>Solve multistep linear equations.</p> <p>Rearrange simple linear equations</p> <p>Simplify algebraic fractions.</p> <p>Apply simple interest formula.</p> <p>Factorise single sets of brackets.</p> <p>Factorise quadratics.</p> <p>Identify errors and justify correct solutions.</p> <p>Recall measurement and angle rules.</p> <p>Apply concepts of expanding, factorising and solving to simple real life contexts.</p>	<p><b>Reading as a Mathematician</b></p> <p><b>Students will complete the following steps when starting a problem:</b></p> <ol style="list-style-type: none"> <li>1. Scan the whole problem.</li> <li>2. Identify the task.</li> <li>3. Reread the problem. What is important to help you solve the problem?</li> <li>4. Translate - (create a mathematical model)</li> <li>5. Solve the problem.</li> </ol>	<p><b>Retrieval &amp; Comprehension</b> <i>Calculate</i> – determine or find (e.g. a number, answer) by using mathematical processes; obtain a numerical answer showing the relevant stages in the working; ascertain/determine from given facts, figures or information</p> <p><i>Use</i> - operate or put into effect; apply knowledge or rules to put theory into practice</p> <p><b>Analytical Processes</b> <i>Identify (Errors/Problems)</i> – distinguish; locate, recognise and name; establish or indicate who or what someone or something is; provide an answer from a number of possibilities; recognise and state a distinguishing factor or feature</p> <p><i>Interpret</i> - use knowledge and understanding to recognise trends and draw conclusions from given information; make clear or explicit; elucidate or understand in a particular way; ; give one's own interpretation of; identify or draw meaning from, or give meaning to, information presented in various forms, such as words, symbols, pictures or graphs</p> <p><b>Knowledge Utilisation</b> <i>Solve</i> – find an answer to, explanation for, or means of dealing with (e.g. a problem); work out the answer or solution; obtain the answer/s using algebraic, numerical and/or graphical methods</p>	<p>Use of Scientific calculators</p> <p>Use of spreadsheets</p>

YEAR 10 - UNIT 1: Patterns & Algebra [CORE]		
Content Descriptors	Elaborations	Kirwan High Learning Goals
<b>Patterns &amp; algebra</b>		<b>I Can...</b>
Factorise algebraic expressions by taking out a common algebraic factor (ACMNA230)	<ul style="list-style-type: none"> <li>- using the distributive law and the index laws to factorise algebraic expressions</li> <li>- understanding the relationship between factorisation and expansion</li> </ul>	Use common algebraic factors to factorise expressions and then expand to check solution
Simplify algebraic products and quotients using index laws (ACMNA231)	- applying knowledge of index laws to algebraic terms, and simplifying algebraic expressions using both positive and negative integral indices	Use index laws to multiply and divide two terms with integer and rational indices
Apply the four operations to simple algebraic fractions with numerical denominators (ACMNA232)	<ul style="list-style-type: none"> <li>- expressing the sum and difference of algebraic fractions with a common denominator</li> <li>- using the index laws to simplify products and quotients of algebraic fractions</li> </ul>	Add, subtract, multiply, divide algebraic fractions with numerical denominators and simplify the solution using index laws
Expand binomial products and factorise monic quadratic expressions using a variety of strategies (ACMNA233)	<ul style="list-style-type: none"> <li>- identifying and using common factors, including binomial expressions, to factorise algebraic expressions using the technique of grouping in pairs</li> <li>- using the identities for perfect squares and the difference of squares to factorise quadratic expressions</li> </ul>	Expand binomial products using FOIL or crab claw, or the area method Factorise monic quadratics using the 'abc' method
Substitute values into formulas to determine an unknown (ACMNA234)	- solving simple equations arising from formulas	Substitute values into an expression and evaluate using algebraic conventions and order of operations
<b>Money and financial mathematics</b>		
Solve problems involving linear equations, including those derived from formulas (ACMNA235)	- representing word problems with simple linear equations and solving them to answer questions	Solve linear equations involving multiple steps  Translate a word problem into a linear equation and solve
Connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies (ACMNA229)	- working with authentic information, data and interest rates to calculate compound interest and solve related problems	Explain the difference between simple interest and compound interest  Calculate total interest and total amount using the compound interest formula

<b>YEAR 10 - UNIT 1: Patterns &amp; Algebra [PLUS]</b>		
<b>Content Descriptors</b>	<b>Elaborations</b>	<b>Kirwan High Learning Goals</b>
<b>Patterns &amp; algebra</b>		<b>I Can...</b>
Factorise algebraic expressions by taking out a common algebraic factor (ACMNA230)	- using the distributive law and the index laws to factorise algebraic expressions - understanding the relationship between factorisation and expansion	Use common algebraic factors to factorise expressions and then expand to check solution
Simplify algebraic products and quotients using index laws (ACMNA231)	- applying knowledge of index laws to algebraic terms, and simplifying algebraic expressions using both positive and negative integral indices	Use index laws to multiply and divide two terms with integer and rational indices
Apply the four operations to simple algebraic fractions with numerical denominators (ACMNA232)	- expressing the sum and difference of algebraic fractions with a common denominator - using the index laws to simplify products and quotients of algebraic fractions	Add, subtract, multiply, divide algebraic fractions with numerical denominators and simplify the solution using index laws
Expand binomial products and factorise monic quadratic expressions using a variety of strategies (ACMNA233)	- identifying and using common factors, including binomial expressions, to factorise algebraic expressions using the technique of grouping in pairs - using the identities for perfect squares and the difference of squares to factorise quadratic expressions	Expand binomial products using FOIL or crab claw, or the area method Factorise monic quadratics using the 'abc' method
Substitute values into formulas to determine an unknown (ACMNA234)	- solving simple equations arising from formulas	Substitute values into an expression and evaluate using algebraic conventions and order of operations
<b>Linear and non-linear relationships</b>		
Solve problems involving linear equations, including those derived from formulas (ACMNA235)	- representing word problems with simple linear equations and solving them to answer questions	Solve linear equations involving multiple steps Translate a word problem into a linear equation and solve it
<b>Money and financial mathematics</b>		
Connect the compound interest formula to repeated applications of simple interest using appropriate digital technologies (ACMNA229)	- working with authentic information, data and interest rates to calculate compound interest and solve related problems	Explain the difference between simple interest and compound interest Calculate total interest and total amount using the compound interest formula Use logarithms to solve for the unknown compounding period
<b>10 A - The following descriptors will only be completed by 10 Plus</b>		
<b>Real numbers</b>		<b>I Can...</b>
<ul style="list-style-type: none"> <li>Define rational and irrational numbers and perform operations with surds and fractional indices (ACMNA264)</li> </ul>	- understanding that the real number system includes irrational numbers - extending the index laws to rational number indices	Add, subtract, multiply and divide simple surds

Possible Habit of Mind:				
<b>Exploring Meaning of the HOM</b> By the end of this unit students will be able to:  <i>Remain open to continuous learning</i>	<b>Expanding Capacity for using the HOM</b> By the end of this unit students will be able to:  <i>Recognise that they have so much more to learn</i>	<b>Increasing Alertness for the HOM</b> By the end of this unit students will be able to:  <i>Demonstrate humility and pride when admitting they don't know something</i>	<b>Extending Values of the HOM</b> By the end of this unit students will be able to:  <i>Resist complacency</i>	<b>Building Commitment towards the HOM</b> By the end of this unit students will be able to:  <i>Reflect on remaining open to continuous learning</i>

**General Capabilities:** This unit provides opportunities for students to engage in following capabilities:

<b>Literacy</b> <input checked="" type="checkbox"/> <b>Comprehending texts through listening, reading and viewing</b> <input type="checkbox"/> Composing texts through speaking, writing and creating <input type="checkbox"/> Text knowledge <input type="checkbox"/> Grammar knowledge <input checked="" type="checkbox"/> <b>Word knowledge</b> <input type="checkbox"/> Visual knowledge <b>Numeracy</b> <input checked="" type="checkbox"/> Estimating and calculating with whole numbers <input checked="" type="checkbox"/> <b>Recognising and using patterns and relationships</b> <input checked="" type="checkbox"/> <b>Using fractions, decimals, percentages, ratios and rates</b> <input type="checkbox"/> Using spatial reasoning <input type="checkbox"/> Interpreting statistical information <input type="checkbox"/> Using measurement	<b>ICT</b> <input type="checkbox"/> Applying social and ethical protocols and practices when using ICT <input type="checkbox"/> Investigating with ICT <input type="checkbox"/> Creating with ICT <input type="checkbox"/> Communicating with ICT <input type="checkbox"/> Managing and operating ICT <b>Critical and creative thinking</b> <input checked="" type="checkbox"/> <b>Inquiring - identifying, exploring and organising information and ideas</b> <input type="checkbox"/> Generating ideas, possibilities and actions <input type="checkbox"/> Reflecting on thinking and processes <input checked="" type="checkbox"/> <b>Analysing, synthesising and evaluating reasoning and procedures</b>	<b>Personal and social capability</b> <input type="checkbox"/> Self-awareness <input checked="" type="checkbox"/> <b>Self-management</b> <input type="checkbox"/> Social awareness <input type="checkbox"/> Social management <b>Ethical understanding</b> <input checked="" type="checkbox"/> <b>Understanding ethical concepts and issues</b> <input checked="" type="checkbox"/> <b>Reasoning in decision making and actions</b> <input checked="" type="checkbox"/> <b>Exploring values, rights and responsibilities</b> <b>Intercultural understanding</b> <input type="checkbox"/> Recognising culture and developing respect <input type="checkbox"/> Interacting and empathising with others <input type="checkbox"/> Reflecting on intercultural experiences and taking responsibility
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**Cross Curriculum Priorities:**

<input type="checkbox"/> Aboriginal and Torres Strait Islander histories and cultures	<input type="checkbox"/> Asia and Australia's engagement with Asia	<input type="checkbox"/> Sustainability
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**Differentiation [for small groups or individuals]:**

The learning experiences within this unit can be differentiated by increasing:

- The frequency of exposure for some students
- The intensity of teaching by adjusting the group size
- The duration needed to complete tasks and assessment

Teachers are encouraged to use hands on, visual approaches or real life where necessary. This provides clear links to the outside world and provides concrete examples for students. Increasing the complexity of problems will also allow an opportunity for higher order thinking and for students to solve problems with multiple steps.