Year 7

The proficiency strands Understanding, Fluency, Problem Solving and Reasoning are an integral part of mathematics content across the three content strands: Number and Algebra, Measurement and Geometry, and Statistics and Probability. The proficiencies reinforce the significance of working mathematically within the content and describe how the content is explored or developed. They provide the language to build in the developmental aspects of the learning of mathematics.

At this year level:

Understanding includes describing patterns in uses of indices with whole numbers, recognising equivalences between fractions, decimals, percentages and ratios, plotting points on the Cartesian plane, identifying angles formed by a transversal crossing a pair of lines, and connecting the laws and properties of numbers to algebraic terms and expressions.

Fluency includes calculating accurately with integers, representing fractions and decimals in various ways, investigating best buys, finding measures of central tendency and calculating areas of shapes and volumes of prisms.

Problem Solving includes formulating and solving authentic problems using numbers and measurements, working with transformations and identifying symmetry, calculating angles and interpreting sets of data collected through chance experiments.

Reasoning includes applying the number laws to calculations, applying known geometric facts to draw conclusions about shapes, applying an understanding of ratio and interpreting data displays.

Number and Algebra

<table>
<thead>
<tr>
<th>Number and place value</th>
<th>Elaborations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigate index notation and represent whole numbers as products of powers of prime numbers (ACMNA149)</td>
<td>● defining and comparing prime and composite numbers and explaining the difference between them</td>
</tr>
<tr>
<td></td>
<td>● applying knowledge of factors to strategies for expressing whole numbers as products of powers of prime factors, such as repeated division by prime factors or creating factor trees</td>
</tr>
<tr>
<td></td>
<td>● solving problems involving lowest common multiples and greatest common divisors (highest common factors) for pairs of whole numbers by comparing their prime factorisation</td>
</tr>
<tr>
<td>Investigate and use square roots of perfect square numbers (ACMNA150)</td>
<td>● investigating square numbers such as 25 and 36 and developing square-root notation</td>
</tr>
<tr>
<td></td>
<td>● investigating between which two whole numbers a square root lies</td>
</tr>
<tr>
<td>Apply the associative, commutative and distributive laws to aid mental and written computation (ACMNA151)</td>
<td>● understanding that arithmetic laws are powerful ways of describing and simplifying calculations</td>
</tr>
<tr>
<td>Compare, order, add and subtract integers (ACMNA280)</td>
<td></td>
</tr>
<tr>
<td>Real numbers</td>
<td>Elaborations</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Compare fractions using equivalence. Locate and represent positive and negative fractions and mixed numbers on a number line (ACMNA152)</td>
<td>● exploring equivalence among families of fractions by using a fraction wall or a number line (for example by using a fraction wall to show that 2/3 is the same as 4/6 and 6/9)</td>
</tr>
<tr>
<td>Solve problems involving addition and subtraction of fractions, including those with unrelated denominators (ACMNA153)</td>
<td>● exploring and developing efficient strategies to solve additive problems involving fractions (for example by using fraction walls or rectangular arrays with dimensions equal to the denominators)</td>
</tr>
<tr>
<td>Multiply and divide fractions and decimals using efficient written strategies and digital technologies (ACMNA154)</td>
<td>● investigating multiplication of fractions and decimals, using strategies including patterning and multiplication as repeated addition, with both concrete materials and digital technologies, and identifying the processes for division as the inverse of multiplication</td>
</tr>
<tr>
<td>Express one quantity as a fraction of another, with and without the use of digital technologies (ACMNA155)</td>
<td>● using authentic examples for the quantities to be expressed and understanding the reasons for the calculations</td>
</tr>
<tr>
<td>Round decimals to a specified number of decimal places (ACMNA156)</td>
<td>● using rounding to estimate the results of calculations with whole numbers and decimals, and understanding the conventions for rounding</td>
</tr>
</tbody>
</table>
| Connect fractions, decimals and percentages and carry out simple conversions (ACMNA157) | ● justifying choices of written, mental or calculator strategies for solving specific problems including those involving large numbers  
● understanding that quantities can be represented by different number types and calculated using various operations, and that choices need to be made about each  
● calculating the percentage of the total local municipal area set aside for parkland, manufacturing, retail and residential dwellings to compare land use |
| Find percentages of quantities and express one quantity as a percentage of another, with and without digital technologies. (ACMNA158) | ● using authentic problems to express quantities as percentages of other amounts |
| Recognise and solve problems involving simple ratios (ACMNA173)            | ● understanding that rate and ratio problems can be solved using fractions or percentages and choosing the most efficient form to solve a particular problem |
| Money and financial mathematics                                             | Elaborations                                                                                                                                                                                                 |
Investigate and calculate ‘best buys’, with and without digital technologies (ACMNA174)

- applying the unitary method to identify ‘best buys’ situations, such as comparing the cost per 100g

### Patterns and algebra

#### Elaborations

- understanding that arithmetic laws are powerful ways of describing and simplifying calculations and that using these laws leads to the generality of algebra

**Elaborations**

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

### Linear and non-linear relationships

- Given coordinates, plot points on the Cartesian plane, and find coordinates for a given point (ACMNA178)
- Solve simple linear equations (ACMNA179)
- Investigate, interpret and analyse graphs from authentic data (ACMNA180)

### Measurement and Geometry

- using travel graphs to investigate and compare the distance travelled to and from school
- interpreting features of travel graphs such as the slope of lines and the meaning of horizontal lines
- using graphs of evaporation rates to explore water storage
**Shape**

<table>
<thead>
<tr>
<th>Elaborations</th>
</tr>
</thead>
<tbody>
<tr>
<td>building on the understanding of the area of rectangles to develop formulas for the area of triangles</td>
</tr>
<tr>
<td>establishing that the area of a triangle is half the area of an appropriate rectangle</td>
</tr>
<tr>
<td>using area formulas for rectangles and triangles to solve problems involving areas of surfaces</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shape</th>
<th>Elaborations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draw different views of prisms and solids formed from combinations of prisms (ACMMG161)</td>
<td>using aerial views of buildings and other 3-D structures to visualise the structure of the building or prism</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location and transformation</th>
<th>Elaborations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe translations, reflections in an axis, and rotations of multiples of 90° on the Cartesian plane using coordinates. Identify line and rotational symmetries (ACMMG181)</td>
<td>describing patterns and investigating different ways to produce the same transformation such as using two successive reflections to provide the same result as a translation</td>
</tr>
<tr>
<td></td>
<td>experimenting with, creating and re-creating patterns using combinations of reflections and rotations using digital technologies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Geometric reasoning</th>
<th>Elaborations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify corresponding, alternate and co-interior angles when two straight lines are crossed by a transversal (ACMMG163)</td>
<td>defining and classifying pairs of angles as complementary, supplementary, adjacent and vertically opposite</td>
</tr>
</tbody>
</table>

| Investigate conditions for two lines to be parallel and solve simple numerical problems using reasoning (ACMMG164) | constructing parallel and perpendicular lines using their properties, a pair of compasses and a ruler, and dynamic geometry software |
| | defining and identifying the relationships between alternate, corresponding and co-interior angles for a pair of parallel lines cut by a transversal |

| Demonstrate that the angle sum of a triangle is 180° and use this to find the angle sum of a quadrilateral (ACMMG166) | using concrete materials and digital technologies to investigate the angle sum of a triangle and quadrilateral |

| Classify triangles according to their side and angle properties and describe quadrilaterals (ACMMG165) | identifying side and angle properties of scalene, isosceles, right-angled and obtuse-angled triangles |
| | describing squares, rectangles, rhombuses, parallelograms, kites and trapeziums |
### Statistics and Probability

#### Chance

| Construct sample spaces for single-step experiments with equally likely outcomes (ACMSP167) | ● discussing the meaning of probability terminology (for example probability, sample space, favourable outcomes, trial, events and experiments)  
● distinguishing between equally likely outcomes and outcomes that are not equally likely |
| Assign probabilities to the outcomes of events and determine probabilities for events (ACMSP168) | ● expressing probabilities as decimals, fractionals and percentages |

#### Data representation and interpretation

| Identify and investigate issues involving numerical data collected from primary and secondary sources (ACMSP169) | ● obtaining secondary data from newspapers, the Internet and the Australian Bureau of Statistics  
● investigating secondary data relating to the distribution and use of non-renewable resources around the world |
| Construct and compare a range of data displays including stem-and-leaf plots and dot plots (ACMSP170) | ● understanding that some data representations are more appropriate than others for particular data sets, and answering questions about those data sets  
● using ordered stem-and-leaf plots to record and display numerical data collected in a class investigation, such as constructing a class plot of height in centimetres on a shared stem-and-leaf plot for which the stems 12, 13, 14, 15, 16 and 17 have been produced |
| Calculate mean, median, mode and range for sets of data. Interpret these statistics in the context of data (ACMSP171) | ● understanding that summarising data by calculating measures of centre and spread can help make sense of the data |
| Describe and interpret data displays using median, mean and range (ACMSP172) | ● using mean and median to compare data sets and explaining how outliers may affect the comparison  
● locating mean, median and range on graphs and connecting them to real life |
Year 7 Achievement Standard

By the end of Year 7, students solve problems involving the comparison, addition and subtraction of integers. They make the connections between whole numbers and index notation and the relationship between perfect squares and square roots. They solve problems involving percentages and all four operations with fractions and decimals. They compare the cost of items to make financial decisions. Students represent numbers using variables. They connect the laws and properties for numbers to algebra. They interpret simple linear representations and model authentic information. Students describe different views of three-dimensional objects. They represent transformations in the Cartesian plane. They solve simple numerical problems involving angles formed by a transversal crossing two parallel lines. Students identify issues involving the collection of continuous data. They describe the relationship between the median and mean in data displays.

Students use fractions, decimals and percentages, and their equivalences. They express one quantity as a fraction or percentage of another. Students solve simple linear equations and evaluate algebraic expressions after numerical substitution. They assign ordered pairs to given points on the Cartesian plane. Students use formulas for the area and perimeter of rectangles and calculate volumes of rectangular prisms. Students classify triangles and quadrilaterals. They name the types of angles formed by a transversal crossing parallel line. Students determine the sample space for simple experiments with equally likely outcomes and assign probabilities to those outcomes. They calculate mean, mode, median and range for data sets. They construct stem-and-leaf plots and dot-plots.