Mathematics Sample Program: Year 6



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Contents

[Abbreviations 4](#_Toc482364031)

[Hyperlinks 4](#_Toc482364032)

[Overview 5](#_Toc482364033)

[Topics, suggested time allocations and sequencing 5](#_Toc482364034)

[Content descriptions coverage within each topic 6](#_Toc482364035)

[Achievement standards (for three levels to support planning for a continuum of learning) 8](#_Toc482364036)

[Learning in Mathematics 10](#_Toc482364037)

[Year 6 Semester 1 11](#_Toc482364038)

[Topic 6.1.1 Types of Numbers (Prime, Composite, Square Triangular and Negative) 12](#_Toc482364040)

[Topic 6.1.2 Operating with Decimal Numbers 14](#_Toc482364041)

[Topic 6.1.3 Operations – The Four Operations 16](#_Toc482364042)

[Topic 6.1.4 Shape – Prisms, Pyramids and Angles 18](#_Toc482364043)

[Topic 6.1.5 Measurement – Time, Length, Area and Perimeter, Connecting to Decimal Numbers and Converting between Units of Measure 21](#_Toc482364044)

[Topic 6.1.6 Comparing Representations of Data 23](#_Toc482364045)

[Topic 6.1.7 Pattern and Algebra – Forming Generalisations 25](#_Toc482364046)

[Year 6 Semester 2 27](#_Toc482364047)

[Topic 6.2.1 Operating with Fractions 28](#_Toc482364049)

[Topic 6.2.2 Connecting Fractions, Decimals and Percent 30](#_Toc482364050)

[Topic 6.2.3 Pattern and Algebra – Order of Operations 32](#_Toc482364051)

[Topic 6.2.4 Shape – Transformation and Cartesian Coordinates 34](#_Toc482364052)

[Topic 6.2.5 Measurement – Converting between Metric Units for Volume and Capacity and Mass 37](#_Toc482364053)

[Topic 6.2.6 Quantifying Chance as a Fraction, Decimal and Percent 39](#_Toc482364054)

[Topic 6.2.7 Calculating Percentage Discounts 41](#_Toc482364055)

Abbreviations

ABS Australian Bureau of Statistics

AMSI Australian Mathematical Sciences Institute

CIMT Centre for Innovation in Mathematical Teaching (Plymouth, United Kingdom)

DET Department of Education and Training

ESA Educational Services Australia

NCTM National Council Teachers of Mathematics

NLVM National Library of Virtual Manipulatives

MAV Mathematical Association of Victoria

Hyperlinks

At the time of publication the URLs (website addresses) cited were checked for accuracy and appropriateness of content. However, due to the transient nature of material placed on the web, their continuing accuracy cannot be verified. Teachers are strongly advised to prepare their own indexes of sites that are suitable and applicable to the courses they teach, and to check these addresses prior to allowing student access.

Overview

This Mathematics Sample Program: Year 6 is an example of how the Mathematics curriculum could be organised into a teaching and learning program.

This sample program provides comprehensive coverage of content descriptions from the three strands of the mathematics curriculum and is sequenced to develop knowledge and skills; however, there are many other ways that the curriculum content can be arranged to suit the learning needs of students.

Topics, suggested time allocations and sequencing

|  |  |  |
| --- | --- | --- |
| **Week\*** | **Semester 1** | **Semester 2** |
| **1** | *6.1.1 Types of Numbers (prime, composite, square triangular and negative)*  Strand: Number and Algebra Sub-strand: Number and Place Value | *6.2.1 Operating with Fractions*  Strand: Number and Algebra Sub-strand: Fractions and Decimals; Patterns and Algebra |
| **2** |
| **3** | *6.1.2 Operating with decimal numbers* Strand: Number and Algebra Sub-strand: Number and Place Value |
| **4** |
| **5** | *6.1.3 Operations - The Four Operations* Strand: Number and Algebra Sub-strand: Number and Operations | *6.2.2 Connecting Fractions, Decimals and Percent*  Strand: Number and Algebra Sub-strand: Fractions and Decimals |
| **6** |
| **7** | *6.2.3 Pattern and Algebra - Order of Operations*  Strand: Number and Algebra Sub-strand: Patterns and Algebra |
| **8** |
| **9** | *6.1.4 Shape - Prisims, Pyramids and Angles*  Strand: Measurement and Geometry Sub strand: Geometric Reasoning | *6.2.4 Shape - Transforamtion and Cartesian Coordinates* Strand: Measurement and Geometry  Sub-strand: Location and Transformation |
| **10** |
| **11** | *6.1.5 Measurement - Time, Length, Area and Perimeter, connecting to Decimal Numbers and Converting between Units of Measure*  Strand: Measurement and Geometry  Sub-strand: Using Units of Measurement, Geometric Reasoning | *6.2.5 Measurement - Converting between Metric Units for Volume* and Capacity and Mass Strand: Measurement and Geometry  Sub-strand: Using Units of Measurement, Geometric Reasoning |
| **12** |
| **13** |
| **14** | *6.2.6 Quantifying Chance as a Fraction, Decimal and Percent* Strand: Statistics and Probability  Sub-strand: Chance |
| **15** | *6.1.6 Comparing Representations of Data*  Strand: Statistcs and probability  Sub-strand: Data Representation and Interpretation |
| **16** |
| **17** | *6.1.7 Pattern and Algebra - Forming Generalisations*  Strand: Number and Algebra Sub-strand: Patterns and Algebra | *6.2.7 Calculating Percentage Discounts*  Strand: Number and Algebra Sub-strand: Money and Financial Mathematics |
| **18** |

\* Based on 3 hours teaching time per week

Content descriptions coverage within each topic

|  |  |  |
| --- | --- | --- |
| **Level 6 content descriptions** | **Topic/s** | |
| **Strand: Number and Algebra** | | |
| **Sub-strand: Number and Place Value** | | |
| Identify and describe properties of prime, composite, square and triangular numbers [(VCMNA208)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA208) | 6.1.1 | |
| Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers and make estimates for these computations [(VCMNA209)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA209) | 6.1.3 | |
| Investigate everyday situations that use integers. Locate and represent these numbers on a number line [(VCMNA210)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA210) | 6.1.1 | |
| **Sub-strand: Fractions and Decimals** | | |
| Compare fractions with related denominators and locate and represent them on a number line [(VCMNA211)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA211) | 6.2.1 | |
| Solve problems involving addition and subtraction of fractions with the same or related denominators [(VCMNA212)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA212) | 6.2.1 | |
| Find a simple fraction of a quantity where the result is a whole number, with and without digital technologies [(VCMNA213)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA213) | 6.2.1 | |
| Add and subtract decimals, with and without digital technologies, and use estimation and rounding to check the reasonableness of answers [(VCMNA214)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA214) | 6.1.2 | |
| Multiply decimals by whole numbers and perform divisions by non-zero whole numbers where the results are terminating decimals, with and without digital technologies [(VCMNA215)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA215) | 6.1.2 | |
| Multiply and divide decimals by powers of 10 [(VCMNA216)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA216) | 6.1.2 | |
| Make connections between equivalent fractions, decimals and percentages [(VCMNA217)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA217) | 6.2.2 | |
| **Sub-strand: Money and Financial Mathematics** | | |
| Investigate and calculate percentage discounts of 10%, 25% and 50% on sale items, with and without digital technologies [(VCMNA218)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA218) | 6.2.7 | |
| **Sub-strand: Patterns and Algebra** | | |
| Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence [(VCMNA219)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA219) | | 6.1.7 |
| Explore the use of brackets and order of operations to write number sentences [(VCMNA220)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA220) | | 6.2.3 |
| Design algorithms involving branching and iteration to solve specific classes of mathematical problems [(VCMNA221)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA221) | | 6.2.1 |

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| **Strand: Measurement and Geometry** | |
| **Sub-strand: Using Units of Measurement** | |
| Connect decimal representations to the metric system [(VCMMG222)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG222) | 6.1.5 |
| Convert between common metric units of length, mass and capacity [(VCMMG223)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG223) | 6.1.5  6.2.5 |
| Solve problems involving the comparison of lengths and areas using appropriate units [(VCMMG224)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG224) | 6.1.5 |
| Connect volume and capacity and their units of measurement [(VCMMG225)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG225) | 6.2.5 |
| Interpret and use timetables [(VCMMG226)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG226) | 6.1.5 |
| Measure, calculate and compare elapsed time [(VCMMG227)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG227) | 6.1.5 |
| **Sub-strand: Shape** | |
| Construct simple prisms and pyramids [(VCMMG228)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG228) | 6.1.4 |
| **Sub-strand: Location and Transformation** | |
| Investigate the effect of combinations of transformations on simple and composite shapes, including creating tessellations, with and without the use of digital technologies [(VCMMG229)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG229) | 6.2.4 |
| Introduce the Cartesian coordinate system using all four quadrants [(VCMMG230)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG230) | 6.2.4 |
| Investigate, with and without digital technologies, angles on a straight line, angles at a point and vertically opposite angles. Use results to find unknown angles [(VCMMG231)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG231) | 6.1.4 |
| **Sub-strand: Geometric Reasoning** | |
| Investigate, with and without digital technologies, angles on a straight line, angles at a point and vertically opposite angles. Use results to find unknown angles [(VCMMG231)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG231) | 6.1.4 |
| **Strand: Statistics and Probability** | |
| **Sub-strand: Chance** | |
| Describe probabilities using fractions, decimals and percentages [(VCMSP232)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMSP232) | 6.2.6 |
| Conduct chance experiments with both small and large numbers of trials using appropriate digital technologies [(VCMSP233)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMSP233) | 6.2.6 |
| Compare observed frequencies across experiments with expected frequencies [(VCMSP234)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMSP234) | 6.2.6 |
| **Sub-strand: Data Representation and Interpretation** | |
| Construct, interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables [(VCMSP235)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMSP235) | 6.1.6 |
| Interpret secondary data presented in digital media and elsewhere [(VCMSP236)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMSP236) | 6.1.6 |
| Pose and refine questions to collect categorical or numerical data by observation or survey [(VCMSP237)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMSP237) |  |

Achievement standards (for three levels to support planning for a continuum of learning)

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| --- | --- | --- |
| Level 5 | Level 6 | Level 7 |
| **Number and algebra**  Students solve simple problems involving the four operations using a range of strategies including digital technology. They estimate to check the reasonableness of answers and approximate answers by rounding. Students identify and describe factors and multiples. They explain plans for simple budgets. Students order decimals and unit fractions and locate them on a number line. Students add and subtract fractions with the same denominator. They find unknown quantities in number sentences and continue patterns by adding or subtracting fractions and decimals. | **Number and algebra**  Students recognise the properties of prime, composite, square and triangular numbers and determine sets of these numbers. They solve problems that involve all four operations with whole numbers and describe the use of integers in everyday contexts. Students locate fractions and integers on a number line and connect fractions, decimals and percentages as different representations of the same number. They solve problems involving the addition and subtraction of related fractions. Students calculate a simple fraction of a quantity and calculate common percentage discounts on sale items, with and without the use of digital technology. They make connections between the powers of 10 and the multiplication and division of decimals. Students add, subtract and multiply decimals and divide decimals where the result is rational. Students write number sentences using brackets and order of operations, and specify rules used to generate sequences involving whole numbers, fractions and decimals. They use ordered pairs of integers to represent coordinates of points and locate a point in any one of the four quadrants on the Cartesian plane. | **Number and algebra**  Students solve problems involving the order, 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 all four operations with fractions, decimals, percentages and their equivalences, and express fractions in their simplest form. Students compare the cost of items to make financial decisions, with and without the use of digital technology. They make simple estimates to judge the reasonableness of results. Students use variables to represent arbitrary numbers and connect the laws and properties of number to algebra and substitute numbers into algebraic expressions. They assign ordered pairs to given points on the Cartesian plane and interpret and analyse graphs of relations from real data. Students develop simple linear models for situations, make predictions based on these models, solve related equations and check their solutions. |

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| **Measurement and geometry**  Students use appropriate units of measurement for length, area, volume, capacity and mass, and calculate perimeter and area of rectangles and volume, and capacity of rectangular prisms. They convert between 12 and 24-hour time. Students use a grid reference system to locate landmarks. They estimate angles, and use protractors and digital technology to construct and measure angles. Students connect three-dimensional objects with their two-dimensional representations. They describe transformations of two-dimensional shapes and identify line and rotational symmetry. | **Measurement and geometry**  Students relate decimals to the metric system and choose appropriate units of measurement to perform a calculation. They solve problems involving time, length and area, and make connections between capacity and volume. Students interpret a variety of everyday timetables. They solve problems using the properties of angles and investigate simple combinations of transformations in the plane, with and without the use of digital technology. Students construct simple prisms and pyramids. | **Measurement and geometry**  Students use variables to express relationships in real life data, and interpret and analyse corresponding graphs. They use pro-numerals to construct simple algebraic expressions and substitute numerical values into these. They solve simple linear equations and plot points on the Cartesian plane. Students use formulas for calculating areas of triangles, rectangles and related shapes, and volumes of cubes and rectangular prisms. They form two-dimensional representations of prisms, buildings and other structures. They use simple combinations of transformations, with and without technology, to create geometric patterns and identify line and point symmetry, apply parallel line and transversal angle properties, angles sums in triangles and quadrilaterals, classify triangles and quadrilaterals, and construct them using compass and straight edge and dynamic geometry technology. |
| **Statistics and probability**  Students pose questions to collect categorical and numerical data by observation and survey, and represent the data in a variety of ways with and without the use of technology. They describe and interpret data sets in context. Students recognise that probabilities are measured on a scale of 0 to 1 (inclusive), and represent the probability of events from simple experiments using fractions. | **Statistics and probability**  Students interpret and compare a variety of data displays, including displays for two categorical variables. They analyse and evaluate data from secondary sources. Students compare observed and expected frequencies of events, including those where outcomes of trials are generated with the use of digital technology. They specify, list and communicate probabilities of events using simple ratios, fractions, decimals and percentages. | **Statistics and probability**  Students identify issues involving the collection of discrete and continuous data from primary and secondary sources. They construct stem-and-leaf plots and dot-plots. Students identify or calculate mean, mode, median and range for data sets, using digital technology for larger data sets. They describe the relationship between the median and mean in data displays. Students determine the sample space for simple experiments with equally likely outcomes, and assign probabilities outcomes. |

Learning in Mathematics

The proficiencies of Understanding, Fluency, Problem Solving and Reasoning are fundamental to learning mathematics and working mathematically, and are applied across all three strands Number and Algebra, Measurement and Geometry, and Statistics and Probability.

Understanding refers to students building a robust knowledge of adaptable and transferable mathematical concepts and structures. Students make connections between related concepts and progressively apply the familiar to develop new ideas. They develop an understanding of the relationship between the ‘why’ and the ‘how’ of mathematics. Students build understanding when they:

* Connect related ideas
* Represent concepts in different ways
* Identify commonalities and differences between aspects of content
* Describe their thinking mathematically
* Interpret mathematical information.

Fluency describes students developing skills in choosing appropriate procedures, carrying out procedures flexibly, accurately, efficiently and appropriately, and recalling factual knowledge and concepts readily. Students are fluent when they:

* Make reasonable estimates
* Calculate answers efficiently
* Recognise robust ways of answering questions
* Choose appropriate methods and approximations
* Recall definitions and regularly use facts,
* Can manipulate expressions and equations to find solutions.

Problem solving is the ability of students to make choices, interpret, formulate, model and investigate problem situations, select and use technological functions and communicate solutions effectively. Students pose and solve problems when they:

* Use mathematics to represent unfamiliar or meaningful situations
* Design investigations and plan their approaches
* Apply their existing strategies to seek solutions
* Verify that their answers are reasonable.

Reasoning refers to students developing an increasingly sophisticated capacity for logical, statistical and probabilistic thinking and actions, such as conjecturing, hypothesising, analysing, proving, evaluating, explaining, inferring, justifying, refuting, abstracting and generalising. Students are reasoning mathematically when they:

* Explain their thinking
* Deduce and justify strategies used and conclusions reached
* Adapt the known to the unknown
* Transfer learning from one context to another
* Prove that something is true or false
* Make inferences about data or the likelihood of events
* Compare and contrast related ideas and explain their choices.

Year 6 Semester 1



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| Topic 6.1.1 Types of Numbers (Prime, Composite, Square, Triangular and Negative) | | |
| Strand:  Number and Algebra | Sub-strand:  Number and Place Value | Recommended teaching time:  2 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Identify and describe properties of prime, composite, square and triangular numbers [(VCMNA208)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA208) * Investigate everyday situations that use integers. Locate and represent these numbers on a number line [(VCMNA210)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA210) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students solve simple problems involving the four operations using a range of strategies including digital technology. They estimate to check the reasonableness of answers and approximate answers by rounding. Students identify and describe factors and multiples. They explain plans for simple budgets. Students order decimals and unit fractions and locate them on a number line. Students add and subtract fractions with the same denominator. They find unknown quantities in number sentences and continue patterns by adding or subtracting fractions and decimals. | **Students recognise the properties of prime, composite, square and triangular numbers and determine sets of these numbers. They solve problems that involve all four operations with whole numbers and describe the use of integers in everyday contexts. Students locate fractions and integers on a number line** and connect fractions, decimals and percentages as different representations of the same number. They solve problems involving the addition and subtraction of related fractions. Students calculate a simple fraction of a quantity and calculate common percentage discounts on sale items, with and without the use of digital technology. They make connections between the powers of 10 and the multiplication and division of decimals. Students add, subtract and multiply decimals and divide decimals where the result is rational. Students write number sentences using brackets and order of operations, and specify rules used to generate sequences involving whole numbers, fractions and decimals. They use ordered pairs of integers to represent coordinates of points and locate a point in any one of the four quadrants on the Cartesian plane. | Students solve problems involving the order, 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 all four operations with fractions, decimals, percentages and their equivalences, and express fractions in their simplest form. Students compare the cost of items to make financial decisions, with and without the use of digital technology. They make simple estimates to judge the reasonableness of results. Students use variables to represent arbitrary numbers and connect the laws and properties of number to algebra and substitute numbers into algebraic expressions. They assign ordered pairs to given points on the Cartesian plane and interpret and analyse graphs of relations from real data. Students develop simple linear models for situations, make predictions based on these models, solve related equations and check their solutions. |

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| **Activities** | **Proficiencies** |
| * Recognising that integers form an ordered infinite set  {…-3, -2, -1, 0, 1, 2, 3…} with no first element or last element * Solve every-day additive problems using a number line * Investigate everyday situations that use integers, such as temperatures * Use number lines to position and order integers around zero * Understand that some numbers have special properties and that these properties can be used to solve problems * Representing composite numbers as a product of their prime factors and using this form to simplify calculations by cancelling common primes * Understand that if a number is divisible by a composite number then it is also divisible by the prime factors of that number   *The set* {1, 2, 3 …} *is referred to as the set of positive integers*; *the set* {0, 1, 2, 3 …} *is referred to as the set of non-negative integers; and the set* { … -3, -2, -1} *is referred to as the set of negative integers.* | * **Understanding** the properties of prime and composite numbers, and the relationship between them * **Fluency** in applying prime number rules * **Problem solving** includes formulating and solving authentic problems using integers * **Reasoning** through explaining patterns in square numbers |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Identify and describe factors and multiples of whole numbers and use them to solve problems.   Level 7  Students who are working at this level could:   * Investigate index notation and represent whole numbers as products of powers of prime number. |

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| **Assessment ideas** |
| Students:   * Apply prime number rules (e.g. all prime numbers are greater than 1; multiples of another number cannot be a prime number) to identify all prime numbers on a 10 x 10 grid. |

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| **Resources** |
| **FUSE**  Various FUSE [activities and resources](http://fuse.education.vic.gov.au/VCAA/VCMNA208) |

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| **Notes** | | |
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| Topic 6.1.2 Operating with Decimal Numbers | | |
| Strand:  Number and Algebra | Sub-strand:  Number and Place Value | Recommended teaching time:  2 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Add and subtract decimals, with and without digital technologies, and use estimation and rounding to check the reasonableness of answers [(VCMNA214)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA214) * Multiply decimals by whole numbers and perform divisions by non-zero whole numbers where the results are terminating decimals, with and without digital technologies [(VCMNA215)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA215) * Multiply and divide decimals by powers of 10 [(VCMNA216)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA216) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students solve simple problems involving the four operations using a range of strategies including digital technology. They estimate to check the reasonableness of answers and approximate answers by rounding. Students identify and describe factors and multiples. They explain plans for simple budgets. Students order decimals and unit fractions and locate them on a number line. Students add and subtract fractions with the same denominator. They find unknown quantities in number sentences and continue patterns by adding or subtracting fractions and decimals. | Students recognise the properties of prime, composite, square and triangular numbers and determine sets of these numbers. They solve problems that involve all four operations with whole numbers and describe the use of integers in everyday contexts. Students locate fractions and integers on a number line and connect fractions, decimals and percentages as different representations of the same number. **They solve problems involving the addition and subtraction of related fractions.** Students calculate a simple fraction of a quantity and calculate common percentage discounts on sale items, with and without the use of digital technology. **They make connections between the powers of 10 and the multiplication and division of decimals. Students add, subtract and multiply decimals and divide decimals where the result is rational.** Students write number sentences using brackets and order of operations, and specify rules used to generate sequences involving whole numbers, fractions and decimals. They use ordered pairs of integers to represent coordinates of points and locate a point in any one of the four quadrants on the Cartesian plane. | Students solve problems involving the order, 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 all four operations with fractions, decimals, percentages and their equivalences, and express fractions in their simplest form. Students compare the cost of items to make financial decisions, with and without the use of digital technology. They make simple estimates to judge the reasonableness of results. Students use variables to represent arbitrary numbers and connect the laws and properties of number to algebra and substitute numbers into algebraic expressions. They assign ordered pairs to given points on the Cartesian plane and interpret and analyse graphs of relations from real data. Students develop simple linear models for situations, make predictions based on these models, solve related equations and check their solutions. |

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| **Activities** | **Proficiencies** |
| * Identify integer and non-integer parts of decimal numbers * Add, subtract, multiply and divide with decimal numbers * Estimate answers and round to the nearest whole number to check reasonableness of solutions * Multiply and divide by powers of ten and note the effect on numbers   *Note: Any equations should be set in contexts and worded problems or situations used throughout the unit to emphasise the real-world application of decimal numbers and the four operations; contexts could include distance, weight, or time.* | * **Fluency** including reading decimal numbers and knowledge of the place value chart to tenths and hundredths * **Understanding** including making connections between representations of numbers * **Problem solving** including formulating and solving authentic problems using decimal numbers * **Reasoning** including operating with decimal numbers by understanding the relative value of tenths and hundredths |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Compare, order and represent decimals.   Level 7  Students who are working at this level could:   * Round decimals to a specified number of decimal places. |

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| **Assessment ideas** |
| Students:   * Write and solve worded problems involving decimal numbers and the four operations, estimating first then calculating a solution. |

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| **Resources** |
| **FUSE**  [Decimals](http://fuse.education.vic.gov.au/?FSMF29)  **Illuminations**  [Pick-a-Path](http://illuminations.nctm.org/pickapath/)  **nRich**  [Spiralling Decimals](http://nrich.maths.org/10326) |

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| Topic 6.1.3 Operations – The Four Operations | | |
| Strand:  Number and Algebra | Sub-strand:  Number and Operations | Recommended teaching time:  4 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers and make estimates for these computations [(VCMNA209)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA209) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students solve simple problems involving the four operations using a range of strategies including digital technology. They estimate to check the reasonableness of answers and approximate answers by rounding. Students identify and describe factors and multiples. They explain plans for simple budgets. Students order decimals and unit fractions and locate them on a number line. Students add and subtract fractions with the same denominator. They find unknown quantities in number sentences and continue patterns by adding or subtracting fractions and decimals. | Students recognise the properties of prime, composite, square and triangular numbers and determine sets of these numbers. **They solve problems that involve all four operations with whole numbers** and describe the use of integers in everyday contexts. Students locate fractions and integers on a number line and connect fractions, decimals and percentages as different representations of the same number. They solve problems involving the addition and subtraction of related fractions. Students calculate a simple fraction of a quantity and calculate common percentage discounts on sale items, with and without the use of digital technology. They make connections between the powers of 10 and the multiplication and division of decimals. Students add, subtract and multiply decimals and divide decimals where the result is rational. Students write number sentences using brackets and order of operations, and specify rules used to generate sequences involving whole numbers, fractions and decimals. They use ordered pairs of integers to represent coordinates of points and locate a point in any one of the four quadrants on the Cartesian plane. | Students solve problems involving the order, 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 all four operations with fractions, decimals, percentages and their equivalences, and express fractions in their simplest form. Students compare the cost of items to make financial decisions, with and without the use of digital technology. They make simple estimates to judge the reasonableness of results. Students use variables to represent arbitrary numbers and connect the laws and properties of number to algebra and substitute numbers into algebraic expressions. They assign ordered pairs to given points on the Cartesian plane and interpret and analyse graphs of relations from real data. Students develop simple linear models for situations, make predictions based on these models, solve related equations and check their solutions. |

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| **Activities** | **Proficiencies** |
| * Add, subtract, multiply and divide with whole numbers * Solve problems using the four operations * Develop strategies for solving problems using each operation * Explain the effect of multiplying by zero or multiplying by one | * **Fluency** through the successful use of a variety of efficient mental computation strategies for arithmetic calculations. * **Understanding** using estimation strategies to check the reasonableness of the results of arithmetic calculations performed by calculator, mental or pen-and-paper methods. * **Problem solving** by recognising the appropriate operation to use in a given situation * **Reasoning** through explaining and justifying their computational and estimation strategies. |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Solve problems involving multiplication of large numbers by one- or two-digit numbers using efficient mental, written strategies and appropriate digital technologies. * Solve problems involving division by a one digit number, including those that result in a remainder.   Level 7  Students who are working at this level could:   * Compare, order, add and subtract integers. |

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| **Assessment ideas** |
| Students:   * Use a Thinkboard with one operation in each quadrant; students must solve a problem given by the teacher in each quadrant and write a situation to match the equation; they should show two ways to solve each equation. |

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| **Resources** |
| **AMSI**  [Whole Numbers with all Four Operations](http://www.amsi.org.au/ESA_middle_years/Year6/Year6_md/Year6_1a.html)  **Illuminations**  [Multiplication Stories](http://illuminations.nctm.org/Lesson.aspx?id=1703)  **nRich**  [Make 100](http://nrich.maths.org/1013) |

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| Topic 6.1.4 Shape – Prisms, Pyramids and Angles | | |
| Strand:  Measurement and Geometry | Sub-strand:  Geometric Reasoning | Recommended teaching time:  2 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Construct simple prisms and pyramids [(VCMMG228)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG228) * Investigate, with and without digital technologies, angles on a straight line, angles at a point and vertically opposite angles. Use results to find unknown angles [(VCMMG231)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG231) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students use appropriate units of measurement for length, area, volume, capacity and mass, and calculate perimeter and area of rectangles and volume, and capacity of rectangular prisms. They convert between 12 and 24-hour time. Students use a grid reference system to locate landmarks. They estimate angles, and use protractors and digital technology to construct and measure angles. Students connect three-dimensional objects with their two-dimensional representations. They describe transformations of two-dimensional shapes and identify line and rotational symmetry. | Students relate decimals to the metric system and choose appropriate units of measurement to perform a calculation. They solve problems involving time, length and area, and make connections between capacity and volume. Students interpret a variety of everyday timetables. **They solve problems using the properties of angles** and investigate simple combinations of transformations in the plane, with and without the use of digital technology. **Students construct simple prisms and pyramids.** | Students use variables to express relationships in real life data, and interpret and analyse corresponding graphs. They use pro-numerals to construct simple algebraic expressions and substitute numerical values into these. They solve simple linear equations and plot points on the Cartesian plane. Students use formulas for calculating areas of triangles, rectangles and related shapes, and volumes of cubes and rectangular prisms. They form two-dimensional representations of prisms, buildings and other structures. They use simple combinations of transformations, with and without technology, to create geometric patterns and identify line and point symmetry, apply parallel line and transversal angle properties, angles sums in triangles and quadrilaterals, classify triangles and quadrilaterals, and construct them using compass and straight edge and dynamic geometry technology. |

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| **Activities** | **Proficiencies** |
| * Describe prisms and pyramids using geometrical language, e.g. a pyramid is a 3D shape where the base is a polygon such as a square and the other faces are triangles which meet in an apex over the base; a prism is a 3D shape where the base and opposite face are the same shape. * Construct and describe prisms and pyramids * Consider the history and significance of pyramids from a range of cultural perspectives including those structures found in China, Korea and Indonesia * Identify angles within shapes * Use appropriate tools for determining angles * Identify the size of a right angle as 90° and define acute, obtuse, straight and reflex angles * Measure, estimate and compare angles in degrees and classifying angles according to their sizes * Recognise and use the two alternate conventions for naming angles * Investigate angles on a straight line, angles at a point and vertically opposite angles; use results to find unknown angles | * **Fluency** in naming the properties of 2D and 3D shapes * **Understanding** through the ability to see how geometric properties are related and how some properties are dependent on others * **Problem solving** using visualising to determine if a 2D net can be made into a 3D shape * **Reasoning** about the properties that define shapes for example, that interior angles of a triangle must add to 180 degrees |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Connect three-dimensional objects with their nets and other two-dimensional representations.   Level 7  Students who are working at this level could:   * Draw different views of prisms and solids formed from combinations of prisms. |

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| **Assessment ideas** |
| Students:   * Construct prisms and pyramids from nets, and skeletal models * Identify and construct a variety of angles using a protractor or digital technology. |

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| **Resources** |
| **FUSE**  [3D Shapes: Pyramids](http://fuse.education.vic.gov.au/?FQ27MC)  [3D Shapes: Polyhedra, Prisms, Pyramids](http://fuse.education.vic.gov.au/?82T45R)  **Illuminations**  [Geometric Solids](http://illuminations.nctm.org/Activity.aspx?id=3521) |

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| Topic 6.1.5 Measurement – Time, Length, Area and Perimeter, Connecting to Decimal Numbers and Converting between Units of Measurement | | |
| Strand:  Measurement and Geometry | Sub-strand:  Using Units of Measurement, Geometric Reasoning | Recommended teaching time:  4 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Interpret and use timetables [(VCMMG226)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG226) * Measure, calculate and compare elapsed time [(VCMMG227)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG227) * Solve problems involving the comparison of lengths and areas using appropriate units [(VCMMG224)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG224) * Convert between common metric units of length, mass and capacity [(VCMMG223)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG223) * Connect decimal representations to the metric system [(VCMMG222)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG222) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students use appropriate units of measurement for length, area, volume, capacity and mass, and calculate perimeter and area of rectangles and volume, and capacity of rectangular prisms. They convert between 12 and 24-hour time. Students use a grid reference system to locate landmarks. They estimate angles, and use protractors and digital technology to construct and measure angles. Students connect three-dimensional objects with their two-dimensional representations. They describe transformations of two-dimensional shapes and identify line and rotational symmetry. | **Students relate decimals to the metric system** and choose appropriate units of measurement to perform a calculation. **They solve problems involving time, length and area, and make connections between capacity and volume.** **Students interpret a variety of everyday timetables.** They solve problems using the properties of angles and investigate simple combinations of transformations in the plane, with and without the use of digital technology. Students construct simple prisms and pyramids. | Students use variables to express relationships in real life data, and interpret and analyse corresponding graphs. They use pro-numerals to construct simple algebraic expressions and substitute numerical values into these. They solve simple linear equations and plot points on the Cartesian plane. Students use formulas for calculating areas of triangles, rectangles and related shapes, and volumes of cubes and rectangular prisms. They form two-dimensional representations of prisms, buildings and other structures. They use simple combinations of transformations, with and without technology, to create geometric patterns and identify line and point symmetry, apply parallel line and transversal angle properties, angles sums in triangles and quadrilaterals, classify triangles and quadrilaterals, and construct them using compass and straight edge and dynamic geometry technology. |

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| **Activities** | **Proficiencies** |
| * Understand the metric system and how to convert between metric units for length, perimeter and area using knowledge of decimal numbers * Convert between units of time * Measure, calculate and compare elapsed time * Interpret and use timetables * Recognise and investigate familiar objects using concrete materials and digital technologies * Identify and use the correct operations when converting units including millimetres, centimetres, metres, kilometres, milligrams, grams, kilograms, tonnes, millilitres, litres, kilolitres and megalitres * Recognise the significance of the prefixes in units of measurement | * **Fluency** in converting between units of measure and correct use of standard tools for measuring * **Understanding** that units of measure relate to each other in a base ten system for metric units and base 60 for time * **Problem solving** about finding the area of rectangles and forming a rule or generalisation * **Reasoning** by explaining the relationship between perimeter and area |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Choose appropriate units of measurement for length, area, volume, capacity and mass. * Compare 12- and 24-hour time systems and convert between them.   Level 7  Students who are working at this level could:   * Establish the formulas for areas of rectangles and use these in problem solving. |

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| **Assessment ideas** |
| Students:   * Develop a timetable of daily activities * Plan a trip involving one or more modes of public transport; calculate elapsed time (door to door). |

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| **Resources** |
| **FUSE**  [Area Builder](http://fuse.education.vic.gov.au/?598RXC)  **Illuminations**  [Planning a Playground](http://illuminations.nctm.org/lesson.aspx?id=2771) |

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| Topic 6.1.6 Comparing Representations of Data | | |
| Strand:  Statistics and Probability | Sub-strands:  Data Representation and Interpretation | Recommended teaching time:  2 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Construct, interpret and compare a range of data displays, including side-by-side column graphs for two categorical variables [(VCMSP235)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMSP235) * Interpret secondary data presented in digital media and elsewhere [(VCMSP236)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMSP236) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students pose questions to collect categorical and numerical data by observation and survey, and represent the data in a variety of ways with and without the use of technology. They describe and interpret data sets in context. Students recognise that probabilities are measured on a scale of 0 to 1 (inclusive), and represent the probability of events from simple experiments using fractions. | **Students interpret and compare a variety of data displays, including displays for two categorical variables. They analyse and evaluate data from secondary sources.** Students compare observed and expected frequencies of events, including those where outcomes of trials are generated with the use of digital technology. They specify, list and communicate probabilities of events using simple ratios, fractions, decimals and percentages. | Students identify issues involving the collection of discrete and continuous data from primary and secondary sources. They construct stem-and-leaf plots and dot-plots. Students identify or calculate mean, mode, median and range for data sets, using digital technology for larger data sets. They describe the relationship between the median and mean in data displays. Students determine the sample space for simple experiments with equally likely outcomes, and assign probabilities outcomes. |

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| **Activities** | **Proficiencies** |
| * Interpret and compare data displays * Evaluate the best data representation of certain data * Compare different student-generated diagrams, tables and graphs, describing their similarities and differences and commenting on the usefulness of each representation for interpreting the data * Understand that data can be represented in different ways, sometimes with one symbol representing more than one piece of data, and that it is important to read all information about a representation before making judgments * Investigate data representations in the media and discuss what they illustrate and the messages the people who created them might want to convey * Identify potentially misleading data representations in the media, such as graphs with broken axes or non-linear scales, graphics not drawn to scale, data not related to the population about which the claims are made, and pie charts in which the whole pie does not represent the entire population about which the claims are made | * **Fluency** through identifying important features of graphs * **Understanding** that types of data are best represented by particular types of graphs * **Problem solving** through interpreting data from graphs and critically analysing the information they represent * **Reasoning** through comparing ways of collecting and representing data so information is as accurate as possible |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Describe and interpret different data sets in context.   Level 7  Students who are working at this level could:   * Construct and compare a range of data displays including stem-and-leaf plots and dot plots. |

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| **Assessment ideas** |
| In groups, students:   * Investigate graphical displays of data from online or print newspapers or reports, and report back to the class on:   + The features of the type of graph   + Situations when this graph type is appropriate / best   + What unit of measurement is used or implied?   + What is the highest value? The lowest value?   + What trends can you see?   + Is the data displayed this way misleading? Are there any errors which would not occur in another graph type?   + Is this a convenient way to display data?   + What are the advantages of displaying data in this type of graph? What are the disadvantages?   + Which data might be better displayed as a table or another graph type? |

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| **Resources** |
| **FUSE**  ['Choose Your Own Statistics' (ABS)](http://fuse.education.vic.gov.au/?FKY5S5)  **Department of Education and Training (NSW)**  [Data Representation (Teacher Resource)](https://education.nsw.gov.au/smart-teaching-strategies/numeracy/statistics-and-probability/data,-data-collection-and-representation,-single-variable-data-analysis/stage-4-data-representation) |

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| Topic 6.1.7 Pattern and Algebra – Forming Generalisations | | |
| Strand:  Number and Algebra | Sub-strand:  Patterns and Algebra | Recommended teaching time:  2 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Continue and create sequences involving whole numbers, fractions and decimals. Describe the rule used to create the sequence [(VCMNA219)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA219) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students solve simple problems involving the four operations using a range of strategies including digital technology. They estimate to check the reasonableness of answers and approximate answers by rounding. Students identify and describe factors and multiples. They explain plans for simple budgets. Students order decimals and unit fractions and locate them on a number line. Students add and subtract fractions with the same denominator. They find unknown quantities in number sentences and continue patterns by adding or subtracting fractions and decimals. | Students recognise the properties of prime, composite, square and triangular numbers and determine sets of these numbers. They solve problems that involve all four operations with whole numbers and describe the use of integers in everyday contexts. Students locate fractions and integers on a number line and connect fractions, decimals and percentages as different representations of the same number. They solve problems involving the addition and subtraction of related fractions. Students calculate a simple fraction of a quantity and calculate common percentage discounts on sale items, with and without the use of digital technology. They make connections between the powers of 10 and the multiplication and division of decimals. Students add, subtract and multiply decimals and divide decimals where the result is rational. Students write number sentences using brackets and order of operations, and **specify rules used to generate sequences involving whole numbers, fractions and decimals.** They use ordered pairs of integers to represent coordinates of points and locate a point in any one of the four quadrants on the Cartesian plane. | Students solve problems involving the order, 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 all four operations with fractions, decimals, percentages and their equivalences, and express fractions in their simplest form. Students compare the cost of items to make financial decisions, with and without the use of digital technology. They make simple estimates to judge the reasonableness of results. Students use variables to represent arbitrary numbers and connect the laws and properties of number to algebra and substitute numbers into algebraic expressions. They assign ordered pairs to given points on the Cartesian plane and interpret and analyse graphs of relations from real data. Students develop simple linear models for situations, make predictions based on these models, solve related equations and check their solutions. |

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| **Activities** | **Proficiencies** |
| * Continuing and creating patterns with whole numbers, decimals and fractions and describing the pattern * Identify and generalise number patterns * Investigate additive and multiplicative patterns such as the number of tiles in a geometric pattern, or the number of dots or other shapes in successive repeats of a strip or border pattern looking for patterns in the way the numbers increase/decrease | * **Fluency** through recognising the unit of repeat in a number pattern * **Understanding** how rules can be used to create sequences * **Problem solving** about the relationships between addition and subtraction to find unknown terms * **Reasoning** through explaining forming generalisations about patterns |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Describe, continue and create patterns with fractions, decimals and whole numbers resulting from addition and subtraction.   Level 7  Students who are working at this level could:   * Design and implement mathematical algorithms using a simple general purpose programming language. |

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| **Assessment ideas** |
| Students   * Continue and create patterns with whole numbers, decimals and fractions and explain the ‘rule’ for the pattern. |

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| **Resources** |
| **FUSE**  [Various FUSE Activities](http://fuse.education.vic.gov.au/VCAA/VCMNA219)  **nRich**  [Patterns in Number Sequences](http://nrich.maths.org/8520) (Various Activities) |

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Year 6 Semester 2



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| Topic 6.2.1 Operating with Fractions | | |
| Strand:  Number and Algebra | Sub-strand:  Fractions and Decimals; Patterns and Algebra | Recommended teaching time:  4 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Compare fractions with related denominators and locate and represent them on a number line [(VCMNA211)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA211) * Solve problems involving addition and subtraction of fractions with the same or related denominators [(VCMNA212)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA212) * Find a simple fraction of a quantity where the result is a whole number, with and without digital technologies [(VCMNA213)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA213) * Design algorithms involving branching and iteration to solve specific classes of mathematical problems [(VCMNA221)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA221) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students solve simple problems involving the four operations using a range of strategies including digital technology. They estimate to check the reasonableness of answers and approximate answers by rounding. Students identify and describe factors and multiples. They explain plans for simple budgets. Students order decimals and unit fractions and locate them on a number line. Students add and subtract fractions with the same denominator. They find unknown quantities in number sentences and continue patterns by adding or subtracting fractions and decimals. | Students recognise the properties of prime, composite, square and triangular numbers and determine sets of these numbers. They solve problems that involve all four operations with whole numbers and describe the use of integers in everyday contexts. **Students locate fractions** and integers **on a number line and connect fractions, decimals and percentages as different representations of the same number. They solve problems involving the addition and subtraction of related fractions. Students calculate a simple fraction of a quantity** and calculate common percentage discounts on sale items, **with and without the use of digital technology.** They make connections between the powers of 10 and the multiplication and division of decimals. Students add, subtract and multiply decimals and divide decimals where the result is rational. Students write number sentences using brackets and order of operations, and specify rules used to generate sequences involving whole numbers, fractions and decimals. They use ordered pairs of integers to represent coordinates of points and locate a point in any one of the four quadrants on the Cartesian plane. | Students solve problems involving the order, 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 all four operations with fractions, decimals, percentages and their equivalences, and express fractions in their simplest form. Students compare the cost of items to make financial decisions, with and without the use of digital technology. They make simple estimates to judge the reasonableness of results. Students use variables to represent arbitrary numbers and connect the laws and properties of number to algebra and substitute numbers into algebraic expressions. They assign ordered pairs to given points on the Cartesian plane and interpret and analyse graphs of relations from real data. Students develop simple linear models for situations, make predictions based on these models, solve related equations and check their solutions. |

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| **Activities** | **Proficiencies** |
| * Ordering fractions on number lines * Adding and subtracting fractions with the same denominator and then with related denominators, e.g. ¼ + ½ * Fractions are operators where students find the fraction of a group of items, e.g. ½ of 12, ¼ of 12 and 1/3 of 12 * Understand the processes for adding and subtracting fractions with related denominators and fractions as an operator, in preparation for calculating with all fractions * Model and solve additive problems involving fractions by using methods such as jumps on a number line * Devise flowcharts to represent algorithms for adding two fractions | * **Understanding** that different fractions have different positions along a number line *in relation to* other numbers, and that their position also represents a *distance* along a number line. * **Fluency** in ordering fractions with the same or related denominators * **Problem solving** using a rectangular array to seek solutions to real problems involving fractions * **Reasoning** through explaining how and why fractions with the same or related denominators can be added or subtracted |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Compare and order common unit fractions and locate and represent them on a number line.   Level 7  Students who are working at this level could:   * Compare fractions using equivalence * Locate and represent positive and negative fractions and mixed numbers on a number line. |

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| **Assessment ideas** |
| Students:   * Demonstrate equivalence between fractions using drawings and models. |

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| **Resources** |
| **FUSE**  [Fraction Matcher](http://fuse.education.vic.gov.au/?TKGS2J)  A further range of FUSE [activities and resources](http://fuse.education.vic.gov.au/VCAA/VCMNA211)  **Illuminations**  [Fractional Clothesline](http://illuminations.nctm.org/Lesson.aspx?id=2867) |

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| Topic 6.2.2 Connecting Fractions, Decimals and Percent | | |
| Strand:  Number and Algebra | Sub-strands:  Fractions and Decimals | Recommended teaching time:  2 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Make connections between equivalent fractions, decimals and percentages [(VCMNA217)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA217) | | |
| Level 5 | **Level 6** | Level 7 |
| Students solve simple problems involving the four operations using a range of strategies including digital technology. They estimate to check the reasonableness of answers and approximate answers by rounding. Students identify and describe factors and multiples. They explain plans for simple budgets. Students order decimals and unit fractions and locate them on a number line. Students add and subtract fractions with the same denominator. They find unknown quantities in number sentences and continue patterns by adding or subtracting fractions and decimals. | Students recognise the properties of prime, composite, square and triangular numbers and determine sets of these numbers. They solve problems that involve all four operations with whole numbers and describe the use of integers in everyday contexts. Students locate fractions and integers on a number line and **connect fractions, decimals and percentages as different representations of the same number.** They solve problems involving the addition and subtraction of related fractions. Students calculate a simple fraction of a quantity and calculate common percentage discounts on sale items, with and without the use of digital technology. They make connections between the powers of 10 and the multiplication and division of decimals. Students add, subtract and multiply decimals and divide decimals where the result is rational. Students write number sentences using brackets and order of operations, and specify rules used to generate sequences involving whole numbers, fractions and decimals. They use ordered pairs of integers to represent coordinates of points and locate a point in any one of the four quadrants on the Cartesian plane. | Students solve problems involving the order, 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 all four operations with fractions, decimals, percentages and their equivalences, and express fractions in their simplest form. Students compare the cost of items to make financial decisions, with and without the use of digital technology. They make simple estimates to judge the reasonableness of results. Students use variables to represent arbitrary numbers and connect the laws and properties of number to algebra and substitute numbers into algebraic expressions. They assign ordered pairs to given points on the Cartesian plane and interpret and analyse graphs of relations from real data. Students develop simple linear models for situations, make predictions based on these models, solve related equations and check their solutions. |

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| **Activities** | **Proficiencies** |
| * Connect fractions, decimals and percentages as different representations of the same number * Move fluently between representations and choose the appropriate one for the problem being solved * Using representations to illustrate that the same number can be shown in these different ways for example a 100-square grid (percent and hundredths) which can be folded into halves or quarters | * **Understanding** the different uses of percentages: to represent fractions, to compare numbers and to show increases and decreases * **Fluency** in moving between different representations of the same number * **Problem solving** by investigating why you can tell if a fraction will convert to a terminating or recurring decimal * **Reasoning** through describing the connections between representations of numbers |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Compare, order and represent decimals.   Level 7  Students who are working at this level could:   * Connect fractions, decimals and percentages and carry out simple conversions. |

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| **Assessment ideas** |
| Students:   * Make a set of dominoes using fraction, decimal numbers and percent written as numbers, in words and as representations; they justify how their dominoes match, e.g. the “1/2” matches 50% because 50 out of 100 is half of 100. |

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| **Resources** |
| **FUSE**  [Design Your Own School](http://fuse.education.vic.gov.au/?T755RN)  **AMSI**  [Decimals and Percentages](http://www.amsi.org.au/teacher_modules/decimals_and_percentages.html)  **NZ Maths**  [Fraction, Decimals, Percentages Dominoes](http://www.nzmaths.co.nz/content/fraction-decimals-percentages-dominoes)  **Illuminations**  [A Meter of Candy](http://illuminations.nctm.org/lesson.aspx?id=3229) |

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| Topic 6.2.3 Pattern and Algebra – Order of Operations | | |
| Strand:  Number and Algebra | Sub-strand:  Patterns and Algebra | Recommended teaching time:  2 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Explore the use of brackets and order of operations to write number sentences [(VCMNA220)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA220) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students solve simple problems involving the four operations using a range of strategies including digital technology. They estimate to check the reasonableness of answers and approximate answers by rounding. Students identify and describe factors and multiples. They explain plans for simple budgets. Students order decimals and unit fractions and locate them on a number line. Students add and subtract fractions with the same denominator. They find unknown quantities in number sentences and continue patterns by adding or subtracting fractions and decimals. | Students recognise the properties of prime, composite, square and triangular numbers and determine sets of these numbers. They solve problems that involve all four operations with whole numbers and describe the use of integers in everyday contexts. Students locate fractions and integers on a number line and connect fractions, decimals and percentages as different representations of the same number. They solve problems involving the addition and subtraction of related fractions. Students calculate a simple fraction of a quantity and calculate common percentage discounts on sale items, with and without the use of digital technology. They make connections between the powers of 10 and the multiplication and division of decimals. Students add, subtract and multiply decimals and divide decimals where the result is rational. **Students write number sentences using brackets and order of operations**, and specify rules used to generate sequences involving whole numbers, fractions and decimals. They use ordered pairs of integers to represent coordinates of points and locate a point in any one of the four quadrants on the Cartesian plane. | Students solve problems involving the order, 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 all four operations with fractions, decimals, percentages and their equivalences, and express fractions in their simplest form. Students compare the cost of items to make financial decisions, with and without the use of digital technology. They make simple estimates to judge the reasonableness of results. Students use variables to represent arbitrary numbers and connect the laws and properties of number to algebra and substitute numbers into algebraic expressions. They assign ordered pairs to given points on the Cartesian plane and interpret and analyse graphs of relations from real data. Students develop simple linear models for situations, make predictions based on these models, solve related equations and check their solutions. |

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| **Activities** | **Proficiencies** |
| * Recognise the order that operations are completed has a specific sequence to ensure the same solution is reached * Recognise that brackets are a way to show which part of an equation to do first * Appreciate the need for rules to complete multiple operations within the same number sentence | * **Fluency** through using brackets appropriately * **Understanding** in describing a rationale for the order of operations * **Problem solving** through solving problems using order of operations * **Reasoning** through explaining the need for order of operations |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Use equivalent number sentences involving multiplication and division to find unknown quantities.   Level 7  Students who are working at this level could:   * Identify order of operations in contextualised problems, preserving the order by inserting brackets in numerical expressions, then recognising how order is preserved by convention. |

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| **Assessment ideas** |
| Students:   * Are given a set of four or five numbers, and must student must arrange these using the four operations and brackets as many ways as they can to get different answers, e.g. 1,2,3 and 4 could be 2 x 3 + 1 - 4 = 3 OR 2 x (3 + 1) -4 = 4 |

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| **Resources** |
| **FUSE**  [Order of Operations (1)](http://fuse.education.vic.gov.au/?D2DTTX)  [Order of Operations (2)](http://fuse.education.vic.gov.au/?8KWYX7)  **Department of Education and Training (Victoria)**  [Order of Operations](http://www.education.vic.gov.au/school/teachers/teachingresources/discipline/maths/continuum/Pages/orderofops325.aspx)  **Illuminations**  [Order of Operations Bingo](http://illuminations.nctm.org/lesson.aspx?id=2583) |

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| Topic 6.2.4 Shape – Transformation and Cartesian Coordinates | | |
| Strand:  Measurement and Geometry | Sub-strand:  Location and Transformation | Recommended teaching time:  2 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Investigate the effect of combinations of transformations on simple and composite shapes, including creating tessellations, with and without the use of digital technologies [(VCMMG229)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG229) * Introduce the Cartesian coordinate system using all four quadrants [(VCMMG230)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG230) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students use appropriate units of measurement for length, area, volume, capacity and mass, and calculate perimeter and area of rectangles and volume, and capacity of rectangular prisms. They convert between 12 and 24-hour time. Students use a grid reference system to locate landmarks. They estimate angles, and use protractors and digital technology to construct and measure angles. Students connect three-dimensional objects with their two-dimensional representations. They describe transformations of two-dimensional shapes and identify line and rotational symmetry. | Students relate decimals to the metric system and choose appropriate units of measurement to perform a calculation. They solve problems involving time, length and area, and make connections between capacity and volume. Students interpret a variety of everyday timetables. They solve problems using the properties of angles and **investigate simple combinations of transformations in the plane, with and without the use of digital technology.** Students construct simple prisms and pyramids. | Students use variables to express relationships in real life data, and interpret and analyse corresponding graphs. They use pro-numerals to construct simple algebraic expressions and substitute numerical values into these. They solve simple linear equations and plot points on the Cartesian plane. Students use formulas for calculating areas of triangles, rectangles and related shapes, and volumes of cubes and rectangular prisms. They form two-dimensional representations of prisms, buildings and other structures. They use simple combinations of transformations, with and without technology, to create geometric patterns and identify line and point symmetry, apply parallel line and transversal angle properties, angles sums in triangles and quadrilaterals, classify triangles and quadrilaterals, and construct them using compass and straight edge and dynamic geometry technology. |

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| **Activities** | **Proficiencies** |
| * Visualising the effect of translations, rotations and rotations * Using digital technology to manipulate objects * Understand which attributes of a shape remain the same or change under the effects of transformations such as size, shape or orientation * Create tessellations with simple shapes or simple composite shapes * Understanding that the Cartesian plane provides a graphical or visual way of describing location | * **Fluency** in using the correct terms of transformations * **Understanding** through describing the effect of each form of transformation * **Problem solving** through visualising the effect of transformations * **Reasoning** by explaining the transformation of one shape into another |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Describe translations, reflections and rotations of two-dimensional shapes. Identify line and rotational symmetries.   Level 7  Students who are working at this level could:   * Describe translations, reflections in an axis, and rotations of multiples of 90° on the Cartesian plane using coordinates * Identify line and rotational symmetries. |

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| **Assessment ideas** |
| Students   * Create a game that uses points plotted on a Cartesian plane; the game could be a 'find hidden objects' type of game similar to 'battleships'. |

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| **Resources** |
| **FUSE**  [Location](http://fuse.education.vic.gov.au/?PP9SLH)  [Shape Sorter: Modify Tool](http://fuse.education.vic.gov.au/?DF83DH) |

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| Topic 6.2.5 Measurement – Converting between Metric Units for Volume and Capacity and Mass | | |
| Strand:  Measurement and Geometry | Sub-strand:  Using Units of Measurement, Geometric Reasoning | Recommended teaching time: 4 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Convert between common metric units of length, mass and capacity [(VCMMG223)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG223) * Connect volume and capacity and their units of measurement [(VCMMG225)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMMG225) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students use appropriate units of measurement for length, area, volume, capacity and mass, and calculate perimeter and area of rectangles and volume, and capacity of rectangular prisms. They convert between 12 and 24-hour time. Students use a grid reference system to locate landmarks. They estimate angles, and use protractors and digital technology to construct and measure angles. Students connect three-dimensional objects with their two-dimensional representations. They describe transformations of two-dimensional shapes and identify line and rotational symmetry. | Students relate decimals to the metric system and **choose appropriate units of measurement to perform a calculation.** They solve problems involving time, length and area, and **make connections between capacity and volume.** Students interpret a variety of everyday timetables. They solve problems using the properties of angles and investigate simple combinations of transformations in the plane, with and without the use of digital technology. Students construct simple prisms and pyramids. | Students use variables to express relationships in real life data, and interpret and analyse corresponding graphs. They use pro-numerals to construct simple algebraic expressions and substitute numerical values into these. They solve simple linear equations and plot points on the Cartesian plane. Students use formulas for calculating areas of triangles, rectangles and related shapes, and volumes of cubes and rectangular prisms. They form two-dimensional representations of prisms, buildings and other structures. They use simple combinations of transformations, with and without technology, to create geometric patterns and identify line and point symmetry, apply parallel line and transversal angle properties, angles sums in triangles and quadrilaterals, classify triangles and quadrilaterals, and construct them using compass and straight edge and dynamic geometry technology. |

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| **Activities** | **Proficiencies** |
| * Explore metric units for volume, capacity and mass * Convert between metric units of mass and capacity * Connect volume and capacity and the units of measure, e.g. one cubic centimetre is one millilitre and a litre is one thousand cubic centimetres * Identify and use the correct operations when converting units including millimetres, centimetres, metres, kilometres, milligrams, grams, kilograms, tonnes, millilitres, litres, kilolitres and megalitres * Recognise the significance of the prefixes in units of measurement | * **Fluency** including measuring using metric units * **Understanding** through making reasonable estimations with metric units * **Problem solving** including formulating and solving authentic problems using measurements, * **Reasoning** through explaining how metric units relate to each other |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Choose appropriate units of measurement for length, area, volume, capacity and mass.   Level 7  Students who are working at this level could:   * Understand and use cubic units when interpreting and finding volumes of cubes and rectangular prisms. |

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| **Assessment ideas** |
| Students:   * Create a container with a given volume and capacity to hold a given mass, e.g. one kilogram, and give the dimensions must be given in various ways, e.g. as millilitres and litres, kilograms and grams, etc. |

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| **Resources** |
| **FUSE**  [Converting Between Measurement Units: Mathematics Continuum](https://fuse.education.vic.gov.au/Resource/LandingPage?ObjectId=3bf2509d-6c47-4675-8edc-eb2cd0880dca&SearchScope=Teacher)  [The Metrix: Metric Table](http://fuse.education.vic.gov.au/?5UCFKY) |

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| Topic 6.2.6 Quantifying Chance as a Fraction, Decimal and Percent | | |
| Strand:  Statistics and Probability | Sub-strand:  Chance | Recommended teaching time:  3 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Describe probabilities using fractions, decimals and percentages [(VCMSP232)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMSP232) * Conduct chance experiments with both small and large numbers of trials using appropriate digital technologies [(VCMSP233)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMSP233) * Compare observed frequencies across experiments with expected frequencies [(VCMSP234)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMSP234) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students pose questions to collect categorical and numerical data by observation and survey, and represent the data in a variety of ways with and without the use of technology. They describe and interpret data sets in context. Students recognise that probabilities are measured on a scale of 0 to 1 (inclusive), and represent the probability of events from simple experiments using fractions. | Students interpret and compare a variety of data displays, including displays for two categorical variables. They analyse and evaluate data from secondary sources. **Students compare observed and expected frequencies of events, including those where outcomes of trials are generated with the use of digital technology. They specify, list and communicate probabilities of events using simple ratios, fractions, decimals and percentages.** | Students identify issues involving the collection of discrete and continuous data from primary and secondary sources. They construct stem-and-leaf plots and dot-plots. Students identify or calculate mean, mode, median and range for data sets, using digital technology for larger data sets. They describe the relationship between the median and mean in data displays. Students determine the sample space for simple experiments with equally likely outcomes, and assign probabilities outcomes. |

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| **Activities** | **Proficiencies** |
| * Quantify chance using fractions, decimals and percent * Conduct chance experiments including using digital technologies * Predict likely outcomes and then comparing these predictions to surprising results | * **Understanding** that probability ranges from 0 to 1 and that fractions, decimals and percentages can be used to describe them * **Fluency** in quantify chance using fractions, decimals and percent * **Problem solving** by investigating rainfall predictions (% chance) with observed rainfall for a selected suburb * **Reasoning** why observed frequencies across experiments don’t always match with expected frequencies |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Recognise that probabilities range from 0 to 1.   Level 7  Students who are working at this level could:   * Assign probabilities to the outcomes of events and determine probabilities for events. |

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| **Assessment ideas** |
| Students:   * Investigate games of chance popular in different cultures. |

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| **Resources** |
| **FUSE**  [Probability of Rolling a Six](http://fuse.education.vic.gov.au/?Q5457N)  [Winner with a Spinner](http://fuse.education.vic.gov.au/?TF2DDJ) |

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| Topic 6.2.7 Calculating Percentage Discounts | | |
| Strand:  Number and Algebra | Sub-strand:  Money and Financial Mathematics | Recommended teaching time:  2 weeks |

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| **Mapping to F–10 curriculum in Victoria** | | |
| **Content descriptions** | | |
| * Investigate and calculate percentage discounts of 10%, 25% and 50% on sale items, with and without digital technologies [(VCMNA218)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCMNA218) | | |
| **Achievement standard (excerpt in bold)** | | |
| Level 5 | **Level 6** | Level 7 |
| Students solve simple problems involving the four operations using a range of strategies including digital technology. They estimate to check the reasonableness of answers and approximate answers by rounding. Students identify and describe factors and multiples. They explain plans for simple budgets. Students order decimals and unit fractions and locate them on a number line. Students add and subtract fractions with the same denominator. They find unknown quantities in number sentences and continue patterns by adding or subtracting fractions and decimals. | Students recognise the properties of prime, composite, square and triangular numbers and determine sets of these numbers. They solve problems that involve all four operations with whole numbers and describe the use of integers in everyday contexts. Students locate fractions and integers on a number line and connect fractions, decimals and percentages as different representations of the same number. They solve problems involving the addition and subtraction of related fractions. Students calculate a simple fraction of a quantity and **calculate common percentage discounts on sale items, with and without the use of digital technology.** They make connections between the powers of 10 and the multiplication and division of decimals. Students add, subtract and multiply decimals and divide decimals where the result is rational. Students write number sentences using brackets and order of operations, and specify rules used to generate sequences involving whole numbers, fractions and decimals. They use ordered pairs of integers to represent coordinates of points and locate a point in any one of the four quadrants on the Cartesian plane. | Students solve problems involving the order, 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 all four operations with fractions, decimals, percentages and their equivalences, and express fractions in their simplest form. Students compare the cost of items to make financial decisions, with and without the use of digital technology. They make simple estimates to judge the reasonableness of results. Students use variables to represent arbitrary numbers and connect the laws and properties of number to algebra and substitute numbers into algebraic expressions. They assign ordered pairs to given points on the Cartesian plane and interpret and analyse graphs of relations from real data. Students develop simple linear models for situations, make predictions based on these models, solve related equations and check their solutions. |

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| **Activities** | **Proficiencies** |
| * Calculate discounts to find price of goods * Using digital technology where appropriate to calculate percentage off | * **Fluency** through calculating simple percentages * **Understanding** percentage off using rounding and estimating * **Problem solving** through formulating and solving authentic problems using percentage * **Reasoning** through explaining how to calculate percentage off given amounts |

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| **Considering different levels** |
| Level 5  Students who are working at this level could:   * Identifying the GST component of invoices and receipts.   Level 7  Students who are working at this level could:   * Investigate and calculate 'best buys', with and without digital technologies. |

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| **Assessment ideas** |
| Students:   * Are given a ‘catalogue’ of goods with various percentages off stickers, and must calculate the actual price for items. |

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| **Resources** |
| **FUSE**  [Super Cyril's Circus Supplies](http://fuse.education.vic.gov.au/?T5TNXM)  **AMSI**  [Percentage Discounts](http://amsi.org.au/ESA_middle_years/Year6/Year6_md/Year6_1e.html) |

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