Numbers Up! Volcanic Panic

Correlation with the
Victorian Essential Learning Standards

Level 1

Learning focus

As students work towards the achievement of Level 1 standards in Mathematics, they manipulate and play with objects to develop links between the simulated environment, their experiences, everyday language and mathematical activity.

In *Number*, students manipulate and group objects to develop basic understanding of the concepts of number and numerals. They group objects into sets (collections) and form simple correspondences (relations) between two sets; for example, in sharing apples among children. They learn to count a number of objects (up to 2-digit numbers) and relate the number counted to the use of numerals. They describe and place objects in order such as first, second and third. They model addition by putting groups of objects together and counting the combined set and they model subtraction by moving apart groups of objects.

When *Working mathematically*, students create and explore number patterns using numerals and objects onscreen.

Standards

Number

At Level 1, students form small sets of objects (up to 2-digit numbers). They count the size of small sets. They use one-to-one correspondence to identify when two sets are equal in size and when one set is larger than another. They form collections of sets of equal size. They use ordinal numbers to describe the position of elements in a set from first to tenth. They use materials to model addition and subtraction by the aggregation (grouping together) and disaggregation (moving apart) of objects. They add and subtract by counting forward and backward with 2-digit numbers.

Working mathematically

At Level 1, students use visual resources to investigate mathematical and real life situations. They explore patterns in number.

They test simple conjectures such as 'nine is four more than five'. They check incorrect work with respect to computations and constructions in *Number* through the use of second attempts at questions.

Level 2

Learning focus

As students work towards the achievement of Level 2 standards in Mathematics, they begin to use mathematical symbols and language in a variety of mathematical explorations.

In *Number*, students learn to use virtual base 10 models (units, longs, flats and cubes) and arrays to identify, order and model the counting numbers up to 1000. They identify number patterns. They use models and arrays to support the development of skip counting. They recognise patterns created by skip counting (for example, when counting by fours, the pattern of the ones digits is 4, 8, 2, 6, 0, 4, 8). Students perform simple addition (count on) and subtraction (count back) using numbers up to 3-digits. They use equal groups of objects and rectangular arrays to model multiplication and equal sharing for division. Students divide geometric objects including arrays and regular shapes into equal parts to develop the concept of a simple fraction as part of a whole. They have opportunity to form different totals using dollars and cents, and carry out simple calculations such as change from small amounts.

When *Working mathematically*, students learn to use a combination of everyday language and mathematical statements and symbols that describe the manipulation of sets of numbers, objects and patterns. They use and explore models of familiar and imaginative events.

Students test the truth of conjectures by attempting to find examples or counter-examples.

They develop and consolidate their understanding of the commutative and associative properties for addition and multiplication.

Standards

Number

At Level 2, students model the place value of the natural numbers up to 3-digits. They order numbers and count by 1s, 10s and 100s. Students identify multiples of 2, 4 and 5. They form patterns and sets of numbers based on simple criteria such as odd and even numbers. They carry out simple money calculations. They identify simple fractions such as one half, one third and one quarter in terms of equal sized parts of a whole object, such as a quarter of a pizza, and subsets such as half of a set of 20 coloured pencils. They add and subtract one- and two-digit numbers by counting on and counting back. They mentally compute simple addition and subtraction calculations involving two- or three-digit natural

numbers. They describe and calculate simple multiplication as repeated addition, such as 3 x 5 = 5 + 5 + 5; and division as sharing, such as 8 shared between 4. They have opportunity to use commutative and associative properties of addition and multiplication in mental computation (for example, 3 + 4 = 4 + 3 and 3 + 4 + 5 can be done as 7 + 5 or 3 + 9).

Working mathematically

At Level 2, students make and test simple conjectures.

Level 3

Learning focus

As students work towards the achievement of Level 3 standards in Mathematics, they recognise and explore patterns in numbers. They increasingly use mathematical terms and symbols to describe computation.

In *Number*, students explore place value and order of numbers to tens of thousands. They skip count to create number patterns. They use onscreen resources to develop concepts of decimals to hundredths. They develop concepts of equivalent fractions and compare fraction sizes. They apply number skills to everyday contexts such as shopping. They extend addition and subtraction computations to three digit numbers. They learn to multiply and divide by 2-digit numbers and some decimals.

In *Structure*, students use structured questions to develop ideas about multiplication by replication and division by sharing. They recognise the possibility of remainders when dividing. They investigate the distributive property to develop methods of multiplication and division by whole numbers. They learn to use and describe simple algorithms for computations. They use simple rules to generate number patterns (for example, 'the next term in the sequence is two more than the previous term'). They create and complete number sentences using whole numbers, decimals and fractions.

When *Working mathematically*, students use mathematical symbols (for example, brackets, division and inequality, the words *and, or* and *not*). Students develop and test ideas (conjectures) across the content of mathematical experience.

Students learn to recognise practical applications of mathematics in daily life, including shopping and travel. They identify the mathematical nature of problems for investigation. They choose and use learned facts, procedures and strategies to find solutions.

Standards

Number

At Level 3, students use place value (as the idea that 'ten of these is one of those') to determine the size and order of whole numbers to tens of thousands, and decimals to hundredths. They round numbers up and down to the nearest unit, ten, hundred, or thousand. They develop fraction notation and compare simple common fractions such as 3/4 > 2/3. They skip count forwards and backwards, from various starting points using multiples of 2, 3, 4, 5, 10 and 100.

They estimate the results of computations and recognise. They compute with numbers up to 30 using all four operations.

They explore:
- whole number problems of addition and subtraction involving numbers up to four digits.
- multiplication by single digits (using recall of multiplication tables) and multiples and powers of ten (for example, 5 x 100, 5 x 70).
- division by a single-digit divisor (based on inverse relations in multiplication tables).

They devise and use algorithms for the addition and subtraction of numbers to two decimal places, including situations involving money.

Structure

At Level 3, students recognise that the sharing of a collection into equal-sized parts (division) frequently leaves a remainder. They investigate sequences of decimal numbers generated using multiplication or division by 10. They understand the meaning of the '=' in mathematical statements (for example, to indicate either the result of a computation or equivalence). They use number properties in combination to facilitate computations (for example, 7 + 10 + 13 = 10 + 7 + 13 = 10 + 20). They multiply using the distributive property of multiplication over addition (for example, 13 x 5 = (10 + 3) x 5 = 10 x 5 + 3 x 5). They solve number sentences with missing numbers.

Working mathematically

At Level 3, students apply number skills to everyday contexts such as shopping and travel. They recognise the mathematical structure of problems and use appropriate strategies (for example, recognition of sameness, difference and repetition) to find solutions.

Students test the truth of mathematical statements and generalisations. For example, in:
- computations (whether products will be odd or even, the patterns of remainders from division)
- number patterns (the patterns of ones digits of multiples, terminating or repeating decimals resulting from division)

Level 4

Learning focus

As students work towards the achievement of Level 4 standards in Mathematics, they use correct mathematical terms, symbols and notations. They use mathematical procedures to construct and test conjectures or hypotheses.

In *Number*, students extend their understanding of whole numbers, fractions and decimals. They use patterns and arrays to develop understanding of multiples (including lowest common multiple), factors (including highest common factor), and prime numbers. They recognise and use simple powers (for example, $2^3 = 8$).

Students investigate and use equivalent forms of common fractions. They order fractions and decimals. They explore ideas of ratio (as a comparison) and percentage (comparing to 100). They explore decimals, ratios and percentages as equivalent forms of fractions (for example, $1/2 = 0.5 = 50\% = 1:2$).

Students select and use mental and written methods (algorithms) to add, subtract, multiply and divide whole numbers. For division they recognise remainders as common fractions or decimals. They use mental and written methods to add and subtract decimals. They develop in their understanding of multiplication and division of decimals and simple common fractions.

In *Structure*, students select and use algorithms involving words, diagrams and mathematical symbols (for example, for testing the divisibility of a number).

Students create number sequences by computing the next term from the previous term or terms (recursion). They develop function rules for the terms in sequences based on their position in the sequence.

Students recognise that the 'identity' for each operation has no effect: the number 0 for addition and subtraction, and 1 for multiplication and division.

When *Working mathematically*, students select and test conjectures and generalisations about numbers and mathematical structure.

Students identify and investigate real life and practical applications of mathematics. They solve mathematical problems using a range of strategies (for example, find a pattern, work backwards). They solve new problems based on familiar problem structures.

Standards

Number

At Level 4, students comprehend the size and order of small numbers (to thousandths) and large numbers (to millions). They model integers (positive and negative whole numbers and zero), common fractions and decimals. They create sets of number multiples to find the lowest common multiple of the numbers.

Students identify square and prime numbers. They create factor sets and identify the highest common factor of two or more numbers. They recognise and calculate simple powers of whole numbers (for example, $2^3 = 8$).

Students use decimals, ratios and percentages to find equivalent representations of common fractions (for example, $3/4 = 9/12 = 0.75 = 75\% = 3:4 = 6:8$). They use mental and written algorithms for the addition, subtraction, multiplication and division of natural numbers (positive whole numbers). They add, subtract, and multiply fractions and decimals and apply these operations in practical contexts, including the use of money.

Structure

At Level 4 students form and specify sets of numbers and objects according to given criteria and conditions (for example, 6, 12, 18, 24 are the even numbers less than 30 that are also multiples of three).

Students construct and use rules for sequences based on the previous term, recursion (for example, the next term is three times the last term plus two), and by formula (for example, a term is three times its position in the sequence plus two).

Students establish equivalence relationships between mathematical expressions using properties such as the distributive property for multiplication over addition (for example, 3 x 26 = 3 x (20 + 6)).

Students recognise that addition and subtraction, and multiplication and division are inverse operations. They solve equations by trial and error through the use of second attempts at questions.

Working mathematically

At Level 4, students recognise and investigate the use of mathematics in real situations (for example, determination of test results as a percentage).

Students select and test conjectures. They understand a single counter-example is sufficient to invalidate a conjecture.

Students use the mathematical structure of problems to choose and interpret solutions. They have opportunity to solve new problems based on familiar problem structures.

Level 5

Learning focus

As students work towards the achievement of Level 5 standards in Mathematics, they use mathematics to explore and describe the physical world.

In *Number*, students investigate and explore whole numbers and fractions as squares, square roots and other simple powers.

Students compare quantities using ratios, and form equal ratios using proportion. They use ratios of number pairs to understand constant rate of change. They use numerical means to solve proportion problems and percentage problems as proportion relative to 100.

Students use visual information and patterns to understand binary numbers and to convert between binary and decimal notation.

In *Structure*, students make use of number properties (commutative, associative and distributive) and know where they do not apply.

They use simple functions of a single variable, to explore number patterns. They solve problems using a variety of methods including simplification.

When *Working mathematically*, students form generalisations from multiple examples. They use simple mathematical strategies to explore practical situations.

Standards

Number

At Level 5, students identify complete factor sets for natural numbers. They select equivalent fractions for a fraction given in simplest form (for example, 2/3 = 4/6 = 6/9 = …). They know the decimal equivalents for the unit fractions 1/2, 1/3, 1/4,1/5, 1/8, 1/9 and find equivalent representations of fractions as decimals, ratios and percentages.

Students use knowledge of perfect squares when calculating squares and square roots of numbers (for example, $20^2 = 400$ and $30^2 = 900$ so $\sqrt{700}$ is between 20 and 30). They evaluate natural numbers given in simple base-exponent form (for example, $5^3 = 125$). They calculate squares and cubes of small numbers. They calculate squares and square roots of rational numbers that are perfect squares (for example, $\sqrt{0.81} = 0.9$).

Students express natural numbers base 10 in binary form, (for example, $42_{10} = 101010_2$). Students understand ratio as both set : set comparison (for example, number of boys : number of girls) and subset : set comparison (for example, number of girls : number of students), and find integer proportions of these, including percentages (for example, the ratio number of girls : the number of boys is 2:3 = 4:6 = 40% : 60%).

Students have opportunity to develop efficient mental and/or written methods for arithmetic computation involving rational numbers, including division of integers by two-digit divisors.

Structure

At Level 5, students apply the commutative, associative, and distributive properties in mental and written computation (for example, 24 x 60 can be calculated as 20 x 60 + 4 x 60 or as 12 x 12 x 10).

Students represent a function by a table of values and by a rule. They specify the independent and dependent variables of a function.

Working mathematically

At Level 5, students formulate conjectures and follow simple mathematical deductions (for example, if the side length of a cube is doubled, then the surface area increases by a factor of four, and the volume increases by a factor of eight).

Students develop generalisations by abstracting the features from situations and expressing these in words and symbols. They analyse the reasonableness of suggested solutions, according to given criteria.

Level 6

Learning focus

In *Number*, students investigate familiar and unfamiliar situations and contexts involving the use of all types of real numbers. They use irrational numbers such common surds in calculations in both exact and approximate form. They apply mental, or written forms of computation as appropriate, using estimation to validate their answers. They compute using large or small numbers expressed in scientific notation. They apply the concepts of rounding to either a given number of decimal places or significant figures.

In *Structure*, students apply algebraic properties (for example, associative, commutative, identity, inverse and distributive) to expressions, formulas and equations.

When *Working mathematically*, students develop generalisations by abstracting the features from situations, expressing these in words and symbols. They test propositions, and use formal mathematical arguments to test their truth, modifying them as required.

Standards

Number

At Level 6, students comprehend the set of real numbers containing natural, integer, rational and irrational numbers. They represent rational numbers in both fractional and decimal (terminating and infinite recurring) forms (for example, 14/25 = 1.16, 0.47 = 47/99).

Students carry out arithmetic computations involving natural numbers, integers and finite decimals using mental and/or written algorithms (one- or two-digit divisors in the case of division). They perform computations involving very large or very small numbers in scientific notation (for example, $0.0045 \times 0.000028 = 4.5 \times 10^{-3} \times 2.8 \times 10^{-5} = 1.26 \times 10^{-7}$).

They carry out exact arithmetic computations involving fractions and irrational numbers such as square roots and multiples. They make appropriate estimates of the results of calculations involving rational and irrational numbers, and the decimal approximations for them. They carry out computations to a required accuracy in terms of decimal places and/or significant figures.

Working mathematically

At Level 6, students formulate and test conjectures, generalisations and arguments in natural language and symbolic form (for example, 'if m^2 is even then m is even, and if m^2 is

odd then m is odd').