8-10 Mathematics Teaching Resource
ACKNOWLEDGMENTS

The following people and groups are acknowledged for their valuable contribution to the development of this resource.

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CONCEPT MAP SUPPORT

Learning Outcomes and Curriculum Group

East Torrens Primary School
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INTRODUCTION

This draft *8–10 mathematics teaching resource* is one in a series of companion documents to the South Australian Curriculum, Standards and Accountability (SACSA) Framework. This is an extension of the revised *R–7 mathematics teaching resource*, which has also been distributed to schools in January 2004.

Years 6 and 7 material from the R–7 document has been included in this resource to assist teachers support learning continuity as students progress through the middle years.

This document has been written by middle–senior years teachers with the support of and in collaboration with curriculum officers and professional associations. Their writing has been guided by educators’ feedback to the draft R–7 mathematics teaching resource, which was released for trialling in January 2003.

**Linking with the SACSA Framework**

The purpose of this document is to provide a sample range of learning descriptors relating to the Key Ideas and Outcomes in mathematics 6–10. These descriptors, in dot point format:

- make explicit the knowledge, skills and understandings reflected in the Key Ideas and Outcomes
- make consistent the expectations for learning at specific year levels within and across sites
- support teachers in planning, programming and assessing using the SACSA Framework.

The descriptors are not prescriptive, as learning does not develop in a linear fashion. The dot points describe the possible growth points of learners as they progress towards demonstrating Outcomes to reach a Standard. Teachers will continue to use their professional knowledge, skills and judgments to provide the rich array of learning experiences that cater for the learners in their classrooms.

**Planning for teaching and learning**

When using this resource for planning teaching and learning, teachers will also need to engage with the following core principles:

- The learning program is driven by students’ needs, building on their prior knowledge, with learners active in constructing their own learning.
- The Essential Learnings, Equity Cross-curriculum Perspectives and Enterprise and Vocational Education (including Key Competencies) are vital components of program planning and learning development.
- The full range of ICTs are utilised by learners, including the introduction of the graphic calculator.

At Years 9 and 10, in particular, the teacher-writers have identified only the new learning in each strand. This encourages teachers to assess student needs before commencing programming and planning. It also assists in planning across the middle years.
Format of this resource

The format of this document has been developed:
- with consideration to the organisation of the SACSA Framework
- to ensure consistency across Curriculum Bands
- for practical use by teachers.

To meet these purposes the document:
- is organised in Curriculum Bands for the following year levels: Middle Years (6–8) and in a combined Middle—Senior Years Band (9–10)
- includes cross-referencing to allow navigation between year levels
- contains a small number of ‘assessment and reflective questions’ (A&RQ). The intent of these is to stimulate reflection and ideas about assessment as teachers undertake their planning of teaching, learning and assessing programs
- provides an extensive list of mathematics terminology and symbols
- contains concept maps that precede two of the five strands in Years 6, 7 and 8, providing teachers with a visual representation of the Key Ideas and Outcomes. Teachers may use the concept maps to support them further in their work or they may prefer to develop their own.

The teacher-writers have included reflective questions and discussion points in the document to place greater focus on the Essential Learnings, Equity Cross-curriculum Perspectives and Enterprise and Vocational Education. Trialling and feedback will provide information about whether this aspect of the document is valuable and as to how it will be addressed in the revised edition.

Feedback

You are encouraged to trial this draft resource during term 1, 2004. Your feedback will be most appreciated. A number of consultations will be arranged for early term 2, 2004, along with a broader invitation for feedback. Workshops involving teacher-writers are planned for term 2, 2004 to refine this document in response to the feedback.

In the meantime, if you wish to provide feedback or obtain further information, please contact:

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This concept map provides a visual representation of the Key Ideas and Outcomes below. Educators may prefer to develop their own.

Key Ideas
Students engage with data by formulating and answering questions, and collecting, organising and representing data in order to investigate and understand the world around them.

Students use statistical methods to reduce, analyse and interpret data, while critically evaluating the cultural and social inclusivity of the samples used.

Students engage with data to understand, analyse and apply notions of chance and probability in the social and natural worlds.

Outcomes
3.1 Poses questions, determines a sample, collects and records data including related data, represents sample data in order to investigate the world around them.

3.2 Summarises, recognises bias, draws conclusions and makes conjectures about data. Understands how different organisation and representations influence data interpretation.

3.3 Analyses data to search for patterns in events where the range of outcomes is generated by situations where chance plays a role.

4.1 Poses questions, appropriately designs a survey, collects data and classifies, sequences, collapses, tabulates and represents the data with and without ICTs.

4.2 Reads and describes information in given tables, diagrams, line and bar graphs. Makes predictions based on the information, understanding the limitations of data interpretation and the possible social consequences of these limitations.

4.3 Interprets data and makes numerical statements about probability, models situations, using data to validate their theories about the fairness of everyday situations including hypothetical situations.

Middle Years: Exploring, analysing and modelling data

Students engage with data by formulating and answering questions, and collecting, organising and representing data in order to investigate and understand the world around them.

Students use statistical methods to reduce, analyse and interpret data, while critically evaluating the cultural and social inclusivity of the samples used.

Students engage with data to understand, analyse and apply notions of chance and probability in the social and natural worlds.

Collecting
Accessing existing data (eg internet, ABS)

Posing questions
Surveys

Responding to questions
Reporting (oral, written, ICTs)

Analysing and interpreting
Analysing
Posing questions

Posing questions
Interpreting chance situations

Chance

Modelling chance situations

From sets of data
Theoretical

Identifies possible outcomes
Assigns probabilities
Estimates probabilities
Uses language of chance

Makes predictions

Investigating chance situations

Sampling techniques

Instruments

Central tendency
Mean
Median
Mode

Spread

Graphs (mostly ICTs)
Choose from
- bar graphs
- column graphs
- pie charts
- line graphs
- scatter plots
- stem and leaf plots
- other

Posing questions

Questions, collecting, organising and representing

Representing

Tables

Survey

Issues

Local

Global

Learners' own

Whose interest?

Chance

How does working with data support middle years learners to

- explore issues of personal and social significance?
- develop perspectives to critically reflect on who they are, where they belong, what they value and what their preferred future would look like?
- negotiate, plan and act to enhance their lives and the lives of others?
- develop greater independence and connectedness with their peers, other people and systems (local, national and global)?
- connect their learning across the curriculum?
- produce, create, perform and present?

This conce

This concept map provides a visual representation of the Key Ideas and Outcomes below. Educators may prefer to develop their own.

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Middle Years: Exploring, analysing and modelling data

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Students engage with data to understand, analyse and apply notions of chance and probability in the social and natural worlds.

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Surveys

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Reporting (oral, written, ICTs)

Analysing and interpreting
Analysing
Posing questions

Posing questions
Interpreting chance situations

Chance

Modelling chance situations

From sets of data
Theoretical

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Local

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Learners' own

Whose interest?

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How does working with data support middle years learners to

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- connect their learning across the curriculum?
- produce, create, perform and present?
## Learning Area: Mathematics

### Strand: Exploring, analysing and modelling data

#### Band: Middle Years

**Standards: 3 & 4**

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>Data collection and representation</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students engage with data by formulating and answering questions, and collecting, organising and representing data in order to investigate and understand the world around them. <strong>In T C KC2 KC6 relating to outcomes 3.1, 4.1</strong> Students use statistical methods to reduce, analyse and interpret data, while critically evaluating the cultural and social inclusivity of the samples used. <strong>In T KC1 relating to outcomes 3.2, 4.2</strong></td>
<td>Data collection and representation: (refer p 34 for Years 9 and 10)</td>
<td>OUTCOMES</td>
</tr>
<tr>
<td><strong>Year 6</strong> Standard 3</td>
<td><strong>Year 7</strong> Towards Standard 4</td>
<td><strong>Year 8</strong> Standard 4</td>
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</tbody>
</table>

### KEY IDEAS

- Conducts surveys to collect data.
- Utilises tally system.
- Presents data graphically (eg frequency table).
- Constructs graphs on grid paper (eg pictographs, bar graphs, composite bar graphs, column graphs, line graphs).
- Constructs tables and graphs using graphing software.
- Labels graphs with titles, axes, key and scales.
- Interprets graphs, including pie graphs, from various sources.
- Calculates the mean (average) of a set of data.

### Data collection and representation

- Understands the purpose of taking a sample population.
- Explains the difference between a random sample and a biased sample.
- Plans a range of ways to collect data (eg surveys, interviews).
- Records data using spreadsheets, and uses simple formulae to create graphs using graphing software.
- Constructs and interprets pie graphs using graphing software.
- Finds the mean, median and mode from given data.
- Interprets graphs, including pie graphs, from various sources.
- Interprets information from data, graphs and tables.

### A&RQ: Have I made clear at the beginning the criteria for success?

- Explores a process for statistical enquiry by:
  - formulating key questions to explore (eg social and environmental issues)
  - collecting data
  - classifying data as categorical or quantitative (discrete or continuous)
  - organising and displaying data in table and graph form
  - analysing data and making general comments on its distribution
  - presenting results of surveys; describing initial questions, data collection processes and conclusions; and commenting on how they might be improved.

- Understands and uses terms in constructing and interpreting tables and graphs.

- Interprets information from data, graphs and tables.
Learning Area: Mathematics

Strand: Exploring, analysing and modelling data

Band: Middle Years

Standards: 3 & 4

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>Chance and probability</th>
<th>OUTCOMES</th>
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<tbody>
<tr>
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<td><strong>Year 7</strong> Towards Standard 4</td>
<td><strong>Year 8</strong> Standard 4</td>
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<tr>
<td>Students engage with data to understand, analyse and apply notions of chance and probability in the social and natural worlds.</td>
<td><strong>F In T KC1</strong> relating to outcomes 3.3, 4.3</td>
<td></td>
</tr>
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<td><strong>Students engage with data to understand, analyse and apply notions of chance and probability in the social and natural worlds.</strong></td>
<td><strong>F In T KC1</strong></td>
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<td><strong>Year 6 Standard 3</strong></td>
<td><strong>Year 7</strong> Towards Standard 4</td>
<td><strong>Year 8</strong> Standard 4</td>
</tr>
<tr>
<td>• Describes the likelihood of events in everyday situations using appropriate everyday language (e.g. likely, unlikely, possible, probable, certain, impossible).</td>
<td>• Identifies risks and consequences of taking chances.</td>
<td>• Lists possible outcomes for an event (e.g. uses tree diagrams, matrix diagrams).</td>
</tr>
<tr>
<td>• Orders the terms from impossible to certain.</td>
<td>• Demonstrates an understanding of what constitutes gambling (e.g. lotto, raffles, poker machines).</td>
<td>• Investigates experimental and theoretical probabilities.</td>
</tr>
<tr>
<td>• Describes the likelihood of events in everyday situations using appropriate mathematical terminology (e.g. 50:50 chance, 1 in 4 chance, no chance, equal chance).</td>
<td>• Identifies some of the social consequences of gambling (e.g. implications for families adversely affected by problem gambling).</td>
<td>• Writes formulae to determine probability (e.g. ( P = \frac{\text{number of outcomes in event}}{\text{total number of possible outcomes}} )).</td>
</tr>
<tr>
<td>• Utilises graphic organisers (e.g. tree diagrams) to develop lists of possible outcomes.</td>
<td>• Assigns numbers and percentages to chance (i.e. if it has no chance of occurring it is assigned 0 or 0%; if it is certain to occur it is assigned 1 or 100%).</td>
<td>• Makes their own probability generator (e.g. a spinner to show ( P[\text{red}] = \frac{7}{15} )).</td>
</tr>
<tr>
<td>• Predicts and records possible outcomes of an event.</td>
<td>• Uses data to order chance events from least likely to most likely (e.g. roll 2 dice 20 times and record the total each time, then order the results from the least likely result to the most likely).</td>
<td>• Assigns probabilities for given situations (e.g. ‘Five discs are placed in a bag, two are blue and three are black. What is the probability of drawing a blue disc?’).</td>
</tr>
<tr>
<td>• Tests predictions (e.g. coin tossing).</td>
<td></td>
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</tr>
</tbody>
</table>

**3.3** Analyses data to search for patterns in events where the range of outcomes is generated by situations where chance plays a role. **F In T KC1**

**4.3** Interprets data and makes numerical statements about probability, models situations, using data to validate their theories about the fairness of everyday situations including hypothetical situations. **F In T KC1**
Students engage with data to understand, analyse and apply notions of chance and probability in the social and natural worlds.

**F In T KC1**
relating to outcomes 3.3, 4.3

- Uses samples to make predictions about a larger population from which the sample comes (e.g., using coin tossing, predict the result from a sample of 100 tosses).

**3.3**
Analyses data to search for patterns in events where the range of outcomes is generated by situations where chance plays a role.

**F In T KC1**

**4.3**
Interprets data and makes numerical statements about probability, models situations, using data to validate their theories about the fairness of everyday situations including hypothetical situations.

**F In T KC1**
Learning Area: Mathematics
Strand: Measurement
Band: Middle Years
Standards: 3 & 4

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>Year 6 Standard 3</th>
<th>Year 7 Towards Standard 4</th>
<th>Year 8 Standard 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students understand attributes, units and systems of measurement. They research and report on how measurement is used in the home, community and paid workforce, and recognise transferability between these and other contexts. <strong>In TC KC1 KC2 KC6 relating to outcomes 3.4, 4.4</strong></td>
<td><strong>Length, perimeter and area</strong> (refer p 36 for Years 9 and 10)</td>
<td><strong>OUTCOMES</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Students recognise and develop and report on connections between mathematical ideas and representations. They employ logical strategies to solve problems in measurement situations, and reflect on the reasonableness of their answers. **TKC1 KC2 KC6 relating to outcomes 3.5, 4.5** | - Selects and uses the appropriate device and unit to measure lengths or distance.  
- Measures and records lengths or distances, including kilometres.  
- Converts between units of length (eg mm to cm, cm to m, m to km).  
- Calculates lengths or distances using decimals to three decimal places.  
- Estimates length and perimeter with a reasonable degree of accuracy and confirms by measuring them accurately.  
- Compares perimeters of different shapes (eg P = 16 can be 4x4 shape or 8x2 shape).  
- Constructs a square metre using a variety of lengths and widths.  
- Understands and shows that the perimeter of shapes can be the same regardless of the length of sides.  
- Estimates and records areas in square metres.  
- Uses the abbreviations for square metres (m²) and square centimetres (cm²).  
- Converts between millimetres, centimetres, metres and kilometres (eg 25mm = 0.025m).  
- Uses the formula Distance = Speed x Time to solve problems.  
- Develops and uses the formula for the area of a triangle (eg A = ½ (BxH) or LxW/2).  
- Uses the appropriate units of measurement (eg km², cm², m², mm², ha).  
- Uses appropriate strategies and devices to estimate and accurately measure the area of a shape (eg using an overlay grid).  
- Calculates the area of irregular shapes by separating them into simple parts (eg rectangles and triangles as below). |
| **Year 6 Standard 3** | **Year 7 Towards Standard 4** | **Year 8 Standard 4** |
| - Calculates the area of polygons using appropriate formulae (eg rectangles, triangles, parallelograms, trapezia).  
- Uses different methods to approximate the area of a circle.  
- Calculates the area of a circle using A = πr².  
- Calculates the area of irregular shapes that include circles, as shown below.  
- Estimates area of objects with a reasonable degree of accuracy using various strategies.  
- Calculates the area of polygons using appropriate formulae (eg rectangles, triangles, parallelograms, trapezia).  
- Uses different methods to approximate the area of a circle.  
- Calculates the area of a circle using A = πr².  
- Calculates the area of irregular shapes that include circles, as shown below. |
| - Establishes π as the ratio of the circumference to the diameter of a circle by practical means.  
- Calculates the perimeter of polygons and circles using appropriate formulae.  
- Estimates area of objects with a reasonable degree of accuracy using various strategies.  
- Calculates the area of polygons using appropriate formulae (eg rectangles, triangles, parallelograms, trapezia).  
- Uses different methods to approximate the area of a circle.  
- Calculates the area of a circle using A = πr².  
- Calculates the area of irregular shapes that include circles, as shown below.  
- Converts between units of area (eg cm² to mm², m² to km², mm² to cm², cm² to m², m² to km², m² to ha).  
- Establishes π as the ratio of the circumference to the diameter of a circle by practical means.  
- Calculates the perimeter of polygons and circles using appropriate formulae.  
- Estimates area of objects with a reasonable degree of accuracy using various strategies.  
- Calculates the area of polygons using appropriate formulae (eg rectangles, triangles, parallelograms, trapezia).  
- Uses different methods to approximate the area of a circle.  
- Calculates the area of a circle using A = πr².  
- Calculates the area of irregular shapes that include circles, as shown below. |

**3.4** Selects appropriate attributes and systems to measure for a variety of purposes and reports on how measurement is used in social practice. **In T C KC1 KC2**

**3.5** Uses a range of standard tools to measure relationships between distances and other measurable attributes to calculate size. **T**

**4.4** Selects appropriate measurement units and scale to conduct collaborative research into issues associated with the social or physical world. **In T C KC1 KC4**

**4.5** Applies a variety of techniques and tools, and uses a range of measurement formulae to solve problems. **T KC6**
Students understand attributes, units and systems of measurement. They research and report on how measurement is used in the home, community and paid workforce, and recognise transferability between these and other contexts.

In T C KC1 KC2 KC6 relating to outcomes 3.4, 4.4

Students recognise and develop and report on connections between mathematical ideas and representations. They employ logical strategies to solve problems in measurement situations, and reflect on the reasonableness of their answers.

In T C KC1 KC2 KC6 relating to outcomes 3.5, 4.5

- Explains that the area of squares and rectangles can be found by multiplying the length by the breadth: \( A = L \times W \) or \( A = L \times B \).
- Calculates the area of irregular shapes composed of square and rectangular sections.
- Applies knowledge of length, perimeter and area through practical problem-solving activities.
- Demonstrates understanding of the relationship between perimeter and area through practical problem-solving activities (eg investigating floor plans of the classroom or sports fields).
- Uses scale in ratio form to calculate either original size or drawing size.
- Applies knowledge of perimeter, circumference and area through practical problem-solving activities.

3.4 Selects appropriate attributes and systems to measure for a variety of purposes and reports on how measurement is used in social practice.
4.4 Selects appropriate measurement units and scale to conduct collaborative research into issues associated with the social or physical world.

A&RQ: Do I provide ongoing feedback so that learning can be reviewed and responsive to suggestions?

4.5 Applies a variety of techniques and tools, and uses a range of measurement formulae to solve problems.

T KC6
Learning Area: Mathematics  
Strand: Measurement  
Band: Middle Years  
Standards: 3 & 4

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>Volume and capacity</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
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<td><strong>Year 6</strong>&lt;br&gt;<strong>Standard 3</strong>&lt;br&gt;<strong>Year 7</strong>&lt;br&gt;Towards Standard 4&lt;br&gt;<strong>Year 8</strong>&lt;br&gt;<strong>Standard 4</strong>&lt;br&gt;<strong>OUTCOMES</strong></td>
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<table>
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<th>Year 7</th>
<th>Year 8</th>
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<tr>
<td><strong>Outcomes</strong></td>
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<td><strong>Outcomes</strong></td>
</tr>
<tr>
<td>- Understands the concept of kilolitre (ie 1000 litres = 1 kilolitre).</td>
<td>- Converts mL to L and L to kL and vice versa.</td>
<td>- Converts between mL, L, kL and ML.</td>
</tr>
<tr>
<td>- Uses the abbreviations for millilitres (mL), litres (L) and kilolitres (kL).</td>
<td>- Uses the symbols cm$^3$, m$^3$, mL, L and kL.</td>
<td>- Converts between units of capacity and units of volume (ie 1cm$^3$ = 1mL, 1000cm$^3$ = 1L, 1m$^3$ = 1kL).</td>
</tr>
<tr>
<td>- Constructs 3-D objects using cubic centimetre blocks and measures volume by counting the number of blocks.</td>
<td>- Demonstrates understanding of volume through practical problem-solving activities.</td>
<td>- Calculates the volume of prisms using Volume = area of base x height, and uses appropriate units (eg mm$^3$, cm$^3$ and m$^3$).</td>
</tr>
<tr>
<td>- Uses the abbreviations for cubic centimetres (cm$^3$) and cubic metres (m$^3$).</td>
<td>- Develops and uses formula for volume of rectangular prisms: V = LxWxH or V = LxBxH.</td>
<td>- Applies knowledge of volume through practical problem-solving activities.</td>
</tr>
</tbody>
</table>
| - Estimates the volume of rectangular prisms using cubic centimetres. | - Demonstrates awareness that capacity is related to volume (eg through displacement activities where 1mL = 1cm$^3$). | -**3.5**
Uses a range of standard tools to measure relationships between distances and other measurable attributes to calculate size. In T C KC1 KC2 |
| - Explains that the volume of rectangular prisms can be found by multiplying the length by the width by the height: V = LxWxH. | - Selects and uses the appropriate device and unit to measure capacity. | -**4.4**
Selects appropriate measurement units and scale to conduct collaborative research into issues associated with the social or physical world. In T C KC1 KC4 |
| - Selects and uses the appropriate device and unit to measure capacity. | - Calculates capacity using millilitres and litres to 3 decimal places. | -**4.5**
Applies a variety of techniques and tools, and uses a range of measurement formulae to solve problems. In T KC6 |
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<td><strong>Year 6 Standard 3</strong></td>
<td><strong>Year 7 Towards Standard 4</strong></td>
</tr>
<tr>
<td>Student understands attributes, units and systems of measurement.</td>
<td>Chooses the appropriate units and tools to measure weight of a variety of objects.</td>
</tr>
<tr>
<td>Estimates the mass of familiar objects.</td>
<td>Identifies the relationships between milligrams, grams, kilograms and tonnes (eg 1kg = 1000g, 1t = 1000kg, 1g = 1000mg).</td>
</tr>
<tr>
<td>Selects and uses the appropriate device and unit to measure mass.</td>
<td>Applies the knowledge of mass to practical problem-solving situations (eg mass of 1 litre of water to 1 kilogram).</td>
</tr>
<tr>
<td>Compares the mass of different objects.</td>
<td></td>
</tr>
<tr>
<td>Uses the abbreviations for milligrams (mg), grams (g), tonnes (t) and kilograms (kg).</td>
<td></td>
</tr>
<tr>
<td>Converts between milligrams, kilograms, grams and tonnes to 3 decimal places.</td>
<td></td>
</tr>
<tr>
<td>Applies the knowledge of mass to practical problem-solving situations.</td>
<td></td>
</tr>
<tr>
<td><strong>3.4</strong> Selects appropriate attributes and systems to measure for a variety of purposes and reports on how measurement is used in social practice. <strong>In T C KC1 KC2</strong></td>
<td><strong>3.5</strong> Uses a range of standard tools to measure relationships between distances and other measurable attributes to calculate size. <strong>T</strong></td>
</tr>
<tr>
<td><strong>4.4</strong> Selects appropriate measurement units and scale to conduct collaborative research into issues associated with the social or physical world. <strong>In T C KC1 KC4</strong></td>
<td><strong>4.5</strong> Applies a variety of techniques and tools, and uses a range of measurement formulae to solve problems. <strong>T KC6</strong></td>
</tr>
</tbody>
</table>
### Learning Area: Mathematics

#### Strand: Measurement

#### Band: Middle Years

#### Standards: 3 & 4

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>Time</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 6</strong> Standard 3</td>
<td><strong>Year 7</strong> Towards Standard 4</td>
<td><strong>Year 8</strong> Standard 4</td>
</tr>
<tr>
<td><strong>Students understand attributes, units and systems of measurement. They research and report on how measurement is used in the home, community and paid workforce, and recognise transferability between these and other contexts.</strong>&lt;br&gt;<strong>In T C KC1 KC2 KC6 relating to outcomes 3.4, 4.4</strong>&lt;br&gt;<strong>Students recognise and develop and report on connections between mathematical ideas and representations. They employ logical strategies to solve problems in measurement situations, and reflect on the reasonableness of their answers. T KC1 KC2 KC6 relating to outcomes 3.5, 4.5</strong></td>
<td><strong>Uses a stopwatch to time events accurately to hundredths of seconds.</strong>&lt;br&gt;<strong>Tells the time using analogue, 24 hour and digital clocks.</strong>&lt;br&gt;<strong>Converts between analogue, 24 hour and digital time.</strong>&lt;br&gt;<strong>Converts from one time unit to another (eg ‘How many seconds are there in 1 hour?’).</strong>&lt;br&gt;<strong>Calculates the duration of an event using starting and finishing times.</strong>&lt;br&gt;<strong>Uses a calendar as a planning tool.</strong>&lt;br&gt;<strong>Reads a simple timetable.</strong>&lt;br&gt;<strong>Understands terminology such as AD, BC, CE, BCE (eg 400 BC).</strong>&lt;br&gt;<strong>Reads and constructs a timeline, including AD and BC.</strong></td>
<td><strong>Uses a standard time zone map to answer questions related to time differences.</strong>&lt;br&gt;<strong>Uses bus, train and plane timetables to plan a journey, calculating departure and arrival time, and the time taken for sections of the journey.</strong>&lt;br&gt;<strong>Problem solves using the relationship of Speed = Distance/Time.</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Makes comparisons between time zones in Australia and calculates changes incorporating daylight saving.</strong>&lt;br&gt;<strong>Reads and uses a variety of timetables.</strong>&lt;br&gt;<strong>Constructs and interprets timelines using appropriate scales.</strong>&lt;br&gt;<strong>Explains ways in which time is measured in other cultures (eg calendars which are calculated by moon cycles).</strong>&lt;br&gt;<strong>Uses Speed = Distance/Time to answer problems.</strong></td>
<td><strong>Selects appropriate attributes and systems to measure for a variety of purposes and reports on how measurement is used in social practice. In T C KC1 KC2</strong>&lt;br&gt;<strong>Uses a range of standard tools to measure relationships between distances and other measurable attributes to calculate size. T 4.4</strong>&lt;br&gt;<strong>Selects appropriate measurement units and scale to conduct collaborative research into issues associated with the social or physical world. In T C KC1 KC4</strong>&lt;br&gt;<strong>Applies a variety of techniques and tools, and uses a range of measurement formulae to solve problems. T KC6</strong></td>
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</table>
### Learning Area: Mathematics

**Strand: Measurement**

**Band: Middle Years**

**Standards: 3 & 4**

#### KEY IDEAS

Students understand attributes, units and systems of measurement. They research and report on how measurement is used in the home, community and paid workforce, and recognise transferability between these and other contexts. 

In T C KC1 KC2 KC6 relating to outcomes 3.4, 4.4

Students recognise and develop and report on connections between mathematical ideas and representations. They employ logical strategies to solve problems in measurement situations, and reflect on the reasonableness of their answers.

In T KC1 KC2 KC6 relating to outcomes 3.5, 4.5

#### Temperature

<table>
<thead>
<tr>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard 3</strong></td>
<td><strong>Towards Standard 4</strong></td>
<td><strong>Standard 4</strong></td>
</tr>
</tbody>
</table>

- Determines and records temperature variations.
- Estimates and reads maximum and minimum temperatures in centigrade.
- Calculates and interprets average temperature.
- Demonstrates awareness of the Fahrenheit temperature scale (°F).
- Uses online resources to compare current temperatures in different parts of the world.

#### OUTCOMES

3.4 Selects appropriate attributes and systems to measure for a variety of purposes and reports on how measurement is used in social practice.

In T C KC1 KC2

3.5 Uses a range of standard tools to measure relationships between distances and other measurable attributes to calculate size.

T 4.4

Selects appropriate measurement units and scale to conduct collaborative research into issues associated with the social or physical world.

In T C KC1 KC4

4.5 Applies a variety of techniques and tools, and uses a range of measurement formulae to solve problems.

T KC6
### Learning Area: Mathematics

**Strand: Number**  
**Band: Middle Years**  
**Standards: 3 & 4**

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>Year 6</th>
<th>Whole numbers</th>
<th>Year 7</th>
<th>Year 8</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students recognise relationships within different number concepts in order to make sense of, and represent numerically, a range of community activities and social processes encountered in their lives.</strong></td>
<td><strong>Standard 3</strong></td>
<td><strong>Towards Standard 4</strong></td>
<td><strong>Standard 4</strong></td>
<td><strong>(refer p 37 for Years 9 and 10)</strong></td>
<td></td>
</tr>
<tr>
<td>– Recognises the existence of different number systems (eg Greek, Roman, Hindu–Arabic).</td>
<td>– Develops an understanding of number systems across time and place (eg Mayan, Chinese).</td>
<td>– Researches a different culture’s number system, past and present, and compares it to the Hindu–Arabic system used today.</td>
<td>– Rounds off numbers in multiples of 10 and to 1 and 2 significant figures.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Provides examples of the use of number in everyday life.</td>
<td>– Recognises, uses and writes in words, numbers beyond 1 000 000.</td>
<td>– Uses index notation to express powers of numbers (positive indices only) and links this to the calculator using the power key.</td>
<td>– Uses the calculator to perform calculations including exponents.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Reads, writes and records numbers to one million, using numerals and words.</td>
<td>– Identifies place value of numbers over 1 000 000.</td>
<td>– Recognises the link between squares and square roots, cubes and cube roots and uses the correct notation.</td>
<td>– Explores common uses of positive and negative signs (eg temperature, loss and gain, north and south).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Explains place value of digits in numbers to 1 000 000.</td>
<td>– Compares numbers and uses symbols (eg =, ≠, ≤, ≥).</td>
<td>– Estimates using 1 and 2 figure working and applies this to problem solving.</td>
<td>– Communicates understanding of the meaning of operations with integers and rational numbers, and how they relate to each other.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Writes numbers to 1 000 000 in expanded form.</td>
<td>– Write numbers up to 1 000 000 in expanded form (eg using powers of 10).</td>
<td>– Uses the calculator to perform calculations including exponents.</td>
<td>– Applies appropriate computational tools and strategies to proportional situations involving integers, and rational numbers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Rounds to the nearest 10, 100, 1000, 10 000 and 100 000.</td>
<td>– Uses power or index (exponents) notation.</td>
<td>– Identifies large numbers in everyday use (eg comparing populations).</td>
<td>– Identifies factors, common factors, prime factors, highest common factor and lowest common multiple.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Places numbers in descending and ascending order.</td>
<td>– Writes numbers over 100 000 in ascending and descending order.</td>
<td>– Identifies factors, common factors, prime factors, highest common factor and lowest common multiple.</td>
<td>– Uses arrays and divisibility rules.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Compares numbers and uses symbols (eg =, ≠, &lt; and &gt;).</td>
<td>– Identifies large numbers in everyday use (eg comparing populations).</td>
<td>– Identifies factors, common factors, prime factors, highest common factor and lowest common multiple.</td>
<td>– Identifies triangular and cubic numbers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Explains mental strategies used to solve addition and subtraction problems.</td>
<td>– Identifies factors, common factors, prime factors, highest common factor and lowest common multiple.</td>
<td>– Applies square root to square numbers and uses the symbol ( \sqrt{\text{\textcopyright}} )</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>– Chooses appropriately between mental, written and calculator methods for addition and subtraction problems.</td>
<td>– Uses arrays and divisibility rules.</td>
<td>– Applies square root to square numbers and uses the symbol ( \sqrt{\text{\textcopyright}} )</td>
<td>– Identifies factors, common factors, prime factors, highest common factor and lowest common multiple.</td>
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<tr>
<td><strong>Students understand the meaning of operations and how they relate to each other, and can communicate these through a range of media, including information and communication technologies.</strong></td>
<td><strong>Year 6</strong></td>
<td><strong>Whole numbers</strong></td>
<td><strong>Year 7</strong></td>
<td><strong>Year 8</strong></td>
<td><strong>OUTCOMES</strong></td>
</tr>
<tr>
<td>–Students use computational tools and strategies, and understand and represent the thinking processes employed in solving problems involving proportions.**</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>–Researches a different culture’s number system, past and present, and compares it to the Hindu–Arabic system used today.</td>
<td>– Uses the calculator to perform calculations including exponents.</td>
<td>– Identifies factors, common factors, prime factors, highest common factor and lowest common multiple.</td>
<td>– Applies appropriate computational tools and strategies to proportional situations involving integers, and rational numbers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>–Identifies large numbers in everyday use (eg comparing populations).</td>
<td>–Expresses powers of numbers, using index notation, and links this to the calculator using the power key.</td>
<td>–Uses arrays and divisibility rules.</td>
<td>–Identifies factors, common factors, prime factors, highest common factor and lowest common multiple.</td>
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<td>–Identifies triangular and cubic numbers.</td>
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</tbody>
</table>
Students recognise relationships within different number concepts in order to make sense of, and represent numerically, a range of community activities and social processes encountered in their lives.

**In T KC1 relating to outcomes 3.6, 4.6**

Students understand the meaning of operations and how they relate to each other, and can communicate these through a range of media, including information and communication technologies.

**In T C KC2 KC7 relating to outcomes 3.7, 4.7**

Students use computational tools and strategies, and understand and represent the thinking processes employed in solving problems involving proportions.

**T KC6 relating to outcomes 3.8, 4.8**

- Uses rounding and a mental strategy to multiply a 2 digit number by a 2 digit number to obtain an approximate answer (eg 67x53 = 70x50 = 3500).
- Explores algorithms for long multiplication and understands them.
- Multiplies a 2 digit number by a 2 digit number using the extended form (long multiplication).
- Divides a number with 3 or more digits by multiples of 10 (including remainders).
- Selects and uses appropriate operations to solve contextual word problems.
- Solves a given 2 step number or word problem (eg “A school has a total of 854 students—102 boys and 84 girls leave. How many students are left at the school?”).
- Multiplies a 3 digit number by a 2 digit number using the extended form (long multiplication).
- Divides a number with 3 or more digits by a single digit or multiples of 10 with a remainder expressed as a decimal.
- Understands the order of operations using BEDMAS (Brackets, Exponents, Division, Multiplication, Addition, Subtraction).
- Uses and explains appropriate strategies in problem solving (eg trial and error, working backwards, looking for patterns).
- Uses a calculator, when more appropriate, to solve problems (eg 7243+64).
- Identifies the operations required to solve more complex problems within their experiences (eg deposits and withdrawals in banking, other everyday use).
- Recognises the existence of negative numbers (eg profit and loss).
- Understands and uses rules for multiplying and dividing directed numbers.
- Combines operations with directed numbers using order of operations (BEDMAS).
- Uses the calculator to combine operations with directed numbers.

**A&RQ: Do I encourage my learners to demonstrate their learning in a range of ways?**

**3.6** Represents and analyses relationships amongst number concepts and uses these to make sense of, and represent the world.

**In T KC1 KC2**

3.7 Describes, represents and analyses operations with rational numbers and relationships between them.

**In T C KC1 KC2**

3.8 Uses a variety of estimating and calculating strategies with whole numbers, including memorising multiplication and division facts, fractions and decimals.

**T KC 4.6** Represents and analyses relationships amongst integers and rational numbers and commonly encountered irrational numbers.

**In T C KC1**

4.7 Communicates understanding of the meaning of operations with integers and rational numbers, and how they relate to each other.

**In T C KC2**

4.8 Applies appropriate computational tools and strategies to proportional situations involving integers, and rational numbers.
**Learning Area: Mathematics**  
**Strand: Number**  
**Band: Middle Years**  
**Standards: 3 & 4**

<table>
<thead>
<tr>
<th><strong>KEY IDEAS</strong></th>
<th><strong>Frctions, decimals, percentages, ratios and rates</strong></th>
<th><strong>OUTCOMES</strong></th>
</tr>
</thead>
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<tr>
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<td>3.6 Represents and analyses relationships amongst number concepts and uses these to make sense of, and represent the world. <strong>In T KC1 KC2</strong></td>
</tr>
<tr>
<td>Students understand the meaning of operations and how they relate to each other, and can communicate these through a range of media, including information and communication technologies. <strong>In T C KC2 KC7 relating to outcomes 3.7, 4.7</strong></td>
<td></td>
<td>3.7 Describes, represents and analyses operations with rational numbers and relationships between them. <strong>In T C KC1 KC2</strong></td>
</tr>
<tr>
<td>Students use computational tools and strategies, and understand and represent the thinking processes employed in solving problems involving proportions. <strong>T KC6 relating to outcomes 3.8, 4.8</strong></td>
<td></td>
<td>3.8 Uses a variety of estimating and calculating strategies with whole numbers, including memorising multiplication and division facts, fractions and decimals. <strong>T KC6</strong></td>
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<th><strong>Year 8</strong> Standard 4</th>
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<td><strong>Students recognise and analyse relationships amongst number concepts and use these to make sense of, and represent the world.</strong> <strong>In T KC1 relating to outcomes 3.6, 4.6</strong></td>
<td><strong>Students understand the meaning of operations and how they relate to each other, and can communicate these through a range of media, including information and communication technologies.</strong> <strong>In T C KC1 KC2 relating to outcomes 3.7, 4.7</strong></td>
<td><strong>Students use computational tools and strategies, and understand and represent the thinking processes employed in solving problems involving proportions.</strong> <strong>T KC6 relating to outcomes 3.8, 4.8</strong></td>
</tr>
</tbody>
</table>

- Provides examples of the use of decimals in everyday life.
- Explains the place value of tenths, hundredths and thousandths.
- Reads and writes decimals to thousandths, in both numerals and words.
- Writes decimals in expanded form (eg 1.25 = 1unit +2tenths +5hundredths or 1+0.2+0.05).
- Rounds to the nearest whole number, tenth or hundredth.
- Compares and orders decimals (descending and ascending).
- Uses symbols (eg =, ≠, < and >) to compare decimals.
- Adds or subtracts decimal numbers that have a different number of decimal places.
- Rounds off decimals to 3 places.
- Divides decimals by a whole number.
- Uses notation for recurring decimals such as 0.3.
- Multiplies decimal numbers by decimal numbers (eg 0.2x0.3 = 0.06).
- Divides decimals using calculators (eg calculating averages).
- Converts decimals to fractions (eg 4.258 = 4258/1000).
- Uses decimals in problem solving.
- Compares the size of fractions (eg ‘Which is larger: 7/8 or 1/3?’).
- Compares and orders fractions in ascending or descending order (eg 1/3, 2/8, 7/8).
- Adds and subtracts fractions with different denominators, including improper fractions and whole numbers.
- Determines sets of equivalent fractions.
- Expresses information as a ratio.
- Simplifies ratios.
- Finds equal ratios.
- Uses equal ratios (proportion) to solve real-life problems.
- Uses ratios to divide quantities (eg divide $120 in the ratio 2:3).
- Applies ratios to scale diagrams.
Students recognise relationships within different number concepts in order to make sense of, and represent numerically, a range of community activities and social processes encountered in their lives.

**In T KC1 relating to outcomes 3.6, 4.6**

Students understand the meaning of operations and how they relate to each other, and can communicate these through a range of media, including information and communication technologies.

**In T C KC2 KC7 relating to outcomes 3.7, 4.7**

Students use computational tools and strategies, and understand and represent the thinking processes employed in solving problems involving proportions.

**T KC6 relating to outcomes 3.8, 4.8**

- Multiplies and divides tenths, hundredths and thousandths by a single digit to terminating numbers.
- Multiplies and divides decimal numbers, including money, by 10, 100 and 1000.
- Multiplies and divides decimal numbers, including money, by single digit numbers in everyday contexts (eg cost of 3 computer games at $29.95 each, cost of 1 iceblock if a pack of 8 costs $3.90).
- Continues, creates and describes patterns involving fractions (eg $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1$).
- Converts fractions to lowest terms.
- Converts improper fractions to mixed numbers by division.
- Converts mixed numbers to improper fractions.
- Adds and subtracts simple fractions by changing one denominator (eg $\frac{2}{3} + \frac{1}{6}$).
- Demonstrates understanding of addition and subtraction of fractions through everyday problem solving (eg ‘I ate half a pie and my friend ate two-thirds of a pie. How many pies did we need? How much pie is left over?’).
- Multiplies fractions including whole numbers and mixed numbers.
- Converts fractions to frequently used decimals and percentages (eg $\frac{2}{5}, \frac{5}{6}, \frac{2}{3}$).
- Converts percentages to fractions and decimals.
- Converts fractions and decimals to percentages.
- Expresses fractions of quantities as percentages (eg 20 out of 25 is $\frac{4}{5}$ is 80%).
- Finds simple percentages of quantities (eg 20% of $80$) using both pen and paper and calculator.
- Solves practical problems involving percentage (eg simple interest, banking problems).
- Compares quantities using ratios in problem solving.
- Expresses information as a rate (eg a runner sprints 100 metres in 12 seconds: expressed as a rate = 8.3 m/s).
- Uses rates to solve real-life problems.
- Expresses one quantity as a percentage of another.
- Finds percentages of quantities (eg 18% of $72$).
- Finds a percentage of a quantity when given another (eg find 80% of a quantity if 15% is 30).
- Calculates percentage change.
- Uses percentages to calculate profit and loss.
- Calculates the GST on various items.

**3.6** Represents and analyses relationships amongst number concepts and uses these to make sense of, and represent the world.

**In T KC1 KC2**

**3.7** Describes, represents and analyses operations with rational numbers and relationships between them.

**In T C KC1 KC2**

**3.8** Uses a variety of estimating and calculating strategies with whole numbers, including memorising multiplication and division facts, fractions and decimals.

**T KC6**

**4.6** Represents and analyses relationships amongst integers and rational numbers and commonly encountered irrational numbers.

**In T KC1**

**4.7** Communicates understanding of the meaning of operations with integers and rational numbers, and how they relate to each other.

**In T C KC2**

**4.8** Applies appropriate computational tools and strategies to proportional situations involving integers, and rational numbers.

**T KC6 KC7**
Students recognise relationships within different number concepts in order to make sense of, and represent numerically, a range of community activities and social processes encountered in their lives.

In **T KC1**

**relating to outcomes 3.6, 4.6**

Students understand the meaning of operations and how they relate to each other, and can communicate these through a range of media, including information and communication technologies.

**In T C KC2**

**relating to outcomes 3.7, 4.7**

Students use computational tools and strategies, and understand and represent the thinking processes employed in solving problems involving proportions.

**T KC6**

**relating to outcomes 3.8, 4.8**

- Converts simple decimals to fractions (eg 0.125 = \(\frac{125}{1000} = \frac{1}{8}\), 0.25 = \(\frac{25}{100} = \frac{1}{4}\)).
- Converts fractions to decimals (eg \(\frac{3}{4} = \frac{75}{100} = 0.75\)).
- Explains the use of percentages in everyday life.
- Expresses simple fractions and decimals as percentages (eg 50% = \(\frac{50}{100} = \frac{1}{2}\)).
- Expresses everyday percentages as fractions and decimals (eg 10%, 20%, 25%, 50%, 75%, 100%).
- Compares quantities using ratios.

**3.6** Represents and analyses relationships amongst number concepts and uses these to make sense of, and represent the world.

**In T KC1 KC2**

**3.7** Describes, represents and analyses operations with rational numbers and relationships between them.

**In T C KC1 KC2**

**3.8** Uses a variety of estimating and calculating strategies with whole numbers, including memorising multiplication and division facts, fractions and decimals.

**T KC6**

**4.6** Represents and analyses relationships amongst integers and rational numbers and commonly encountered irrational numbers.

**In T KC1**

**4.7** Communicates understanding of the meaning of operations with integers and rational numbers, and how they relate to each other.

**In T C KC2**

**4.8** Applies appropriate computational tools and strategies to proportional situations involving integers, and rational numbers.

**T KC6 KC7**

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CONCEPT MAP

Middle Years: Pattern and algebraic reasoning

KEY IDEAS
Students demonstrate, record and report on logical and critical thought processes by searching for and abstracting generational algebraic representations from patterns drawn from current social situations.

Students analyse mathematical structures and use algebraic formulae to represent situations. They further develop the capacity to express themselves, and to solve problems involving linear relationships.

Students use mathematical models to make connections and analyse how things might change in both real and abstract contexts. They extract information from tables of data and graphs, making comparisons between varying rates of change, and predicting future events.

OUTCOMES
3.9 Describes and generalises relationships between measurable attributes as patterns and explains the impact of varying one aspect of the relationship.

3.10 Analyses, creates and generalises numerical and spatial patterns and solves problems with such patterns.

3.11 Uses mathematical representations to make connections and analyse change.

OUTCOMES
4.9 Analyses, creates and generalises numeric and visual patterns to solve problems in a range of situations.

4.10 Uses symbolic algebra to represent situations and manipulate the symbolic representations to solve problems involving linear equations and inequations; gives simple algebraic proofs.

4.11 Models contextualised situation, making connections and analysing change.

This concept map provides a visual representation of the Key Ideas and Outcomes below. Educators may prefer to develop their own.
**Learning Area: Mathematics**

**Strand: Pattern and algebraic reasoning**  
**Band: Middle Years**  
**Standards: 3 & 4**

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>Algebra (refer p 39 for Years 9 and 10)</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YEAR 6</strong> Standard 3</td>
<td><strong>YEAR 7</strong> Towards Standard 4</td>
<td><strong>YEAR 8</strong> Standard 4</td>
</tr>
</tbody>
</table>
| - Builds a simple numerical or geometric pattern using materials (e.g. matchstick patterns).  
- Completes the pattern for a numerical or geometric series (e.g. 2, 4, 8, 16).  
- Calculates the value of a missing number in a series of values.  
- Explains how the answers in a series of values are determined.  
- Determines and records a rule, in words, to describe the pattern presented in a table.  
- Applies a rule to a table to calculate the missing values.  
- Calculates the value of a missing number in a number sentence (e.g. $7\times\Delta = 42$. What is the value of $\Delta$?).  
- Extends and describes the rule for numeric and geometric patterns (e.g. ‘7, 36, 181, 906 is previous number times 5 plus 1’).  
- Investigates pattern rules in solving problems (e.g. rates charged by tradespeople 1 hr—$35, 2 hrs—$60, 3 hrs—$95 = nx35−10 for various hours worked).  
- Investigates and analyses graphs showing the relationship between variables (e.g. analysing winter rainfall patterns and making comparisons and predicting future trends).  
- Predicts future trends from linear graphs.  
- Constructs a number sentence to match a problem that is presented in words and that requires finding an unknown.  
- Uses inverse operations to solve a number sentence (e.g. $2x = 8, x = 8÷2$).  
- Describes patterns and relationships in society (e.g. time of year and demand for electricity).  
- Describes geometric patterns in words and adds to the pattern (simple linear expressions).  
- Constructs a table of values for a pattern.  
- Writes a rule to describe a pattern and uses pronumerals (e.g. $4n+3, 2x+1$).  
- Uses spreadsheets to make a number machine to look at rules for linear expressions.  
- Evaluates an algebraic expression by substituting numbers for the unknowns.  
- Uses patterns to solve a problem (e.g. ‘Look at the construction of taxi fares: fare = flag fall + rate/kilometre’).  
- Defines and gives examples of a pronumeral, term, like terms, constant term and coefficient, expression and equation.  |  
| **EXPRESSIONS**  
- Describes patterns and relationships in society (e.g. time of year and demand for electricity).  
- Describes geometric patterns in words and adds to the pattern (simple linear expressions).  
- Constructs a table of values for a pattern.  
- Writes a rule to describe a pattern and uses pronumerals (e.g. $4n+3, 2x+1$).  
- Uses spreadsheets to make a number machine to look at rules for linear expressions.  
- Evaluates an algebraic expression by substituting numbers for the unknowns.  
- Uses patterns to solve a problem (e.g. ‘Look at the construction of taxi fares: fare = flag fall + rate/kilometre’).  
- Defines and gives examples of a pronumeral, term, like terms, constant term and coefficient, expression and equation.  |

**Students demonstrate, record and report on logical and critical thought processes by searching for and abstracting generational algebraic representations from patterns drawn from current social situations.**

**In T KC2 relating to outcomes 3.9, 4.9**

**Students use mathematical models to make connections and analyse how things might change in both real and abstract contexts. They extract information from tables of data and graphs, making comparisons between varying rates of change, and predicting future events.**

**F T 3.10, 4.10**

**Students analyse mathematical structures and use algebraic formulae to represent situations. They further develop the capacity to express themselves, and to solve problems involving linear relationships.**

**T C 3.11, 4.11**
Students demonstrate, record and report on logical and critical thought processes by searching for and abstracting generational algebraic representations from patterns drawn from current social situations.

In T KC2 relating to outcomes 3.9, 4.9

Students use mathematical models to make connections and analyse how things might change in both real and abstract contexts. They extract information from tables of data and graphs, making comparisons between varying rates of change, and predicting future events.

FT KC1 KC6 relating to outcomes 3.10, 4.10

Students analyse mathematical structures and use algebraic formulae to represent situations. They further develop the capacity to express themselves, and to solve problems involving linear relationships.

TC KC6 relating to outcomes 3.11, 4.11

- Collects like terms in expressions with 1 and 2 pronumerals.
- Uses index notation to collect like items (eg $3a^2b^3$).
- Uses the distributive law to expand brackets and simplify (eg $3(2x+y) = 6x+3y$).

**EQUATIONS**

- Solves simple linear equations by inspection or trial and error.
- Undoes algebraic expressions using inverse operations.
- Solves linear equations containing 2 or more operations.
- Solves worded problems by constructing equations and solving them.
- Plots and describes points in the four quadrants of the Cartesian plane.
- Graphs the values from a given table or a grid.
- Describes the pattern formed when a graph is drawn from a table of values (ie writes the rule).
- Describes and models a situation, makes connections and analyses it (eg looks at a fun run fundraiser in relation to sponsorship rates, model the different rates, graph and analyse).

3.9 Describes and generalises relationships between measurable attributes as patterns and explains the impact of varying one aspect of the relationship.

F T KC1 KC2

3.10 Analyses, creates and generalises numerical and spatial patterns and solves problems with such patterns.

TC KC6

3.11 Uses mathematical representations to make connections and analyse change.

In T

4.9 Analyses, creates and generalises numeric and visual patterns to solve problems in a range of applications.

F T KC1 KC6

4.10 Uses symbolic algebra to represent situations and manipulate the symbolic representations to solve problems involving linear equations and inequation; gives simple algebraic proofs.

TC KC6

4.11 Models contextualised situation, making connections and analysing change.

In T

**A&RQ:** Do I provide opportunities for my learners to support their peers through collaborative reflection about their learning?
Learning Area: Mathematics  
Strand: Spatial sense and geometric reasoning  
Band: Middle Years  
Standards: 3 & 4

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>Year 6 Standard 3</th>
<th>Lines and angles</th>
<th>Year 7 Towards Standard 4</th>
<th>Year 8 Standard 4</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students explore and analyse features in their immediate and extended environment in geometric terms. They compare perspectives of spatial sense and geometric reasoning in order to understand different human interactions with their environment.</td>
<td>Uses symbols for ‘is parallel to’ (∥) and ‘is perpendicular to’ (⊥).</td>
<td>Uses the terms lines, points, rays, segments, intersections, parallel and perpendicular when constructing diagrams (eg using drawing software to design a moving analogue clock).</td>
<td>Determines angle properties relating to straight lines, intersecting lines, parallel lines and a transversal by using geometry software.</td>
<td>3.12 Describes and generalises spatial relationships within and between groups of 2-D and 3-D shapes and objects and appreciates their application in a range of cultural contexts. Id In KC2</td>
<td></td>
</tr>
<tr>
<td>Identifies and draws perpendicular lines.</td>
<td>Bisects angles using a compass.</td>
<td>Uses the angle properties of parallel lines to determine unknown angles: corresponding, alternate, allied and vertically opposite.</td>
<td>4.12 Identifies characteristics and properties of 2-D and 3-D shapes and understands how these have influenced the built environment. In KC1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Names and labels lines, rays and line segments (eg AB, AB, AB).</td>
<td>Constructs triangles when only the lengths of sides are given.</td>
<td>Calculates unknown interior and exterior angles of a triangle.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Uses common conventions to indicate right angles, equal angles and parallel lines, as shown below.</td>
<td>Uses understanding of angles to determine compass bearings and true bearings.</td>
<td>Determines the sum of interior angles of any n-sided polygon using triangles.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classifies and identifies angles as right, acute, obtuse, reflex, straight or a revolution.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Constructs, labels and names angles using letters of the alphabet (eg ∠ABC).</td>
<td>Estimates and measures angles in degrees using protractor and geometry software.</td>
<td>Identifies the terminology of a circle: radius, diameter, circumference.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimates and measures angles in degrees using protractor and geometry software.</td>
<td>Constructs an angle of a given size using a protractor.</td>
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</tr>
<tr>
<td>Applies understanding of angles to spatial sense and geometric reasoning activities (eg movement of the hands of a clock).</td>
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<td></td>
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</tr>
<tr>
<td>Proves and uses the fact that the sum of the interior angles of a triangle is 180°.</td>
<td>Proves and uses the fact that the sum of the interior angles of a triangle is 180°.</td>
<td></td>
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</tbody>
</table>
Students explore and analyse features in their immediate and extended environment in geometric terms. They compare perspectives of spatial sense and geometric reasoning in order to understand different human interactions with their environment.

**Id In T KC1 relating to outcomes 3.12, 4.12**

- Proves and uses the fact that the sum of the interior angles of a quadrilateral is 360°.
- Understands the meaning of the term congruence.
- Recognises congruence in lines, shapes and solids.
- Applies understanding of angles to spatial sense and geometric reasoning activities (eg movement of the hands of a clock).

**3.12**
Describes and generalises spatial relationships within and between groups of 2-D and 3-D shapes and objects and appreciates their application in a range of cultural contexts.

**4.12**
Identifies characteristics and properties of 2-D and 3-D shapes and understands how these have influenced the built environment.

**In KC1**
Learning Area: Mathematics
Strand: Spatial sense and geometric reasoning
Band: Middle Years
Standards: 3 & 4

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>2-D and 3-D objects</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students explore and analyse features in their immediate and extended environment in geometric terms. They compare perspectives of spatial sense and geometric reasoning in order to understand different human interactions with their environment.</td>
<td>Year 6 Standard 3 <em>Constructs a model of a simple 3-D shape from drawings of different views.</em></td>
<td>Year 8 Standard 4 <em>Identifies faces, vertices and edges of polyhedra and looks at relationships (eg Euler’s formula).</em></td>
</tr>
<tr>
<td></td>
<td><em>Uses the appropriate terminology in describing 3-D objects, including base, edge, surface, vertex and face.</em></td>
<td><em>Identifies 2-D shapes within patterns across cultures and in nature (eg an investigation of Islamic design).</em></td>
</tr>
<tr>
<td></td>
<td><em>Visualises and sketches simple solids from different views.</em></td>
<td><em>Classifies solids in terms of their geometric properties (ie faces, edges, vertices and cross-sections).</em></td>
</tr>
<tr>
<td></td>
<td><em>Constructs a model of a simple solid from an isometric drawing.</em></td>
<td><em>Draws 3-D solids.</em></td>
</tr>
<tr>
<td></td>
<td><em>Identifies and names the properties of rectangular prisms and triangular prisms.</em></td>
<td><em>Identifies and names properties of polyhedra (eg tetrahedron, pentagonal prism, hexagonal prism).</em></td>
</tr>
<tr>
<td></td>
<td><em>Identify and name the properties of square based and triangular based pyramids.</em></td>
<td><em>Constructs complex solids from nets (eg hexagonal based pyramid).</em></td>
</tr>
<tr>
<td></td>
<td><em>Uses the formal names for prisms and identifies pyramids.</em></td>
<td><em>Draws oblique and isometric projections of cubes using paper or drawing software.</em></td>
</tr>
<tr>
<td></td>
<td><em>Names the properties of square based and triangular based pyramids.</em></td>
<td><em>Recognises the properties of quadrilaterals.</em></td>
</tr>
<tr>
<td></td>
<td><em>Compares and describes the side and angle properties of isosceles, equilateral and scalene triangles.</em></td>
<td><em>Constructs, names and classifies scalene, isosceles and equilateral triangles.</em></td>
</tr>
<tr>
<td></td>
<td><em>Identifies isosceles, scalene and equilateral triangles.</em></td>
<td><em>Determines unknown angles in quadrilaterals and triangles.</em></td>
</tr>
</tbody>
</table>

3.12 Describes and generalises spatial relationships within and between groups of 2-D and 3-D shapes and objects and appreciates their application in a range of cultural contexts. 

4.12 Identifies characteristics and properties of 2-D and 3-D shapes and understands how these have influenced the built environment.

A&RQ: Do I use learner achievement data to support and plan for future learning?
<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>Transformation</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 6 Standard 3</td>
<td>Year 7 Towards Standard 4</td>
<td>Year 8 Standard 4</td>
</tr>
<tr>
<td>Students analyse and understand the uses and purposes of flips (reflection), slides (translation), rotations and dilations to explore geometric relationships and alternative preferred possibilities in the physical world.</td>
<td>Rotates a shape about a point (eg rotates 90º clockwise). Reflects a complex shape or design on a line. Translates shapes over a given distance (eg translates the shape 5 squares horizontally to the left on grid paper). Enlarges and reduces shapes using a scale. Creates tessellation using rotation, translation and reflection (eg using drawing software).</td>
<td>Identifies rotational symmetry. Constructs a mirror image of designs using a line of symmetry. Uses line and rotational symmetry to classify polygons and polyhedra. Creates a complex tessellating shape by using translation, rotation or reflection to modify a simple shape. Identifies functional and aesthetic uses of tessellation in social contexts (eg paving, the works of M C Escher, patterns). Performs 2 step geometrical transformations using grid paper or drawing software. Describes various transformations.</td>
</tr>
<tr>
<td>Rotate shapes clockwise and anticlockwise.</td>
<td>Analyses the result of a series of flips, slides, rotations and reflections and translations and uses scales to undertake enlargements and reductions of figures and objects.</td>
<td>3.13 4.13</td>
</tr>
<tr>
<td>Identifies and names shapes that have rotational symmetry.</td>
<td>Identifies, represents and justifies one and two step geometrical transformations.</td>
<td>T C KC1</td>
</tr>
<tr>
<td>Uses both pen and paper and geometry software to construct a shape that has rotational symmetry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recognises tessellations in the everyday environment (eg weaving).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Makes enlargements and reductions of 2-D shapes, pictures and maps using pen and paper or using geometry software.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discusses similarities and differences of the same object or scene represented in different sizes (eg drawings enlarged on a photocopier, drawings or pictures using geometry software).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Learning Area: Mathematics
Strand: Spatial sense and geometric reasoning
Band: Middle Years
Standards: 3 & 4

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>Location and position</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students develop and extend their capacity to solve problems in multi-layered and abstract ways in order to produce accurate maps, graphs and models. T C KC6 relating to outcomes 3.14, 4.14</td>
<td>Year 6 Standard 3</td>
<td>Year 7 Towards Standard 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uses a coordinate grid to make simple 2-D shapes (eg ‘At what coordinates would the vertices of a square be placed?’).</td>
<td>Draws environmental and geometric objects from different perspectives.</td>
<td>Uses a Cartesian grid to plot points and lines and develop a relationship to describe the lines.</td>
</tr>
<tr>
<td>Reads and interprets maps, plans, scale drawings and diagrams which have been drawn to scale.</td>
<td>Describes and draws what is seen and not seen from different views of 3-D shapes (eg pyramids, prisms).</td>
<td>Uses bearings and distance to describe a position.</td>
</tr>
<tr>
<td>Reads and writes scales in words and through diagrams (eg 1cm represents 5km; 1:500,000).</td>
<td>Draws 3-D objects using solid lines for visible edges and dotted lines for invisible edges.</td>
<td></td>
</tr>
<tr>
<td>Recognises and uses the cardinal and intermediate points on a magnetic compass.</td>
<td>Recognises that a location can be represented on maps or plans using different scales.</td>
<td></td>
</tr>
<tr>
<td>Uses a magnetic compass to find north and hence the direction associated with the other three major compass points.</td>
<td>Uses a scale to calculate the distance between two points on a map.</td>
<td></td>
</tr>
<tr>
<td>Identifies and records familiar routes, locations and objects in their environment.</td>
<td>Reads, writes and uses scales in words in problem solving.</td>
<td></td>
</tr>
<tr>
<td>Uses coordinate grids to make more complex 2-D shapes (eg making a picture).</td>
<td>Produces scaled plans (eg classroom, bedroom).</td>
<td></td>
</tr>
<tr>
<td>Evaluates maps and plans in terms of appropriateness of scale, use of symbols, appropriateness for task, clarity of purpose, accuracy etc.</td>
<td>Uses coordinate grids to make more complex 2-D shapes (eg making a picture).</td>
<td></td>
</tr>
<tr>
<td>Produces, uses and critiques scaled maps and plans and envisages alternative possibilities. F T KC3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Represents and uses location maps, pathways diagrams and network diagrams to describe current and possible future characteristics of the physical world. F T KC1 KC6</td>
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<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Students develop and extend their capacity to solve problems in multi-layered and abstract ways in order to produce accurate maps, graphs and models.

**T C KC6**

**relating to outcomes 3.14, 4.14**

- Explains a pathway to a location on a model, map or plan using distance, direction, angle multiples of 45°, compass points and coordinates.
- Finds alternative routes using a scale (e.g., to find the shortest route between two points).
- Follows simple directions to move from point to point on a given path, using maps, a magnetic compass and written and oral instructions.
- Develops a simple orienteering course.

**3.14**

Produces, uses and critiques scaled maps and plans and envisages alternative possibilities.

**F T KC3**

**4.14**

Represents and uses location maps, pathways diagrams and network diagrams to describe current and possible future characteristics of the physical world.

**F T KC1 KC6**
TERMINOLOGY

Strand: Exploring, analysing and modelling data

<table>
<thead>
<tr>
<th>Data collection and representation</th>
<th>Chance and probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scatterplot, Stemplot, Cartesian plane, Collinear, Dependent variable, Gradient, Independent variable, Linear graph, Non-linear graph, Ordered pair, Point of intersection, Quadrant, Simultaneous solution, Substitute, Intercept, Biased, Bimodal, Box and whisker plot, Categorical, Conjecture, Skewed, Outlier, Quartile, Distributive, Bar graph, Column graph, Pictograph, Histogram, Composite bar graph, Pie graph, Line graph, Tally, Data, Mean, Mode, Median, Sample, Table, Categorical, Quantitative, Survey sample, Statistics, Percentage, Title, Axis.</td>
<td>Compound events, Dependent, Simultaneous, Expectation, Occurrence, Random, Relative frequency, Simulation, Theoretical probability, Possible, Probable, Likelihood, Predict, Relationship, Impossible, Possibility, Experiment, Tree diagram, Gamble, Certain, Event, Trial, Consequence, Likely, Unlikely, Sample, Population, Variable.</td>
</tr>
</tbody>
</table>

Strand: Measurement

<table>
<thead>
<tr>
<th>Length, perimeter and area; Volume and capacity; Mass; Time; Angles; Temperature</th>
</tr>
</thead>
</table>

Strand: Number

<table>
<thead>
<tr>
<th>Whole numbers; Fractions, decimals, percentages, ratios and rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decimal, Numerator, Denominator, Rational, Irrational, Percentage, Reciprocal, Equivalent, Mixed number, Improper fraction, Fraction, Quantity, Number system, Thousandths, Divisor, Spreadsheet, Prime, Composite, Digit, Divisibility, Test, Exponent, Infinite, Integer, Proportion, Ratio, Scientific rotation, Compound, Interest, Invest, Principal, Unitary method, Rate, Quadratic, Depreciation, Appreciation, Commission, Deduction, Discount, Exchange rate, Gross, Inflation, Piece work, Retainer, Superannuation.</td>
</tr>
</tbody>
</table>
**Strand: Pattern and algebraic reasoning**

**Patterns**

Pronumerals, Variables, Equations, Formula, Number sentence, Pattern, Linear graphs, Predict, Substitute, Numerical, Geometric, Abstract relationship, Structure, Model, Inequation, Coefficient, Elimination, Induction, Interchange, Inverse, Linear equation, Binomial, Consecutive, Distributive, Identity, Quadratic, Direct variation, Negative reciprocal, Proportionality constant, Rectangular hyperbola, Asymptote, Exponential decay/growth.

**Strand: Spatial sense and geometric reasoning**

**2-D and 3-D objects**

Isometric, Bisect, Perspective, Base, Edge, Surface, Vertex, Face, Cross-section, Isosceles, Scalene, Equilateral, Oblique, Polyhedra, Acute, Obtuse, Reflex, Points, Rays, Segments, Intersections, Parallel, Perpendicular, Centre, Radius, Diameter, Circumference, Quadrilateral, Interior, Exterior, Euler, Arc, Segment, tangent, ellipse, Net, Curved surface, Parallelogram, Plane face, Prism, Pyramid, Sphere, Surface area, Trapezium, Adjacent, Alternate, Apex, Co-interior, Allied, Complementary, Concurrent, Congruence, Converse, Corresponding, Deductive.

**Transformation**

Tessellation, Rotate, Symmetry, Enlarge, Reduce, 2 dimensional/2-D, 3 dimensional/3-D, Reflect, Translate, Transform, Clockwise, Anti-clockwise, Adjacent, Axis of symmetry, Cosine, Equiangular, Perpendicular bisector, Proportion, Rotational symmetry, Sine, Trigonometric ratio, Tangent, Trigonometry.

**Location and position**

Magnetic compass, Scale drawings, Map, Plan, Ratio, Cardinal, Diagram, Orienteering, Intermediate points, Coordinate grid, Models, Pathways, Location, Vertices, Routes.
Learning Area: Mathematics

Strand: Exploring, analysing and modelling data  
Band: Middle–Senior Years  
Standard: 5

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>(refer p 7 for Years 6, 7 and 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students engage with data by developing skills in posing questions, and collecting, organising, representing, critiquing and communicating data to help answer those questions.</td>
<td></td>
</tr>
</tbody>
</table>
| In T C KC1 KC2 relating to outcome 5.1
| Students use critical appraisal to interpret data using methods of exploratory data analysis, while developing and evaluating predictions, inferences and arguments from data. |
| F T C KC1 KC6 relating to outcome 5.2
| Students understand basic notions of chance and probability, apply them to social situations, and report on their findings. |
| F In T KC2 relating to outcome 5.3
| (refer p 7 for Concept Map) |
| **Year 9 Towards Standard 5** | **Year 10 Standard 5** |
| • Works with student generated and published data. | • Uses random sampling techniques to collect data. |
| • Recognises bias in a sample. | • Organises, sorts and stores raw data and scans it for errors, and reports on reasons for inconsistencies. |
| • Arranges discrete data in an ordered stem and leaf plot. | • Interprets data presented as graphs and tables and describes the distribution of the data. |
| • Places dependent and independent variables from a data set on appropriate axes. | • Constructs histograms for continuous data sets. |
| • Organises and displays discrete data by creating a frequency table and column graph, with and without ICTs. | • Finds measures of the centre from a distribution when data is given in various forms, and chooses which measures are appropriate. |
| • Recognises the symmetry or skewness of a distribution. | • Finds measures of spread of a data set including range, interquartile range and standard deviation. |
| • Recognises outliers through observation. | • Finds the minimum value, lower quartile, upper quartile, median and maximum value for a data set (5 number summary) using manual and electronic means. |
| • Compares data sets using compound graphs (eg back to back stem and leaf plots, side by side column graphs). | • Represents and records trends in scatter plots and, where appropriate, sketches lines of best fit, reporting on implications. |
| • Finds the mean, median and mode from a table, column graph or stem and leaf plot. | • Uses random sampling techniques to collect data. |
| • Represents data using box plots and uses them for statistical argument. | • Organises, sorts and stores raw data and scans it for errors, and reports on reasons for inconsistencies. |
| • Makes predictions based on data representations. | • Interprets data presented as graphs and tables and describes the distribution of the data. |
| • Interprets data and demonstrates an understanding of the limitations of any data set. | • Constructs histograms for continuous data sets. |

**OUTCOMES**

5.1 Plans experiments and surveys; checks data for inconsistencies; and represents and reports on central tendency and spread of data.  
T C KC2 KC3

5.2 Displays and summaries data to show location and spread, while interpreting and critiquing collected and published data from a variety of sources and perspectives (describing distributions, and making comparisons, inferences and predictions where appropriate).  
F T C KC1

5.3 Calculates probabilities in a variety of situations involving chance, including situations involving compound events.  
F In T KC6
Learning Area: Mathematics
Strand: Exploring, analysing and modelling data
Band: Middle–Senior Years
Standard: 5

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>Year 9 Towards Standard 5</th>
<th>Year 10 Standard 5</th>
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</thead>
<tbody>
<tr>
<td>Students engage with data by developing skills in posing questions, and collecting, organising, representing, critiquing and communicating data to help answer those questions. <strong>In T C KC1 KC2 relating to outcome 5.1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students use critical appraisal to interpret data using methods of exploratory data analysis, while developing and evaluating predictions, inferences and arguments from data. <strong>F T C KC1 KC6 relating to outcome 5.2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students understand basic notions of chance and probability, apply them to social situations, and report on their findings. <strong>F In T KC2 relating to outcome 5.3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Describes probabilities in qualitative terms ranging from impossible to certain.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Assigns and interprets numerical values in decimal/fraction form to probabilities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Performs experiments and determines probabilities (eg uses computer generated simulations).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Determines probabilities using tree diagrams and 2-D grids, with and without replacement.</td>
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<td></td>
</tr>
<tr>
<td>• Interprets data and makes numerical statements about probability.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Understands and uses complementary events in probability.</td>
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<td></td>
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<tr>
<td>• Investigates and calculates probabilities involving compound events.</td>
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<td></td>
</tr>
<tr>
<td>• Calculates the probability of independent and dependent events, using Venn diagrams where appropriate.</td>
<td></td>
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</tr>
</tbody>
</table>

**Discussion point:** Lobby groups can often change decisions made.  
**Reflective question:** Can you plan for the use of data to provide input into supporting one side of a local issue?  

**Discussion point:** Discuss the reliable and ethical use of data.  
**Reflective question:** How can data be used to solve a complex problem? Consider posing a question and using data to support your discussion.

5.1 Plans experiments and surveys; checks data for inconsistencies; and represents and reports on central tendency and spread of data.  
**T C KC2 KC3**

5.2 Displays and summaries data to show location and spread, while interpreting and critiquing collected and published data from a variety of sources and perspectives (describing distributions, and making comparisons, inferences and predictions where appropriate).  
**F T C KC1**

5.3 Calculates probabilities in a variety of situations involving chance, including situations involving compound events.  
**F In T KC6**
Learning Area: Mathematics
Strand: Measurement
Band: Middle–Senior Years
Standard: 5

### KEY IDEAS

Students extend their capacity to think mathematically. They analyse and make connections between measurements, select and develop strategies to solve a variety of problems, and select means of communicating results appropriate in a range of contexts.

<table>
<thead>
<tr>
<th>Year 9</th>
<th>Year 10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LENGTH, AREA AND VOLUME</strong></td>
<td><strong>LENGTH, AREA AND VOLUME</strong></td>
</tr>
<tr>
<td>• Chooses appropriate instruments to measure in 2-D and 3-D situations.</td>
<td>• Understands and uses formulae in practical situations for the surface area of cones and spheres.</td>
</tr>
<tr>
<td>• Gives reasonable estimates of length, area or volume of an original from a scaled map, model, plan or photograph.</td>
<td>• Uses formulae for the volume of a pyramid, cone and sphere and applies these to practical situations.</td>
</tr>
<tr>
<td>• Selects and uses suitable formulae and measurements to calculate a wide range of quantities including perimeter, area, volume and speed.</td>
<td>• Analyses problems and chooses the appropriate measurement formulae to solve them (eg ‘Given this object, calculate its density’).</td>
</tr>
<tr>
<td>• Constructs formulae for composite shapes.</td>
<td>• Explains the compounding effect of errors in calculations involving measurement.</td>
</tr>
<tr>
<td>• Makes conversions between volume units: mm³, cm³, m³, km³.</td>
<td><strong>Discussion point</strong>: There are many moral, ethical and mathematical issues related to packaging. <strong>Reflective question</strong>: What methods could you use to solve some of the issues and do these help to design better packaging to suit a commonly used product? (eg a container for soft drink).</td>
</tr>
<tr>
<td>• Calculates surface areas of regular shapes.</td>
<td><strong>TRIGONOMETRY</strong></td>
</tr>
<tr>
<td>• Develops processes for determining dimensions of 2-D and 3-D objects given a fixed area or volume (eg ‘If volume = 1 litre, what are the possible dimensions?’).</td>
<td>• Investigates the relationships between angles and lengths of sides in similar right-angled triangles.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>PYTHAGORAS’S THEOREM</strong></th>
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</tr>
</thead>
<tbody>
<tr>
<td>• Uses investigation to find the rule of Pythagoras, using terminology that includes hypotenuse and adjacent side.</td>
<td>• Understands the three trigonometric ratios: sine θ, cosine θ and tangent θ.</td>
</tr>
<tr>
<td>• Finds the lengths of sides of right-angled triangles using Pythagoras’s theorem.</td>
<td>• Draws and compares graphs of y = sine θ, y = cosine θ and y = tangent θ.</td>
</tr>
<tr>
<td>• Uses the converse of Pythagoras’s theorem to check for right angled triangles.</td>
<td>• Uses the three trigonometric ratios to find unknown sides and angles in right-angled triangles.</td>
</tr>
<tr>
<td>• Applies Pythagoras’s theorem in appropriate contexts.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5.4</strong> Appropriately selects, uses and communicates attributes, units and systems of measurement. <strong>In T C KC1 KC2</strong></td>
</tr>
<tr>
<td><strong>5.5</strong> Applies a variety of techniques and tools, and manipulates formulae to solve and report on everyday and community problems. <strong>In T C KC2 KC6</strong></td>
</tr>
</tbody>
</table>
### Learning Area: Mathematics  
**Strand: Number**  
**Band: Middle–Senior Years**  
**Standard: 5**

#### KEY IDEAS
- Students understand concepts of 'number', ways of representing numbers, relationships among numbers, number systems and the concept of numbers represented in logarithmic form. They report on their conceptualisation, and understand that numbers have cultural bases.  
  - In T C KC2 relating to outcome 5.6
- Students understand and report on the meaning of operations, how they relate to each other and their use in modelling growth and change.  
  - F In T C KC2 relating to outcome 5.7
- Students select and use computational tools and strategies fluently, and estimate appropriately.  
  - T C KC6 relating to outcome 5.8

#### OUTCOMES

<table>
<thead>
<tr>
<th>Year 9 Towards Standard 5</th>
<th>Year 10 Standard 5</th>
</tr>
</thead>
</table>

**IRRATIONAL NUMBERS**
- Evaluates and/or approximates square roots.
- Understands the difference between rational and irrational numbers.
- Understands what a surd is and uses a calculator to approximate the value of any surd.

**SCIENTIFIC NOTATION**
- Uses scientific notation in developing an understanding of very large and very small numbers.
- Interprets and uses scientific notation using a calculator and/or computer to do calculations involving very large or very small numbers.

**BUSINESS APPLICATIONS**
- Develops further understanding of financial applications by:
  - using and understanding the simple interest formula
  - performing and understanding compound interest calculations with and without the compound interest formula
  - using percentage calculations with graphs, charts and tables to analyse information.

**INDEX FORM**
- Simplifies surds.
- Operates with surds.
- Evaluates numbers in index form with positive and negative powers.
- Evaluates numbers in index form with rational powers.
- Evaluates expressions using numbers in scientific notation.
- Applies knowledge of index rules to real world situations.

**BUSINESS APPLICATIONS**
- Shows understanding of a range of financial mathematics calculations using ICTs and other methods by:
  - calculating incomes based on different modes of payment
  - calculating additional payments based on overtime, annual leave loading, allowance and bonuses
  - calculating net pay
  - calculating taxable income and tax payable
Students understand concepts of number, ways of representing numbers, relationships among numbers, number systems and the concept of numbers represented in logarithmic form. They report on their conceptualisation, and understand that numbers have cultural bases.

**In T C KC2 relating to outcome 5.6**

Students understand and report on the meaning of operations, how they relate to each other and their use in modelling growth and change.

**F In T C KC2 relating to outcome 5.7**

Students select and use computational tools and strategies fluently, and estimate appropriately.

**T C KC6 relating to outcome 5.8**

- varying prices by given percentage mark-ups and mark-downs
- understanding and performing percentage chain calculations
- calculating loan repayments
- constructing personal budgets.

**Discussion point:** There’s a commonly held view that the ability of Australian students to understand fractions, has decreased since February 14, 1966.

**Reflective question:** Apart from this event, what other events may have contributed further to a decline in the ability to manipulate fractions?

**Discussion point:** Some banks in Australia make profits in excess of $2 000 000 000 per year.

**Reflective question:** How are bank fees structured? Demonstrate how they are related to bank profits.

**In T C KC2**

**5.7** Demonstrates and justifies understanding of the meaning of operations with numbers, and how they relate to each other in modelling growth and change.

**F In T C KC2**

**5.8** Uses computational tools and strategies fluently and can estimate appropriately.

**T C**
Learning Area: Mathematics
Strand: Pattern and algebraic reasoning
Band: Middle–Senior Years
Standard: 5

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students recognise various families of functions, and analyse the effects of changes, in describing and analysing local and global behaviour of functions from a variety of contexts. <strong>In T C KC1 relating to outcome 5.9</strong></td>
<td><strong>5.9</strong> Recognises equivalent forms of an expression, equation, function or relation; and recognises range of families of function, analyses parameter changes, and describes local and global behaviour of such functions. <strong>In T C KC1 KC2</strong></td>
</tr>
<tr>
<td>Students use symbolic forms to represent, analyse and communicate mathematical situations and structure, in order to devise logical and creative solutions to contemporary problems ranging from proving identities to logical understanding of the argument by mathematical induction. <strong>T C KC1 KC2 relating to outcome 5.10</strong></td>
<td><strong>5.10</strong> Represents advanced functions with symbolic algebra, sketches, graphs and tables; solves problems by manipulating equations involving advanced functions. <strong>T C KC6</strong></td>
</tr>
<tr>
<td>Students use mathematical models to make connections and analyse how things might change in both real and abstract contexts. They employ skills of interpolation and extrapolation to make and communicate informed judgments about future events, and what could influence them. <strong>F In T C KC1 KC2 KC6 relating to outcome 5.11</strong></td>
<td><strong>5.11</strong> Uses a variety of mathematical models to make connections and analyse how things might change in both real and abstract contexts. <strong>F In T C KC1</strong></td>
</tr>
</tbody>
</table>

### Year 9 Towards Standard 5

#### EXPRESSIONS
- Uses the distributive rule to expand and simplify \((a+b)(c+d)\).
- Investigates special cases, difference of two squares, and perfect squares.
- Factorises algebraic expressions by removing highest common factor (HCF).
- Builds an understanding of Index Laws through discovery methods.
- Understands and uses the Zero Index Law and the Negative Index Law.

#### LINEAR EQUATIONS AND INEQUALITIES
- Understands the purpose of an equal sign in linear equations.
- Solves linear equations which require simplification before solution.
- Writes linear inequalities involving algebraic notation.
- Solves linear inequalities and uses number lines to display solutions.

#### FORMULAE
- Substitutes into formulae and finds unknowns.

### Year 10 Standard 5

#### EXPRESSIONS/EQUATIONS
- Understands the difference between an expression and an equation.
- Explores the existence of quadratic relationships in contextual situations (e.g., projectile motion, maximising problems).
- Investigates the form of quadratic equations.
- Factorises quadratic expressions by:
  - recognising and using the sum and product pattern
  - recognising and using the perfect square pattern
  - recognising and using the difference of two squares pattern
  - using ‘trial and error’ and/or other methods for factorising quadratics that don’t fit known patterns.
- Solves quadratic equations by factorising.
- Interprets and solves simple, worded problems using quadratics.
- Finds quadratic equations given their solutions.

#### SIMULTANEOUS EQUATIONS
- Solves a range of problems involving simultaneous equations using algebraic methods.
Students recognise various families of functions, and analyse the effects of changes, in describing and analysing local and global behaviour of functions from a variety of contexts.

**In T C KC1 relating to outcome 5.9**

Students use symbolic forms to represent, analyse and communicate mathematical situations and structure, in order to devise logical and creative solutions to contemporary problems ranging from proving identities to logical understanding of the argument by mathematical induction.

**T C KC1 KC2 relating to outcome 5.10**

Students use mathematical models to make connections and analyse how things might change in both real and abstract contexts. They employ skills of interpolation and extrapolation to make and communicate informed judgments about future events, and what could influence them.

**F In T C KC1 KC2 KC6 relating to outcome 5.11**

**COORDINATE GEOMETRY**
- Understands the nature of the equation that produces a straight line.
- Understands the concept of slope (eg slope = rise/run or slope = y step/x step).
- Investigates and finds the slope and y intercept of a line with equation of the form y = mx + c and graphs relationship.
- Identifies and graphs horizontal and vertical lines from their equations.
- Graphs a straight line from its equations using the y intercept and the slope, or using the x and y intercepts.
- Finds the slope and y intercept from coordinate pairs that exhibit a linear relationship and hence determines the equation of the line.
- Solves problems that involve linear relationships.

**Discussion point:** Discuss the costs and ethics of owning and using mobile phones.

**Reflective question:** Can you find the most affordable phone for you from a range of advertisements and provide evidence of why it is the best deal in regard to cost compared to usage?

**COORDINATE GEOMETRY**
- Graphs and understands the concepts of distance, midpoint and slope on the coordinate plane by plotting two points and counting squares.
- Derives the formulae for distance, midpoint and slope on the coordinate plane.
- Uses the form \((y−y_1) = m (x−x_1)\).
- Finds equations of horizontal and vertical lines.
- Plots data and solves a range of problems relating to bivariate data (eg cost of production, hiring tradespeople, shipping costs of goods).
- Determines the equation of a line from a variety of sources including graphs, tables, and x and y intercepts.

**FUNCTIONS**
- Understands the concept of a function and its notation (eg \(f (x)\)).
- Explores linear, quadratic and exponential functions.
- Substitutes known values into a relationship to find the unknown.
- Draws sketches of functions and investigates the effect of varying the constant using ICTs.
- Draws connections between the results of varying the constants in families of functions.
- Identifies the important features of functions from their general form (eg for quadratics; intercepts, axis of symmetry, vertex cords).
- Demonstrates understanding and ability to work with mathematical models.

**5.9** Recognises equivalent forms of an expression, equation, function or relation; and recognises range of families of function, analyses parameter changes, and describes local and global behaviour of such functions.

**In T C KC1 KC2**

**5.10** Represents advanced functions with symbolic algebra, sketches, graphs and tables; solves problems by manipulating equations involving advanced functions.

**T C KC6**

**5.11** Uses a variety of mathematical models to make connections and analyse how things might change in both real and abstract contexts.

**F T C KC1**
Learning Area: Mathematics
Strand: Spatial sense and geometric reasoning
Band: Middle–Senior Years
Standard: 5

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students plan, test and refine their geometric reasoning, understanding and language through critical analysis and conjecture, and use alternatives to validate and formalise proofs.</td>
<td>Year 9 Towards Standard 5 Planar geometry</td>
</tr>
<tr>
<td>Students extend their geometric understanding and language through the use of different representational systems to solve complex spatial problems.</td>
<td>Year 10 Standard 5 Planar geometry</td>
</tr>
<tr>
<td>Students gain confidence in their capacity to use symbolic forms to analyse mathematical situations and structures, and to establish and communicate proofs and envisage other possibilities.</td>
<td></td>
</tr>
</tbody>
</table>

### Year 9 Towards Standard 5 Planar Geometry
- Proves triangle congruence.
- Investigates similarities between triangles using ICTs.
- Proves two triangles are similar using an appropriate test.
- Finds missing sides and angles in similar triangles.
- Applies knowledge of similar triangles to solve practical problems.

### Year 10 Standard 5 Planar Geometry
- Understands terminology that relates to a circle, including diameter and chord.
- Investigates circle properties in order to develop theorems.
- Uses circle theorems to solve problems.
- Uses previously learned geometric theorems to construct proofs.

### Year 9 Towards Standard 5 Transformation
- Applies transformations to coordinate axes.
- Determines the translation vector in a translation.
- Determines the centre and angle of rotation.
- Finds the axis (axes) of symmetry of a figure where possible.
- Finds the scale factor and centre of enlargement.

### Year 10 Standard 5 Networks and Maps
- Finds paths that meet specifications (eg the shortest route).
- Produces maps and plans, labelling key features of a location or path according to the purpose of the map.
- Recognises and explains loci (paths) of moving objects (eg valve on a travelling bicycle wheel).

**Discussion point**: Discuss the issues related to urban sprawl and the city of Adelaide.
**Reflective question**: What are the environmental and economic implications of establishing a modern housing development?

**Discussion point**: Discuss the systems for transferring goods around the world.
**Reflective question**: What is the cheapest and quickest way to transport a parcel from Roxby Downs to New York? What other factors did you take into consideration?
### Learning Area: Mathematics

**Strand: Analysing and modelling change**

**Band: Middle–Senior Years**

**Standard: 5**

<table>
<thead>
<tr>
<th>KEY IDEAS</th>
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</thead>
<tbody>
<tr>
<td>Students express personal ideas and analyse graphical representations. They make and justify predictions about relationships between variables, including variables involving a range of times and cultures.</td>
<td><strong>5.15</strong> Draws, describes and justifies graphical relationships between variables. T C KC2</td>
</tr>
<tr>
<td>Students analyse change and rates of change in a range of contexts, and use experimental and theoretical data to make logical statements about these understandings.</td>
<td><strong>5.16</strong> Describes change and varying rates of change and makes predictions when analysing graphical information. T C KC2</td>
</tr>
<tr>
<td>Students use and interpret relationships between variables as tools for analysing and modelling change, and to make reasonable predictions about future events.</td>
<td><strong>5.17</strong> Uses and interprets relationships between variables as a tool for analysing and modelling change in a range of contexts. F In T C KC1</td>
</tr>
</tbody>
</table>

### Year 9 Towards Standard 5

- Explores the relationship between variables (e.g., volume of fluid and height of fluid for different shaped bottles and a baby in the bath).
- Uses scatter graphs to plot data.
- Expresses the relationship between variables represented on the scatter graph as strong or weak, positive or negative correlations.
- Visualises the line of best fit and uses ICTs to determine the equation.
- Uses equations to make predictions.

### Year 10 Standard 5

- Determines whether two quantities are directly or inversely proportional.
- Recognises and draws the graphs associated with quantities which are directly or inversely proportional.
- Solves real-life problems involving quantities which are directly or inversely proportional.
- Graphs and understands the nature of rectangular hyperbolae.
- Draws graphs of exponential functions.
- Solves growth and decay problems.

**Discussion point**: Weather forecasts are an extremely important part of our lives.

**Reflective question**: Can you analyse the accuracy of short, medium and long-term weather forecasts and develop a model to support your analysis?
### TERMINOLOGY

#### Strand: Exploring, analysing and modelling data

<table>
<thead>
<tr>
<th>Data collection and representation</th>
<th>Chance and probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scatterplot, Stemplot, Cartesian plane, Collinear, Dependent variable, Gradient, Independent variable, Linear graph, Non-linear graph, Ordered pair, Point of intersection, Quadrant, Simultaneous solution, Substitute, Intercept, Biased, Bimodal, Box and whisker plot, Categorical, Conjecture, Skewed, Outlier, Quartile, Distributive, Bar graph, Column graph, Pictograph, Histogram, Composite bar graph, Pie graph, Line graph, Tally, Data, Mean, Mode, Median, Sample, Table, Categorical, Quantitative, Survey sample, Statistics, Percentage, Title, Axis.</td>
<td>Compound events, Dependent, Simultaneous, Expectation, Occurrence, Random, Relative frequency, Simulation, Theoretical probability, Possible, Probable, Likelihood, Predict, Relationship, Impossible, Possibility, Experiment, Tree diagram, Gamble, Certain, Event, Trial, Consequence, Likely, Unlikely, Sample, Population, Variable.</td>
</tr>
</tbody>
</table>

#### Strand: Measurement

<table>
<thead>
<tr>
<th>Length, perimeter and area; Volume and capacity; Mass; Time; Angles; Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area, Diameter, Angles, Tonne, Speed, Metre, Kilometre, Perimeter, Timetable, Prism, Gram, Millimetre, Capacity, Radius, Metric system, Centimetre, Hectare, Volume, Surface area, Kilogram, Kilolitre, Millilitre, Megalitre, Length, Circumference, Mass, Weight, Litre, Timeline, Formula, Daylight saving, Timetable, Time zone, Digital, Analogue, Calendar, Schedule, Duration, AD, BC, CE (Common Era), Approximation, Converse, Hypotenuse, Integer, Surd, Apex, Boundary, Conversion, Concentric.</td>
</tr>
</tbody>
</table>

#### Strand: Number

<table>
<thead>
<tr>
<th>Whole numbers; Fractions, decimals, percentages, ratios and rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decimal, Numerator, Denominator, Rational, Irrational, Percentage, Reciprocal, Equivalent, Mixed number, Improper fraction, Fraction, Quantity, Number system, Thousandths, Divisor, Spreadsheet, Prime, Composite, Digit, Divisibility, Test, Exponent, Infinite, Integer, Proportion, Ratio, Scientific notation, Compound, Interest, Invest, Principal, Unitary method, Rate, Quadratic, Depreciation, Appreciation, Commission, Deduction, Discount, Exchange rate, Gross, Inflation, Piece work, Retainer, Superannuation.</td>
</tr>
</tbody>
</table>
**Strand: Pattern and algebraic reasoning**

**Patterns**

- Pronumerals, Variables, Equations, Formula, Number sentence, Pattern, Linear graphs, Predict, Substitute, Numerical, Geometric, Abstract relationship, Structure, Model, Inequation, Coefficient, Elimination, Induction, Interchange, Inverse, Linear equation, Binomial, Consecutive, Distributive, Identity, Quadratic, Direct variation, Negative reciprocal, Proportionality constant, Rectangular hyperbola, Asymptote, Exponential decay/growth.

**Strand: Spatial sense and geometric reasoning**

<table>
<thead>
<tr>
<th>2-D and 3-D objects</th>
<th>Transformation</th>
<th>Location and position</th>
</tr>
</thead>
</table>
BIBLIOGRAPHY