

Term 2: Unit 2 Real Numbers, Linear Relationships**Year 9 Australian Curriculum Achievement Standard:**

By the end of Year 9, students solve problems involving simple interest. They interpret ratio and scale factors in similar figures. Students explain similarity of triangles. They recognise the connections between similarity and the trigonometric ratios. Students compare techniques for collecting data from primary and secondary sources. They make sense of the position of the mean and median in skewed, symmetric and bi-modal displays to describe and interpret data.

Students apply the index laws to numbers and express numbers in scientific notation. They expand binomial expressions. They find the distance between two points on the Cartesian plane and the gradient and midpoint of a line segment. They sketch linear and non-linear relations. Students calculate areas of shapes and the volume and surface area of right prisms and cylinders. They use Pythagoras' Theorem and trigonometry to find unknown sides of right-angled triangles. Students calculate relative frequencies to estimate probabilities, list outcomes for two-step experiments and assign probabilities for those outcomes. They construct histograms and back-to-back stem-and-leaf plots.

Unit Overview:

Students solve problems involving simple interest. Students apply the index laws to numbers and express numbers in scientific notation. They calculate the gradient and midpoint of a line segment. They sketch linear and non-linear relations.

Assessment Overview:**Task:****Item : Real Numbers, Linear and Non-Linear Relationships (Exam)**

In-class exam (technology-free section included)

Week 9

Conditions:

Length: Up to 60 minutes

Two sections: Technology-active and Technology-free

Exam conditions (following KSHS exam protocol)

Key Skill/s:

Apply the simple interest formula, including rearranging.

Apply the index laws to numbers and variables.

Express numbers in scientific notation and decimal form.

Calculate gradient and midpoint of a line segment.

Sketch and solve linear equations.

Guaranteed Vocabulary:	Design Question Four Strategy	Design Question Five Strategy	21 st Century Skill:
<p>Simple interest Index laws Scientific notation Linear Non-linear Gradient</p>	<p>Element 9: <u>Using Structured Practice Sessions</u> Students will primarily be practising exercises with routinely set homework and feedback structure.</p> <p>Students will practice a variety of questions and contexts</p> <p>Students will be encouraged to write their own questions and these can be swapped with other students to increase engagement and collaboration</p>	<p>Element 12: <u>Engaging students in Cognitively Complex Tasks</u> Students will use the reading as a mathematician strategy to interpret higher level problems and develop strategies to solve them.</p>	<p>Students will:</p> <p>Critical thinking: analytical thinking, problem-solving, decision-making, reasoning, reflecting & evaluating, intellectual flexibility</p> <p>Creative thinking, curiosity & imagination, identifying alternatives, seeing or making new links</p> <p>Communication: effective oral and written communication, using language, symbols and texts</p> <p>Collaboration and teamwork: participating & contributing</p> <p>Personal and social skills: management (self, career, time, planning and organising), character (resilience, mindfulness, open- and fair-mindedness, self-awareness)</p>
Guaranteed Skills/Language Features:	Reading Comprehension Skill and Strategy	Cognitive Verbs	ICT to Enhance Learning:
<p>Apply the simple interest formula, including rearranging. Apply the index laws to numbers and variables. Express numbers in scientific notation and decimal form. Calculate gradient and midpoint of a line segment. Sketch linear and non-linear relations.</p>	<p>Reading as a Mathematician</p> <p>Students will complete the following steps when starting a problem:</p> <ol style="list-style-type: none"> 1. Scan the whole problem. 2. Identify the task. It could be a: 3. Reread the problem. What is important to help you solve the problem? 4. Translate - (create a mathematical model) 5. Solve the problem. 	<p>Identify Recall Create Develop Calculate Understand Apply</p>	<p>Mathspace Sumdog Scientific Calculators</p>

Learning Goals:

Strands and Sub-Strands	Australian Curriculum Content Descriptors	Australian Curriculum Elaborations	Kirwan High Learning Goals
Money and financial mathematics	Solve problems involving simple interest (ACMNA211)	<ul style="list-style-type: none"> understanding that financial decisions can be assisted by mathematical calculations 	<ul style="list-style-type: none"> Rearrange the simple interest formula for the desired variable Apply the simple interest formula to find any missing variable Solve worded problems involving simple interest
Patterns and algebra	Extend and apply the index laws to variables, using positive integer indices and the zero index (ACMNA212)	<ul style="list-style-type: none"> understanding that index laws apply to variables as well as numbers 	<ul style="list-style-type: none"> Apply index laws to numerical expressions with integer indices Simplify and evaluate expressions, involving both positive and negative indices
Real numbers	Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate problems (ACMNA208)	<ul style="list-style-type: none"> identifying direct proportion in real-life contexts 	<ul style="list-style-type: none"> Identifying direct proportion situations
	Apply index laws to numerical expressions with integer indices (ACMNA209)	<ul style="list-style-type: none"> simplifying and evaluating numerical expressions, using involving both positive and negative integer indices 	<ul style="list-style-type: none"> Apply the index laws to variables
	Express numbers in scientific notation (ACMNA210)	<ul style="list-style-type: none"> representing extremely large and small numbers in scientific notation, and numbers expressed in scientific notation as whole numbers or decimals 	<ul style="list-style-type: none"> Express very large and very small numbers in scientific notation Express numbers in scientific notation in standard or decimal form
Using units of measurement	Investigate very small and very large time scales and intervals (ACMMG219)	<ul style="list-style-type: none"> investigating the usefulness of scientific notation in representing very large and very small numbers 	
Linear and non-linear relationships	Find the midpoint and gradient of a line segment (interval) on the Cartesian plane using a range of strategies, including graphing software (ACMNA294)	<ul style="list-style-type: none"> investigating graphical and algebraic techniques for finding midpoint and gradient recognising that the gradient of a line is the same as the gradient of any line segment on that line 	<ul style="list-style-type: none"> Find the midpoint of a line segment
	Sketch linear graphs using the coordinates of two points and solve linear equations (ACMNA215)	<ul style="list-style-type: none"> determining linear rules from suitable diagrams, tables of values and graphs and describing them using both words and algebra 	<ul style="list-style-type: none"> Sketch linear equations using gradient and y-intercept Solve linear equations Determine linear rules from diagrams, tables and graphs

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

<p>Literacy</p> <ul style="list-style-type: none">✓ Comprehending texts through listening, reading and viewing✓ Composing texts through speaking, writing and creating<input type="checkbox"/> Text knowledge<input type="checkbox"/> Grammar knowledge✓ Word knowledge✓ Visual knowledge <p>Numeracy</p> <ul style="list-style-type: none">✓ Estimating and calculating with whole numbers✓ Recognising and using patterns and relationships✓ Using fractions, decimals, percentages, ratios and rates<input type="checkbox"/> Using spatial reasoning<input type="checkbox"/> Interpreting statistical information<input type="checkbox"/> Using measurement	<p>ICT</p> <ul style="list-style-type: none"><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 <p>Critical and creative thinking</p> <ul style="list-style-type: none">✓ Inquiring - identifying, exploring and organising information and ideas✓ Generating ideas, possibilities and actions✓ Reflecting on thinking and processes✓ Analysing, synthesising and evaluating reasoning and procedures	<p>Personal and social capability</p> <ul style="list-style-type: none"><input type="checkbox"/> Self-awareness<input type="checkbox"/> Self-management<input type="checkbox"/> Social awareness<input type="checkbox"/> Social management <p>Ethical understanding</p> <ul style="list-style-type: none"><input type="checkbox"/> Understanding ethical concepts and issues<input type="checkbox"/> Reasoning in decision making and actions<input type="checkbox"/> Exploring values, rights and responsibilities <p>Intercultural understanding</p> <ul style="list-style-type: none"><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.