Term 1: Unit 1 Measurement and Algebra

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 composite shapes and the volume and surface area of right prisms and cylinders. They expand binomial expressions and begin to factorise more complex expressions.

Assessment Overview:

Task:

Item 1: Measurement and Algebra Skills

In-class exam (technology-free section included) - Term 1 Week 9

Key Skill/s:

Partitioning composite shapes into simple shapes as a strategy for solving problems involving area. Solving problems involving surface area and volume of cylinders and prisms. Applying index laws to variables as well as numbers. Understanding the relationship between expansion and factorisation and identifying algebraic factors in algebraic expressions.

Conditions:

Length: Up to 60 minutes

Two sections: Technology-active and Technology-free

Exam conditions (following KSHS exam protocol)

Guaranteed Vocabulary:	**Design Question Four Strategy**	**Design Question Five Strategy**	**21st Century Skill:**
Composite shape Surface area Volume Capacity Index laws Expanding Binomials Factorising Algebraic factor	Element 9: <u>Using Structured Practice Sessions</u> Students will primarily be practising exercises with routinely set homework and feedback structure. Students will practice a variety of questions and contexts Students will be encouraged to write their own questions and these can be swapped with other students to increase engagement and collaboration	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.	Students will: **Critical thinking:** analytical thinking**,** problem-solving**,** decision-making**,** reasoning**,** reflecting & evaluating, intellectual flexibility **Creative thinking,** curiosity & imagination**,** identifying alternatives**,** seeing or making new links **Communication:** effective oral and written communication**,** using language, symbols and texts **Collaboration and teamwork:** participating & contributing **Personal and social skills:** management (self, career, time, planning and organising)**,** character (resilience, mindfulness, open- and fair-mindedness, self-awareness)
Guaranteed Skills/Language Features:	**Reading Comprehension Skill and Strategy**	**Cognitive Verbs**	**ICT to Enhance Learning:**
Calculating the area of composite shapes Develop the formulae for surface area Apply the surface area and volume formulae Convert between volume and capacity Expand binomials Factorise expressions with numerical and algebraic factors	**Reading as a Mathematician** **Students will complete the following steps when starting a problem:** **1.** Scan the whole problem. **2.** Identify the task. **3.** Reread the problem. What is important to help you solve the problem? **4.** Translate - (create a mathematical model) **5.** Solve the problem.	Identify Recall Create Develop Calculate Understand Apply	Scientific Calculators Use of spreadsheets Online apps

Learning Goals:

Strands and Sub-Strands	Australian Curriculum Content Descriptors	Australian Curriculum Elaborations	Kirwan High Learning Goals
Using units of measurement	Calculate areas of composite shapes (ACMMG216)	• understanding that partitioning composite shapes into rectangles and triangles is a strategy for solving problems involving area	• Identify the common shapes within composite shapes • Recall and apply the area formulae for common shapes • Calculate the area of composite shapes
	Calculate the surface area and volume of cylinders and solve related problems (ACMMG217)	• analysing nets of cylinders to establish formulas for surface area	• Create and analyse the net of a cylinder • Develop the formula for the surface area of a cylinder • Calculate the volume and capacity of a cylinder and solve problems
	Solve problems involving the surface area and volume of right prisms (ACMMG218)	• solving practical problems involving surface area and volume of right prisms	• Create and analyse the net of a prism • Develop the formula for the surface area of a prism • Calculate the volume of a prism
Patterns and Algebra	Apply the distributive law to the expansion of algebraic expressions, including binomials, and collect like terms where appropriate (ACMNA213)	• understanding that the distributive law can be applied to algebraic expressions as well as numbers • understanding the relationship between expansion and factorisation and identifying algebraic factors in algebraic expressions	• Apply the distributive law to expand algebraic expressions, including binomials, and collect like terms

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

Literacy
- ✓ Comprehending texts through listening, reading and viewing
- ✓ Composing texts through speaking, writing and creating
- ☐ Text knowledge
- ☐ Grammar knowledge
- ✓ Word knowledge
- ☐ Visual knowledge

Numeracy
- ✓ Estimating and calculating with whole numbers
- ✓ Recognising and using patterns and relationships
- ☐ Using fractions, decimals, percentages, ratios and rates
- ☐ Using spatial reasoning
- ☐ Interpreting statistical information
- ✓ Using measurement

ICT
- ☐ Applying social and ethical protocols and practices when using ICT
- ☐ Investigating with ICT
- ☐ Creating with ICT
- ☐ Communicating with ICT
- ☐ Managing and operating ICT

Critical and creative thinking
- ✓ 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

Personal and social capability
- ☐ Self-awareness
- ☐ Self-management
- ☐ Social awareness
- ☐ Social management

Ethical understanding
- ☐ Understanding ethical concepts and issues
- ☐ Reasoning in decision making and actions
- ☐ Exploring values, rights and responsibilities

Intercultural understanding
- ☐ Recognising culture and developing respect
- ☐ Interacting and empathising with others
- ☐ Reflecting on intercultural experiences and taking responsibility

Cross Curriculum Priorities:

- ☐ Aboriginal and Torres Strait Islander histories and cultures
- ☐ Asia and Australia's engagement with Asia
- ☐ Sustainability

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.