7.4 Content for Stage 2

✍ Consult

Mathematics • Stage 2

Number and Algebra

Whole Numbers 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- selects and uses appropriate mental or written strategies, or technology, to solve problems MA2-2WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- orders, reads and represents numbers of up to five digits MA2-4NA

Students:

Recognise, model, represent and order numbers to at least 10 000 (ACMNA052)

- represent numbers up to four digits using objects, words, numerals and digital displays [L]
  - make the largest and smallest number from four given digits (Communicating) [CCT]
- identify the number before and after a given two-, three- or four-digit number
- order a set of four-digit numbers in ascending or descending order
  - use place value to compare and explain the relative size of four-digit numbers (Communicating, Reasoning)
- use the symbols for 'is less than' $(<)$ and 'is greater than' $(>)$ to show the relationship between two numbers [L]

Apply place value to partition, rearrange and regroup numbers to at least 10 000 to assist calculations and solve problems (ACMNA053)

- apply an understanding of place value and the role of zero to read, write and order numbers up to four digits [L]
  - interpret four-digit numbers used in everyday contexts (Problem Solving) [N, CCT]
- state the place value of digits in two-, three- or four-digit numbers, eg 'in the number 3426, the 3 represents 3000 or 3 thousands'
- count forwards and backwards by tens or hundreds on and off the decade, eg 1220, 1230, 1240, … (on the decade); 423, 323, 223, … (off the decade)
- record numbers up to four digits using expanded notation, eg $5429 = 5000 + 400 + 20 + 9$
- use place value to partition numbers of up to four digits, eg 3265 as three groups of 1000, two groups of 100, six groups of 10 and five ones
- partition numbers of up to four digits in non-standard forms, eg 3265 can be 32 hundreds and 65 ones [CCT]
- round numbers to the nearest ten, hundred or thousand when estimating

Mathematics • Stage 2

Number and Algebra

Whole Numbers 1

Background information

Students should be encouraged to develop different counting strategies, eg if they are counting a large number of shells they can count out groups of ten and then count the groups.

The place value of digits in various numerals is investigated. Students should understand, for example, that the 5 in 35 represents five ones but the 5 in 53 represents five tens.

Language

Students should be able to communicate using the following language: greater than, thousands, ascending order, descending order.

The word ‘and’ is used between the hundreds and the tens when reading and writing a number in words but not between other places, eg 3568 is read ‘three thousand, five hundred and sixty-eight’.

The word ‘round’ has different meanings in different contexts, eg ‘the plate is round’, ‘round 23 to the nearest ten’.

The word ‘place’ has different meanings in everyday language to those used in a mathematical context.

Mathematics • Stage 2

Number and Algebra

Whole Numbers 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- orders, reads and represents numbers of up to five digits MA2-4NA

Students:

Recognise, represent and order numbers to at least tens of thousands (ACMNA072)

- order numbers of up to five digits in ascending or descending order
- state the place value of digits in numbers of up to five digits [L]
  - pose and answer questions that extend understanding of numbers, eg 'What happens if I rearrange the digits in the number 12 345?', 'How can I rearrange the digits to make the largest number?' (Communicating, Reasoning) [L, N, CCT]
- use place value to partition numbers of up to five digits and recognise this as 'expanded notation', eg 67 012 is 60 000 + 7000 + 10 + 2
- partition numbers of up to five digits in non-standard forms, eg 67 000 can be 50 000 and 17 000 [CCT]
- round numbers to the nearest ten, hundred, thousand or ten thousand when estimating

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Background information

The convention for writing numbers of more than four digits requires that numerals have a space (and not a comma) to the left of each group of three digits when counting from the units column, eg 6234, 16 234.

Language

Students should be able to communicate using the following language: tens of thousands, place value, expanded notation.

Refer also to language in Whole Numbers 1.

Mathematics • Stage 2

Number and Algebra

Addition and Subtraction 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- selects and uses appropriate mental or written strategies, or technology, to solve problems MA2-2WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- uses mental and written strategies for addition and subtraction involving two-, three- and four-digit numbers MA2-5NA

Students:

Recall addition facts for single-digit numbers and related subtraction facts to develop increasingly efficient mental strategies for computation (ACMNA055)

- add three or more single-digit numbers [N]
  - model and apply the associative property of addition to aid mental computation, eg 2 + 3 + 8 = 2 + 8 + 3 = 10 + 3 = 13 (Communicating, Reasoning) [N]
- apply known single-digit addition and subtraction facts to aid addition and subtraction of two-, three- and four-digit numbers [N, CCT]
  - the jump strategy, eg 23 + 35; 23 + 30 is 53, 53 + 5 = 58
  - the split strategy, eg 23 + 35; 20 + 30 + 5 + 3 is 58
  - the compensation strategy, eg 63 + 29; 63 + 30 is 93, subtract 1 to obtain 92
  - using patterns to extend number facts, eg 500 – 200; since 5 – 2 = 3, so 500 − 200 is 300
  - bridging the decades, eg 34 + 26; 34 + 6 is 40, 40 + 20 is 60
  - changing the order of addends to form multiples of 10, eg 16 + 8 + 4; add 16 to 4 first
  - using place value to partition numbers, 500 + 670; 500 + 600 + 70 is 1170
  - partitioning number in non-standard forms, eg 500 + 670; 670 is 500 + 170, so 500 + 670 is 500 + 500 + 170 which is 1000 + 170 [N, CCT]
  - choose and apply efficient strategies for addition and subtraction (Problem Solving)
  - discuss and compare different methods of addition and subtraction (Communicating) [N]
- add and subtract two or more numbers, with and without trading, using concrete materials and record the method
- use mental and written strategies to solve a variety of addition and subtraction problems [N, CCT]
  - give a reasonable estimate for a problem, explain how the estimate was obtained and check the solution (Communicating, Reasoning) [N, CCT]

Recognise and explain the connection between addition and subtraction (ACMNA054)

- demonstrate how addition and subtraction are inverse operations
- explain and check solutions to problems using the inverse operation or a different method [N, CCT]

Represent money values in multiple ways and count the change required for simple transactions to the nearest five cents (ACMNA059)

- calculate equivalent amounts of money using different denominations, eg 50 cents can be made up of two 20 cent coins and a 10 cent coin [N, WE]

Mathematics • Stage 2

Number and Algebra

Addition and Subtraction 1

- perform simple calculations with money, including finding change, and round to the nearest five cents [N, PSC, WE]
- calculate mentally to give change [N]

Background information

An inverse operation is the operation that reverses the effect of the original operation. Addition and subtraction are inverse operations; multiplication and division are inverse operations.

Language

Students should be able to communicate using the following language: operation, trade, solution, estimate, round to.

Mathematics • Stage 2

Number and Algebra

Addition and Subtraction 2

Outcomes

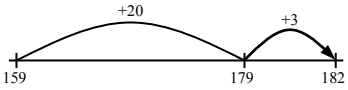
A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- selects and uses appropriate mental or written strategies, or technology, to solve problems MA2-2WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- uses mental and written strategies for addition and subtraction involving two-, three- and four-digit numbers MA2-5NA

Students:

Apply place value to partition, rearrange and regroup numbers to at least tens of thousands to assist calculations and solve problems (ACMNA073)

- apply knowledge of place value and mental strategies to add and subtract with whole numbers up to five digits [L]
- record mental strategies used to solve problems involving addition and subtraction,
  eg 159 + 23; 'I added 20 to 159 to get 179, then I added 3 more to get 182'
  or on an empty number line:



- write and solve a variety of problems involving addition and subtraction with whole numbers up to five digits [L, N, CCT]
- use a formal written algorithm to record addition and subtraction calculations involving two-, three- and four-digit numbers [L],

eg $\begin{array}{r} 134 \\ +\ 235 \\ \hline \end{array}$ $\begin{array}{r} 2459 \\ +\ 138 \\ \hline \end{array}$ $\begin{array}{r} 568 \\ -\ 322 \\ \hline \end{array}$ $\begin{array}{r} 1352 \\ +\ 168 \\ \hline \end{array}$

Solve problems involving purchases and the calculation of change to the nearest five cents with and without digital technologies (ACMNA080)

- solve addition and subtraction problems involving money, with and without digital technologies [CCT]
  - use a variety of strategies to solve unfamiliar problems involving money (Communicating, Problem Solving) [N, CCT, WE]
  - reflect on own method of solution for a money problem, considering whether it can be improved (Communicating, Reasoning) [N, CCT, PSC]
- calculate change correct to the nearest five cents [CCT, WE]
- use estimation to check solutions to addition and subtraction problems, including those involving money [N]

Mathematics • Stage 2

Number and Algebra
Addition and Subtraction 2

Background information

Students should be encouraged to estimate answers before attempting to solve problems in concrete or symbolic form. There is still a need to emphasise mental computation even though students can now use a formal written method. The following formal method may be used.

The following example shows a suitable layout for the decomposition method:

$$\begin{array}{r} {}^{3}\not{2}\,{}^{1}\not{4}\,5\,6 - \\ 1\,3\,8\,5 \\ \hline 1\,0\,7\,1 \end{array}$$

When developing a formal written algorithm, it will be necessary to sequence the examples to cover the range of possibilities that include: questions without trading, questions with trading in one or more places, and questions with one or more zeros in the first number.

Language

Word problems requiring subtraction usually fall into two types − either ‘take away’ or ‘comparison’.

Take away – How many remain after some are removed?
eg ‘I have 30 apples in a box and give away 12. How many apples do I have left in the box?’

Comparison – How many more need to be added to a group? What is the difference between two groups?
eg ‘I have 18 apples. How many more apples do I need to have 30 apples in total?’, ‘Mary has 30 apples and I have 12 apples. How many more apples does Mary have than me?’

Students need to be able to translate from these different language contexts into a subtraction calculation.

The word ‘difference’ has a specific meaning in a subtraction context. Difficulties could arise for some students with phrasing in relation to subtraction problems, eg ‘10 take away 9’ will give a different response to ‘10 was taken away from 9’.

Mathematics • Stage 2

Number and Algebra

Multiplication and Division 1

Outcomes

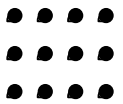
A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- selects and uses appropriate mental or written strategies, or technology, to solve problems MA2-2WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- uses mental and informal written strategies for multiplication and division MA2-6NA

Students:

Recall multiplication facts of two, three, five and ten and related division facts (ACMNA056)

- count by twos, threes, fives or tens using skip counting
- use mental strategies to recall multiplication facts for multiples of two, three, five and ten
  - link 'doubling' to multiplication facts for multiples of two, eg 'double three is six' (Reasoning) [L, N]
- recognise and use the symbols for 'multiplied by' ×, 'divided by' ÷ and 'equals' = [L]
- link multiplication and division facts using groups or arrays,



3 rows of 4 is 12	$3 \times 4 = 12$
4 columns of 3 is 12	$4 \times 3 = 12$
12 shared into 3 rows is 4	$12 \div 3 = 4$
12 shared into 4 columns is 3	$12 \div 4 = 3$

  - explain why a rectangular array can be read as a division in two ways by forming vertical or horizontal groups, eg 12 ÷ 4 = 3 or 12 ÷ 3 = 4 (Communicating, Reasoning) [L]

Investigate number sequences involving multiples of 3, 4, 6, 7, 8 and 9 (ACMNA074)

- count by threes, fours, sixes, sevens, eights or nines using skip counting
  - investigate visual number patterns on a hundreds chart (Problem Solving)

Represent and solve problems involving multiplication using efficient mental and written strategies and appropriate digital technologies (ACMNA057)

- apply the associative property of multiplication to aid mental computation, eg 2 × 3 × 5 = 2 × 5 × 3 = 10 × 3 = 30 [N]
- use mental strategies to multiply a one-digit number by a multiple of 10, including
  - repeated addition, eg 3 × 20; 20 + 20 + 20 = 60
  - using place value concepts, eg 3 × 20; 3 × 2 tens = 6 tens = 60
  - factorising the multiple of 10, eg 3 × 20; 3 × 2 × 10 = 6 × 10 = 60 [N]
  - apply the inverse relationship of multiplication and division to justify answers, eg 12 ÷ 3 is 4 because 4 × 3 = 12 (Reasoning) [N, CCT]
- select and use mental and written strategies, and appropriate digital technology, to solve simple multiplication and division problems [N, CCT, WE]
  - pose multiplication and division problems and apply appropriate strategies to solve them (Communicating, Reasoning) [CCT]

Mathematics • Stage 2

Number and Algebra

Multiplication and Division 1

  - explain how an answer was obtained and compare own method/s of solution with those of other students (Communicating, Reasoning) [N, CCT]
  - explain problem-solving strategies using language, actions, materials and drawings (Communicating, Problem Solving) [L, N]
- describe and record methods used in solving multiplication and division problems [L, N]

Background information

At this Stage, the emphasis in multiplication and division is on students developing mental strategies and using their own (informal) methods for recording their strategies. Comparing their method of solution with those of others will lead to the identification of efficient mental and written strategies. One problem may have several acceptable methods of solution.

Students could extend their recall of number facts beyond the multiplication facts to 10 × 10 by also memorising multiples of numbers such as 11, 12, 15, 20 and 25.

An inverse operation is the operation that reverses the effect of the original operation. Addition and subtraction are inverse operations; multiplication and division are inverse operations.

Digital technologies include the use of calculators.

Language

Students should be able to communicate using the following language: multiply, multiplied by, tens, double, multiples, multiplication facts, divide, divided by, halve, division facts, equals, is equal to, operations, hundreds chart, solution.

When beginning to build and read multiplication facts aloud, it is best to use a language pattern of words that relates back to concrete materials such as arrays. As students become more confident with recalling multiplication number facts, they may use less language. For example, ‘seven rows (or groups) of three’ becomes ‘seven threes’ with the ‘rows of’ or ‘groups of’ implied. This then leads to: one three is three, two threes are six, three threes are nine, and so on.

Mathematics • Stage 2

Number and Algebra

Multiplication and Division 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- selects and uses appropriate mental or written strategies, or technology, to solve problems MA2-2WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- uses mental and informal written strategies for multiplication and division MA2-6NA

Students:

Recall multiplication facts up to 10 × 10 and related division facts (ACMNA075)

- describe the result of multiplication as the product of two or more numbers, eg the product of 5 and 6 is 30 [L]
- build multiplication facts to at least 10 × 10 by recognising and describing patterns, including:
  - modelling and applying the commutative property of multiplication, eg 7 × 9 = 9 × 7
  - using known facts to work out unknown facts, eg 5 × 7 is 35, so 6 × 7 is 7 more, which is 42
  - recognising the relationship between multiplication facts, eg 5 × 8; double 5, double again and then double again [CCT]
  - factorising the larger number, eg 5 × 8 is the same as 5 × 2 × 4 which becomes 10 × 4 [CCT]

  ▸ make generalisations about numbers and number relationships, eg ‘It doesn’t matter what order you multiply two numbers in because the answer is always the same’ (Communicating, Reasoning) [N, CCT]
- recall multiplication facts up to 10 × 10 including zero facts with automaticity
- find multiples for a given whole number, eg the multiples of 4 are 4, 8, 12, 16, …
- relate multiplication facts to their inverse division facts, eg 6 × 4 = 24; so 24 ÷ 6 = 4 and 24 ÷ 4 = 6
- determine factors for a given whole number, eg the factors of 12 are 1, 2, 3, 4, 6, 12

Develop efficient mental and written strategies and use appropriate digital technologies for multiplication and for division where there is no remainder (ACMNA076)

- multiply three or more single-digit numbers, eg 5 × 3 × 6 [N]

  ▸ model and apply the associative property of multiplication to aid mental computation, eg 3 × 5 × 8 = 3 × 40 = 120 (Communicating) [N]
- use mental and written strategies to multiply a two-digit number by a one-digit number, including:
  - using known facts, eg 10 × 9 = 90 so 13 × 9 = 90 + 9 + 9 + 9 = 90 + 27 = 117
  - multiplying the tens and then the units, eg 7 × 19; 7 tens plus 7 nines is 70 plus 63 which makes 133
  - using the relationship between multiplication facts, eg 23 × 4 is double 23 and double again [CCT]
  - factorising the larger number, eg 18 × 5 = 9 × 2 × 5 = 9 × 10 = 90 [CCT]

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Number and Algebra

Multiplication and Division 2

  - create a table or simple spreadsheet to record multiplication facts, eg a 10 × 10 grid showing multiplication relationships (Communicating) [N, ICT]

- use mental and written strategies to divide by a one-digit number, including:
  - using the inverse relationship of multiplication and division, eg 63 ÷ 9 = 7 because 7 × 9 = 63
  - recalling known division facts
  - relating to known division facts, eg 36 ÷ 4; halve 36 and halve again [N]
  - apply the inverse relationship of multiplication and division to justify answers, eg 63 ÷ 9 = 7 because 7 × 9 = 63 (Problem Solving, Reasoning) [N, CCT]
- recognise and use ÷ and $\overline{)}$ to indicate division of two-digit numbers by single-digit numbers where there is no remainder [L]
- solve word problems involving multiplication and division, including those related to money [L, N, CCT, PSC, WE]
  - check the answer to a word problem using digital technology (Reasoning) [ICT]

Use mental strategies and informal recording methods for division with remainders

- model division, including where the answer involves a remainder, using concrete materials
  - explain why a remainder is obtained in answers to some division problems (Communicating, Reasoning) [CCT]
- use mental strategies to divide by a one-digit number in problems for which answers include a remainder, eg 29 ÷ 6; if 4 × 6 = 24 and 5 × 6 = 30 the answer is 4 remainder 5
- record remainders to division problems, eg 17 ÷ 4 = 4 remainder 1 [L]
- record answers to division problems to show the connection with multiplication, including where there is a remainder, eg 17 = 4 × 4 + 1 [L]
- interpret the remainder in the context of a word problem [L, CCT]

Background information

An inverse operation is the operation that reverses the effect of the original operation. Addition and subtraction are inverse operations; multiplication and division are inverse operations.

Linking multiplication and division is an important understanding for students at this stage. Students should come to realise that division 'undoes' multiplication and multiplication 'undoes' division. Students should be encouraged to check the answer to a division question by multiplying their answer by the divisor. To divide, students may recall division facts or transform the division into a multiplication and use multiplication facts, eg 35 ÷ 7 is the same as $\square \times 7 = 35$.

Digital technologies include the use of calculators.

Mathematics • Stage 2

Number and Algebra

Multiplication and Division 2

Language

Students should be able to communicate using the following language: ones/units, ‘double and double again’, ‘double, double again and then double again’, factors, ‘halve and halve again’, ‘halve, halve again and then halve again’, remainder, remaining, product.

The term ‘product’ has a different meaning in mathematics from its everyday usage. In mathematics, ‘product’ refers to the answer obtained when two or more numbers are multiplied together.

Mathematics • Stage 2

Number and Algebra

Fractions and Decimals 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- represents, models and compares commonly used fractions and decimals MA2-7NA

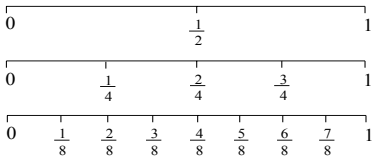
Students:

Model and represent unit fractions including $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{5}$ and their multiples to a complete whole (ACMNA058)

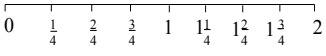
- model, compare and represent fractions with denominators 2, 3, 4, 5 and 8 including:
  - modelling simple fractions of a whole object or collection of objects using concrete materials
  - naming fractions up to one whole, eg $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}$
  - ordering fractions with the same denominator
  - interpreting the denominator as the number of equal parts a whole has been divided into
  - interpreting the numerator as the number of equal fractional parts, eg $\frac{3}{8}$ means 3 equal parts of 8
  - comparing unit fractions by referring to the denominator or diagrams, eg $\frac{1}{8}$ is less than $\frac{1}{2}$
  - renaming $\frac{2}{2}, \frac{4}{4}, \frac{8}{8}$ as 1 [L]

Count by quarters, halves and thirds, including with mixed numerals. Locate and represent these fractions on a number line (ACMNA078)

- identify and describe mixed numerals as having a whole number part and a fractional part
- count and order fractions on a number line by
  - placing halves, quarters and eighths on a number line between 0 and 1, eg



  - counting by halves, thirds and quarters, eg $0, \frac{1}{2}, 1, 1\frac{1}{2}, 2, \ldots$ or $0, \frac{1}{3}, \frac{2}{3}, 1, 1\frac{1}{3}, 1\frac{2}{3}, 2, \ldots$
  - placing halves, thirds and quarters on a number line that extends beyond 1, eg



Mathematics • Stage 2

Number and Algebra
Fractions and Decimals 1

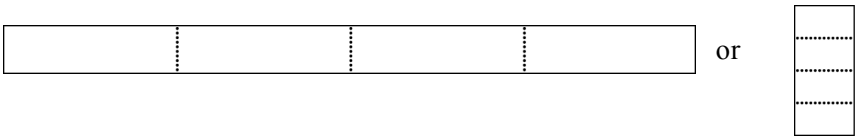
Background information

At this Stage, 'commonly used fractions' refers to those with denominators 2, 3, 4 and 8, as well as those with denominators 5, 10 and 100. Students apply their understanding of fractions with denominators 2, 3, 4 and 8 to fractions with denominators 5, 10 and 100.

Fractions are used in different ways: to describe equal parts of a whole; to describe equal parts of a collection of objects; to denote numbers (eg $\frac{1}{2}$ is midway between 0 and 1 on the number line); and as operators related to division (eg dividing a number in half).

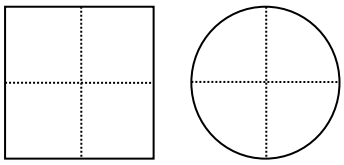
Three Models of Fractions

Linear Model: uses one-directional cuts or folds that compare fractional parts based on length; this model should be introduced first. Cuts or folds may be either vertical or horizontal.



Discrete Model: uses separate items in collections to represent parts of the whole group.

Area Model: uses multi-directional cuts or folds to compare fractional parts to the whole. This model should only be introduced once students have an understanding of the concept of area, which it should be introduced in Stage 2.



Language

Students should be able to communicate using the following language: fraction, one-third, third, fifth, whole number, mixed numeral, numerator, denominator, is equal to, multiples, number line, diagram.

When expressing fractions in English, the numerator is said first, followed by the denominator. However, in many Asian languages (eg Chinese, Japanese) the opposite is the case: the denominator is said before the numerator. Students from such language backgrounds should be encouraged to think in English when they are speaking about or expressing fractions.

Mathematics • Stage 2

Number and Algebra

Fractions and Decimals 2

Outcomes

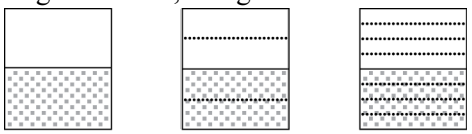
A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- represents, models and compares commonly used fractions and decimals MA2-7NA

Students:

Investigate equivalent fractions used in contexts (ACMNA077)

- model, compare and represent fractions with denominators 2, 4 and 8, followed by 3 and 6, and also 5, 10 and 100
- model, compare and represent the equivalence of fractions with related denominators by redividing the whole, using concrete materials and diagrams [L, N],
  eg



$\frac{1}{2}$ $\frac{2}{4}$ $\frac{4}{8}$

Recognise that the place value system can be extended to tenths and hundredths. Make connections between fractions and decimal notation (ACMNA079)

- recognise and apply decimal notation to express whole numbers, tenths and hundredths as decimals, eg 0.1 is the same as $\frac{1}{10}$ [L]
  - investigate equivalences using various methods, eg use a number line or a calculator to show that $\frac{1}{2}$ is the same as 0.5 and $\frac{5}{10}$ (Communicating, Reasoning) [CCT]
  - identify and interpret the everyday use of fractions and decimals, such as those in advertisements (Communicating, Problem Solving) [L, N, CCT]
- use place value to partition decimals with up to two decimal places, eg $5.37 = 5 + \frac{3}{10} + \frac{7}{100}$
- partition decimals with up to two decimal places in non-standard forms, eg $5.37 = 5 + \frac{37}{100}$
  - apply knowledge of hundredths to represent amounts of money in decimal form, eg five dollars and 35 cents is $5\frac{35}{100}$ which is the same as \$5.35 (Communicating) [N]
- model, compare and represent decimals with up to two decimal places [L]
  - apply decimal knowledge to record measurements, eg 123 cm = 1.23 m (Communicating) [N]
  - recognise that amounts of money are written with two decimal places, eg \$4.30 is not written as \$4.3 (Communicating) [N]
  - use one of the symbols for dollars $(\$)$ and cents (c) correctly when expressing amounts of money as decimals, ie \$5.67, 567c are correct, but not \$5.67c (Communicating) [N]

Mathematics • Stage 2

Number and Algebra

Fractions and Decimals 2

  - use a calculator to create patterns involving decimal numbers, eg 1 ÷ 10, 2 ÷ 10, 3 ÷ 10 (Communicating)

- order decimals with up to two decimal places on a number line, eg 'locate on a number line: 0.5, 0.25, 0.75'
- round a number with one or two decimal places to the nearest whole number
- round an answer obtained by using a calculator to one or two decimal places

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Background information

Money is an application of decimals to two decimal places.

Fractions are used in different ways: to describe equal parts of a whole; to describe equal parts of a collection of objects; to denote numbers (eg $\frac{1}{2}$ is midway between 0 and 1 on the number line); and as operators related to division (eg dividing a number in half).

Refer also to background information Fractions and Decimals 1.

Language

Students should be able to communicate using the following language: decimal, decimal point, decimal places, digit, tenths, hundredths, divide.

The decimal 1.12 is read 'one point one two' and not 'one point twelve'.

At this Stage it is not intended that students necessarily use the terms 'numerator' and 'denominator'.

Refer also to language in Fractions and Decimals 1.

Mathematics • Stage 2

Number and Algebra

Patterns and Algebra 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- selects and uses appropriate mental or written strategies, or technology, to solve problems MA2-2WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- generates number patterns and completes simple number sentences by calculating missing values MA2-8NA

Students:

Describe, continue, and create number patterns resulting from performing addition or subtraction (ACMNA060)

- identify and describe patterns when counting forwards or backwards by threes, fours, sixes, sevens, eights or nines
- model, describe and then record number patterns using diagrams, words or symbols [L]
  - ask questions about how number patterns have been created and how they can be continued (Communicating) [L, CCT]
- create and continue a variety of number patterns that increase or decrease, and describe them in more than one way, eg find the next term in the pattern 42, 39, 36, … [L]
  - play ‘guess my rule’ games such as ‘1, 4, 7, 10, …: what is the rule?’ (Problem Solving) [N]

Investigate the conditions required for a number to be odd or even and identify odd and even numbers (ACMNA051)

- model odd and even numbers of up to two digits using arrays and other collection-based diagrams
  - describe and generalise the condition for a number to be even or odd (Communicating, Reasoning) [N]
  - recognise the connection between even numbers and multiples of two (Reasoning) [N]
- identify odd and even numbers of up to four digits

Background information

At this Stage, students explore patterns using odd and even numbers. The concept of an odd number as being an even number with a ‘left over’ is a precursor to understanding remainders in multiplication and division, and the concept of equal grouping.

Language

Students should be able to communicate using the following language: next term, rule, odd, even, multiple.

Mathematics • Stage 2

Number and Algebra

Patterns and Algebra 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- selects and uses appropriate mental or written strategies, or technology, to solve problems MA2-2WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- generates number patterns and completes simple number sentences by calculating missing values MA2-8NA

Students:

Use equivalent number sentences involving addition and subtraction to find unknown quantities (ACMNA083)

- complete number sentences involving addition and subtraction by calculating missing values, eg find $\square$ so that $\square + 55 = 83$; find $\square$ so that $\square - 15 = 19$
  - use inverse operations to complete number sentences (Problem Solving) [CCT]
  - justify a solution to a number sentence (Communicating, Reasoning) [N, CCT]
- use the equals sign to record equivalent number relationships involving addition and subtraction, and to mean 'is the same as' rather than as an indication to perform an operation, eg 5 + 2 = 4 + 3 [L]
  - check number sentences to determine if they are true or false and explain why, eg 'Is 7 + 5 = 8 + 3 true? If not, why not?' (Communicating, Reasoning) [N, CCT]
- find the missing value in a number sentence involving operations of addition or subtraction on both sides of the equals sign, eg $8 + \square = 6 + 7$

Investigate and use the properties of odd and even numbers (ACMNA071)

- investigate and generalise the result of using the four operations on pairs of odd or even numbers or one odd and one even number, eg odd + even = odd; odd × odd = odd
  - explain why the result of a calculation is odd or even with reference to the properties of the numbers used in the calculation (Communicating, Reasoning) [CCT]
  - predict whether the answer to a calculation will be odd or even by using the properties of the numbers in the calculation (Reasoning) [N]

Explore and describe number patterns resulting from performing multiplication (ACMNA081)

- generate number patterns using multiples of whole numbers, eg 3, 6, 9, 12, …
- find a higher term in a number pattern resulting from performing multiplication given the first few terms, eg determine the next term in the pattern 4, 8, 16, 32, 64, …
  - describe how the next term in a number pattern is calculated (Communicating) [N]

Solve word problems by using number sentences involving multiplication or division where there is no remainder (ACMNA082)

- complete number sentences involving multiplication and division by calculating missing values, eg find $\square$ so that $28 = \square \times 7$; find $\square$ so that $40 \div \square = 5$ [N]

Mathematics • Stage 2

Number and Algebra

Patterns and Algebra 2

- represent and solve multiplication and division word problems using number sentences, eg 'I buy six pens and the total cost is $24. What is the cost of each pen?' can be represented as $6 \times \square = 24$ or $24 \div 6 = \square$ [L, N, CCT]
  - discuss whether it is more appropriate to represent the problem using × or ÷ in order to calculate the solution (Communicating, Reasoning) [N, CCT]
  - pose a word problem based on a given number sentence, eg $3 \times \square = 27$ (Communicating, Problem Solving, Reasoning) [L, N, CCT]
- use the equals sign to record equivalent number relationships involving multiplication, and to mean 'is the same as' rather than as an indication to perform an operation, eg $4 \times 3 = 6 \times 2$ [L]
  - connect number relationships involving multiplication to factors of a number, eg 'Since $4 \times 3 = 6 \times 2$, then 4, 3, 2 and 6 are factors of 12' (Communicating) [N]
  - check number sentences to determine if they are true or false and explain why, eg 'Is $7 \times 5 = 8 \times 4$ true? If not, why not?' (Communicating, Reasoning) [N, CCT]

Background information

At this Stage, the investigation of odd and even numbers leads to understanding what happens to numbers when they are added together or multiplied together. For example, 'An odd number added to an even number always results in an odd number'; 'An even number multiplied by an even number always results in an even number'.

To represent equality of groups, either 'is the same as' or 'is equal to' should be used. Use of the word 'equals' may suggest that the right side of an equation contains 'the answer', rather than a value equivalent to that on the left. At this Stage, the term 'is the same as' is emphasised as more appropriate for students' level of understanding.

Mathematics • Stage 2

Measurement and Geometry

Length 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- estimates, measures, compares and records lengths, distances and perimeters in metres, centimetres and millimetres MA2-9MG

Students:

Measure, order and compare objects using familiar metric units of length, mass and capacity (ACMMG061)

- estimate, measure, compare and order lengths or distances using metres and centimetres
  - explain strategies used to estimate lengths or distances, eg by referring to a known length such as 'My handspan is 10 cm and my desk is 8 handspans long, so my desk is about 80 cm long' (Communicating, Problem Solving)
- record lengths and distances using metres and centimetres, eg 1 m 25 cm
- recognise the need for a smaller unit than the centimetre
- recognise that ten millimetres is equal to one centimetre [N]
- estimate, measure and compare lengths to the nearest millimetre
- record lengths using the abbreviation for millimetres, eg 5 cm 3 mm or 53 mm
  - describe how a length or distance was measured (Communicating)

Background information

At this Stage, measurement experiences enable students to develop an understanding of the size of the metre, centimetre and millimetre, to estimate and measure using these units, and to select the appropriate unit and measuring device.

Language

Students should be able to communicate using the following language: millimetre.

Mathematics • Stage 2

Measurement and Geometry

Length 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- estimates, measures, compares and records lengths, distances and perimeters in metres, centimetres and millimetres MA2-9MG

Students:

Use scaled instruments to measure and compare lengths, masses, capacities and temperatures (ACMMG084)

- use a tape measure, ruler or trundle wheel to measure lengths and distances
  - select and use an appropriate device to measure lengths and distances (Problem Solving) [N]
  - explain why two students may obtain different measures for the same length (Communicating, Reasoning) [CCT]
- estimate, measure and compare lengths or distances using millimetres
- recognise the features of an object associated with length that can be measured, eg length, height, width and perimeter [N]
- use the term ‘perimeter’ to describe the total distance around a shape [L]
- estimate and measure the perimeter of two-dimensional shapes
  - describe when perimeter might be used in everyday situations, eg determining the length of fencing required to enclose a playground (Communicating) [L, CCT]
- convert between metres and centimetres, and centimetres and millimetres
  - describe one centimetre as one hundredth of a metre and one millimetre as one tenth of a centimetre (Communicating) [L]
  - explain the relationship between the size of a unit and the number of units needed, eg more centimetres than metres will be needed to measure the same length (Communicating, Reasoning) [CCT]
- record lengths and distances using decimal notation to two decimal places, eg 1.25 m

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Background information

It is important that students have a clear understanding of the distinction between perimeter and area.

Mathematics • Stage 2

Measurement and Geometry

Length 2

Language

Students should be able to communicate using the following language: height, width, perimeter, two decimal places.

'Perimeter' comes from the Greek words that mean to measure around the outside: *peri* meaning 'around'; and *metron* meaning 'measure'.

Height: usually refers to the distance from the base to the top of an object or shape.

Width: usually refers to the shorter side of a rectangle; another word for width is 'breadth'.

Mathematics • Stage 2

Measurement and Geometry

Area 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- estimates, measures, compares and records areas using square centimetres and square metres MA2-10MG

Students:

Recognise and use formal units to estimate and measure area

- recognise the need for the square centimetre as a formal unit to measure area
- use a 10 cm × 10 cm tile (or grid) to find areas that are less than, greater than or about the same as 100 square centimetres
- measure and compare the areas of a variety of surfaces using a square centimetre grid overlay
- estimate and measure the areas of rectangles and squares in square centimetres
  - discuss strategies used to estimate area in square centimetres, eg visualising repeated units (Communicating, Problem Solving) [N]
  - use efficient strategies for counting large numbers of square centimetres, eg using strips of 10 or squares of 100 (Problem Solving) [N]
- record area in square centimetres using words, eg 55 square centimetres
- recognise the need for a unit larger than a square centimetre
- construct a square metre and use it to measure large areas
  - explain where square metres are used for measuring in everyday situations, eg floor coverings (Communicating, Problem Solving) [N, CCT]
  - recognise areas that are 'smaller than a square metre', 'about the same as a square metre' and 'bigger than a square metre' (Reasoning) [L, N]
- estimate and measure the areas of rectangles and squares in square metres, eg the classroom floor or door
  - discuss strategies used to estimate area in square metres, eg visualising repeated units (Communicating, Problem Solving) [N]
- record areas in square metres using words, eg 5 square metres
- record areas using the abbreviations for square metre (m^2) and square centimetre (cm^2) [L]

Background information

At this Stage, it is appropriate to link the understanding of area to skip counting and multiplication.

Mathematics • Stage 2

Measurement and Geometry

Area 1

Language

Students should be able to communicate using the following language: greater than, less than, square centimetre, square metre.

The abbreviation m^2 is read 'square metre(s)' and not 'metre squared' or 'metre square'. Likewise, the abbreviation cm^2 is read 'square centimetre(s)' and not 'centimetre squared' or 'centimetre square'.

Mathematics • Stage 2

Measurement and Geometry

Area 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- estimates, measures, compares and records areas using square centimetres and square metres MA2-10MG

Students:

Compare the areas of regular and irregular shapes by informal means (ACMMG087)

- compare two or more areas by informal means, eg using tiles or a square centimetre grid overlay
  - recognise that rectangles with different length and width may have the same area (Reasoning)
  - discuss strategies for counting partial units in the total area of the shape, eg 'two half tiles make one whole tile' (Communicating, Problem Solving) [CCT]
  - explain why two students may obtain different measurements for the same irregular area (Communicating, Reasoning) [N, CCT]

Compare objects using familiar metric units of area and volume (ACMMG290)

- estimate the larger of two or more rectangular areas in square centimetres and then measure in square centimetres to compare and order the areas [N]
- estimate the larger of two or more rectangular areas in square metres and then measure in square metres to compare and order the areas [N]

Background information

At this Stage, students should appreciate that a formal unit allows for easier and more accurate communication of area measures. Measurement experiences should enable students to develop an understanding of the size of units, select the appropriate unit, and estimate and measure using the unit. An important understanding at this Stage is that an area of one square metre need not be a square. It could, for example, be a rectangle, two metres long and half a metre wide.

Language

Students should be able to communicate using the following language: irregular area, rectangle, square, partial.

Refer also to language in Area 1.

Mathematics • Stage 2

Measurement and Geometry

Volume and Capacity 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- estimates, measures, compares and records capacities and volumes using litres, millilitres and cubic centimetres MA2-11MG

Students:

Measure, order and compare objects using familiar metric units of length, mass and capacity (ACMMG061)

- recognise the need for formal units to measure volume and capacity
  - explain the need for a standard unit to measure the volume of liquids and the capacity of containers (Communicating, Reasoning) [CCT]
- use the litre as a formal unit to measure capacity
  - relate the litre to familiar everyday containers, eg milk cartons (Reasoning)
  - recognise that one-litre containers can be a variety of shapes (Reasoning)
- estimate the larger of two or more capacities and then measure in litres to compare and order the containers by capacity
  - estimate the number of cups needed to fill a container with a capacity of one litre (Reasoning) [N]
- record capacities using the abbreviation for litre (L) [L]

Mathematics • Stage 2

Measurement and Geometry

Volume and Capacity 1

Background information

The order in which capacity and volume appear in the content is not indicative of the order in which they should be taught.

Volume and capacity relate to the measurement of three-dimensional space, in the same way that area relates to the measurement of two-dimensional space.

The attribute of volume is the amount of space occupied by an object or substance and can be measured in cubic units, eg cubic centimetres (cm^3) and cubic metres (m^3).

Capacity refers to the amount a container can hold and can be measured in millilitres (mL) and/or litres (L). Capacity is only used in relation to containers and generally refers to liquid measurement. The capacity of a closed container will be slightly less than its volume – capacity is based on the inside dimensions, while volume is determined by the outside dimensions of the container.

It is not necessary to refer to these definitions with students (capacity is not taught as a separate concept to volume until Stage 4).

At this Stage, students should appreciate that a formal unit allows for easier and more accurate communication of measures, and should be introduced to the litre, millilitre and cubic centimetre.

Measurement experiences should enable students to develop an understanding of the size of the unit, estimate and measure using the unit, and select the appropriate unit and measuring device.

Fluids are commonly measured in litres and millilitres. Hence the capacities of containers used to hold fluids are usually measured in litres and millilitres, eg a litre of milk will fill a container that has a capacity of one litre.

The cubic centimetre can be related to the centimetre as a unit to measure length and the square centimetre as a unit to measure area.

When recording units of measurement, a space should be left between the number value and the abbreviated unit of measurement, eg 3 mL, not 3mL.

Language

Students should be able to communicate using the following language: litre.

Mathematics • Stage 2

Measurement and Geometry

Volume and Capacity 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- estimates, measures, compares and records capacities and volumes using litres, millilitres and cubic centimetres MA2-11MG

Students:

Use scaled instruments to measure and compare lengths, masses, capacities and temperatures (ACMMG084)

- recognise the need for a unit smaller than the litre to measure capacity
- recognise that 1000 millilitres is equal to one litre [N]
  - relate the millilitre to familiar everyday containers and familiar informal units, eg 1 teaspoon is approximately 5 mL, 250 mL fruit juice containers, etc (Reasoning)
- use a measuring device calibrated in millilitres to measure capacity, eg place a measuring cylinder under a dripping tap to measure water lost over a particular period of time [SE]
- record capacities using the abbreviation for millilitre (mL) [L]
- convert between millilitres and litres, eg 1250 mL = 1 litre 250 millilitres
- estimate the larger of two or more capacities, and then measure in millilitres to compare and order the containers by capacity
- compare the volumes of two or more objects by marking the change in water level when each is submerged in a container
  - estimate the change in water level when an object is submerged (Reasoning) [N, CCT]
- measure the overflow in millilitres when different objects are submerged in a container filled to the brim with water
- estimate the capacity of a substance in a partially filled container from the information on the label detailing the contents of the container
- recognise a thermometer as a measuring device, and read and record temperatures to the nearest degree
  - use a thermometer to take and record daily temperature readings (Communicating) [N, SE]

Compare objects using familiar metric units of area and volume (ACMMG290)

- recognise the advantages of using a cube as a unit when packing or stacking
- use the cubic centimetre as a formal unit to measure volume
- pack small containers with cubic centimetre blocks and describe packing in terms of layers, eg 2 layers of 10 cubic centimetre blocks
- construct three-dimensional objects using cubic centimetre blocks and count to determine volume
- record volumes using the abbreviation for cubic centimetre (cm^3) [L]

Mathematics • Stage 2

Measurement and Geometry

Volume and Capacity 2

- estimate the larger of two or more volumes, and then count using cubic centimetre blocks to compare and order the objects by volume
  - distinguish between mass and volume, eg 'This stone is heavier than the ball but it takes up less room' (Communicating, Reasoning) [N, CCT]
  - interpret information about volume on commercial packaging (Problem Solving) [L, N]

Background information

The order in which capacity and volume appear in the content is not indicative of the order in which they should be taught.

The displacement strategy for finding the volume of an object relies on the fact that an object displaces its own volume when it is totally submerged in a liquid. The strategy may be applied in two ways: using a partially filled, calibrated, clear container and noting the change in the level of the liquid when the object is submerged; or submerging an object into a container filled to the brim with liquid and measuring the overflow.

The use of a thermometer to measure temperature is included in this section of the Syllabus. It is not anticipated that this skill will be taught as part of a learning experience focused on volume and capacity. It may be helpful to draw students' attention to the link between temperature scale and negative numbers.

Refer also to background information in Volume and Capacity 1.

Language

Students should be able to communicate using the following language: measure, layers, millilitre, cubic centimetre, thermometer, degrees.

The abbreviation cm^3 is read 'cubic centimetre(s)' and not 'centimetre cubed'.

Mathematics • Stage 2

Measurement and Geometry

Mass 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- estimates, measures, compares and records masses of objects using kilograms and grams MA2-12MG

Students:

Measure, order and compare objects using familiar metric units of length, mass and capacity (ACMMG061)

- recognise the need for a formal unit to measure mass
- measure the mass of an object in kilograms using an equal arm balance
  - associate kilogram measures with familiar objects, eg a standard pack of flour has a mass of 1 kg; a litre of milk has a mass of approximately 1 kg (Reasoning) [N]
  - recognise that objects with a mass of one kilogram can be a variety of shapes and sizes (Reasoning)
- record mass using the abbreviation for kilograms (kg) [L]
- use hefting to identify objects that are 'more than', 'less than' and 'about the same as' one kilogram
  - discuss strategies used to estimate mass, eg by referring to a known mass (Communicating, Problem Solving) [N]
- estimate and check the number of similar objects that have a total mass of one kilogram
  - explain why two students may obtain different measures for the same mass (Communicating, Reasoning) [CCT]

Background information

At this Stage, students should appreciate that a formal unit allows for easier and more accurate communication of mass measures and are introduced to the kilogram and gram. Students should develop an understanding of the size of these units, and estimate and measure using these units.

Language

Students should be able to communicate using the following language: kilogram.

'Hefting' is testing the weight of an object by lifting and balancing it. Where possible students can compare the weights of two objects by using their bodies to balance each object, eg holding one object in each hand or balancing an object on each arm or leg.

Mathematics • Stage 2

Measurement and Geometry

Mass 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- selects and uses appropriate mental or written strategies, or technology, to solve problems MA2-2WM
- estimates, measures, compares and records masses of objects using kilograms and grams MA2-12MG

Students:

Use scaled instruments to measure and compare lengths, masses, capacities and temperatures (ACMMG084)

- recognise the need for a unit smaller than the kilogram
- recognise that 1000 grams is equal to one kilogram
- measure the mass of an object in grams using a set of scales [L]
  - associate gram measures with familiar objects, eg a standard egg has a mass of about 60 grams (Reasoning) [N]
- measure and compare the masses of objects in kilograms and grams using a set of scales
  - interpret statements, and discuss the use of grams and kilograms, on commercial packaging (Problem Solving) [L, N, CCT]
- record mass using the abbreviation for grams (g) [L]
- measure, compare and record masses of objects using a set of scales
- interpret commonly used fractions of a kilogram including $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ and relate these to the number of grams
  - solve problems including those involving commonly used fractions of a kilogram (Communicating, Problem Solving) [N, CCT]

Background information

Refer to background information in Mass 1.

Language

Students should be able to communicate using the following language: scales, gram, fraction of a kilogram.

The term ‘scale’ as in a set of scales may be confusing for some students who associate it with other uses of the word ‘scales’, eg fish scales, snake scales, scales on a map, or musical scales. These other meanings should be discussed with all students.

Mathematics • Stage 2

Measurement and Geometry

Time 1

Outcome

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- reads and records time in one-minute intervals and converts between hours, minutes and seconds MA2-13MG

Students:

Tell time to the minute and investigate the relationship between units of time (ACMMG062)

- recognise the coordinated movements of the hands on an analog clock, including:
  - how many minutes it takes for the minute hand to move from one numeral to the next
  - how many minutes it takes for the minute hand to complete one revolution
  - how many minutes it takes for the hour hand to move from one numeral to the next
  - how many minutes it takes for the minute hand to move from the 12 to any other numeral
  - how many seconds it takes for the second hand to complete one revolution
- read analog and digital clocks to the minute, eg 7:35 is read as 'seven thirty-five' or 'twenty-five to eight' [L]
- record in words various times shown on analog and digital clocks [L]

Background information

A solar year actually lasts 365 days 5 hours 48 minutes and 45.7 seconds.

Language

Students should be able to communicate using the following language: revolution.

Mathematics • Stage 2

Measurement and Geometry

Time 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- selects and uses appropriate mental or written strategies, or technology, to solve problems MA2-2WM
- reads and records time in one-minute intervals and converts between hours, minutes and seconds MA2-13MG

Students:

Convert between units of time (ACMMG085)

- convert between units of time and recall time facts, eg 60 seconds = 1 minute, 60 minutes = 1 hour, 24 hours = 1 day

Use am and pm notation and solve simple time problems (ACMMG086)

- record digital time using the correct notation, including am and pm, eg 9:15 am [L]
  - describe times given in am and pm notation in relation to 'midday' (or 'noon') and 'midnight', eg '3:15 pm is three and a quarter hours after midday' (Communicating) [L]
- relate analog notation to digital notation, eg ten to nine in the morning is the same as 8:50 am [L]
- solve simple time problems using appropriate strategies, eg calculate the time spent on particular activities during the school day [N, CCT]
- read and interpret simple timetables, timelines and calendars [L, N, CCT, PSC]

Background information

Midday and midnight need not be expressed in am or pm form. '12 noon' or '12 midday' and '12 midnight' should be used, even though 12:00 pm and 12:00 am are sometimes seen.

The terms 'am' and 'pm' are used only for the digital form of time recording and not with the 'o'clock' terminology.

It is important to note that there are many different ways of recording dates, including abbreviated forms.

Different notations for dates are used in different countries, eg 8 December 2014 is recorded as 8.12.14 in Australia but as 12.8.14 in America.

See also background information in Time 1.

Language

Students should be able to communicate using the following language: timetable, timeline, 'am' and 'pm' notation, midday, noon, midnight.

In Latin am is *ante meridiem*, meaning before midday in English. In Latin pm is *post meridiem*, meaning after midday in English.

Mathematics • Stage 2

Measurement and Geometry

Three-Dimensional Space 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- makes, compares, sketches and names three-dimensional objects, and describes their features MA2-14MG

Students:

Make models of three-dimensional objects and describe key features (ACMMG063)

- identify and name three-dimensional objects as prisms, pyramids, cylinders, cones and spheres [L]
  - recognise and describe the use of three-dimensional objects in a variety of contexts, eg buildings, packaging (Communicating) [L, CCT]
- compare and describe features of prisms, pyramids, cylinders, cones and spheres [L]
  - compare features of three-dimensional objects and two-dimensional shapes (Communicating, Reasoning) [CCT]
  - describe similarities and differences between prisms, pyramids, cylinders, cones and spheres (Communicating) [L, CCT]
- make models of prisms, pyramids, cylinders, cones and spheres given a three-dimensional object, picture or photograph to view
- create nets from everyday packages, eg a cereal box
  - investigate, make and describe the variety of nets that can be used to create particular three-dimensional objects (Communicating, Problem Solving, Reasoning) [L]

Background information

The formal names for particular prisms and pyramids are not introduced at this Stage. Prisms and pyramids are to be treated as classes to group all prisms and all pyramids. Names for particular prisms or pyramids are introduced in Stage 3.

Prisms have two bases that are the same shape and size. The bases of a prism may be squares, rectangles, triangles or other polygons. The other faces are rectangular if the faces are perpendicular to the bases. The base of a prism is the shape of the uniform cross-section, not necessarily the face on which it is resting.

Pyramids differ from prisms as they have only one base and all the other faces are triangular. The triangular faces meet at a common vertex.

Spheres, cones and cylinders do not fit into the classification of prisms or pyramids as they have curved surfaces, not faces, eg a cylinder has two flat surfaces and one curved surface.

Mathematics • Stage 2

Measurement and Geometry

Three-Dimensional Space 1

Language

Students should be able to communicate using the following language: net, package.

Shape: the term ‘shape’ refers to a two-dimensional figure.

Object: the term ‘object’ refers to a three-dimensional figure.

In geometry, a three-dimensional object is called a solid. The three-dimensional object may in fact be hollow but it is still defined as a geometrical solid. Models at this Stage should include skeletal models.

Mathematics • Stage 2

Measurement and Geometry

Three-Dimensional Space 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- makes, compares, sketches and names three-dimensional objects, and describes their features MA2-14MG

Students:

Investigate and represent three-dimensional objects using drawings

- identify three-dimensional objects in the environment and from drawings, photographs or descriptions [L]
  - investigate types of three-dimensional objects used in commercial packaging and give reasons why some are more commonly used (Communicating, Reasoning) [N, CCT, PSC]
- identify and name a three-dimensional object from drawings of its faces [L]
- sketch prisms, pyramids, cylinders and cones, attempting to show depth
  - compare own drawings of three-dimensional objects with other drawings and photographs of three-dimensional objects (Reasoning)
  - draw three-dimensional objects using a computer drawing tool, attempting to show depth (Communicating) [ICT]
- sketch three-dimensional objects from different views including top, front and side views
  - investigate different two-dimensional representations of three-dimensional objects in the environment, eg in Aboriginal art (Communicating) [ICT, AHC]
- sketch different views of an object constructed from cubes on isometric grid paper
- make, visualise and draw the resulting cut face (plane section) when a three-dimensional object receives a straight cut [CCT]
- recognise that prisms have a uniform cross-section when the section is parallel to the base
- recognise that pyramids do not have a uniform cross-section

Mathematics • Stage 2

Measurement and Geometry

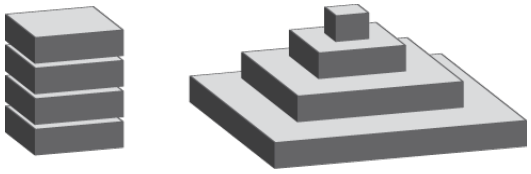
Three-Dimensional Space 2

Background information

A section is a representation of an object as it would appear if cut by a plane, eg if the corner was cut off a cube, the resulting cut face would be a triangle. An important understanding at this Stage is that the cross-sections parallel to the base of prisms are uniform and the cross-sections parallel to the base of pyramids are not.

Students could explore these ideas by stacking uniform objects to model prisms, and stacking sets of seriated shapes to model pyramids,

eg



Note: such stacks are not strictly pyramids but assist understanding.

When using examples of Aboriginal rock carvings and art, it is recommended that local examples should be used wherever possible. Consult with local Aboriginal communities and education consultants for such examples.

Refer also to background information in Three-Dimensional Space 1.

Language

Students should be able to communicate using the following language: top view, side view, front view, depth, cube, parallel, cross-section, grid paper.

Refer also to language in Three-Dimensional Space 1.

Mathematics • Stage 2

Measurement and Geometry

Two-Dimensional Space 1

Outcomes

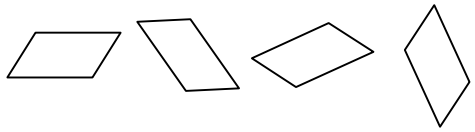
A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- manipulates, classifies and sketches two-dimensional shapes, including quadrilaterals, and describes their features MA2-15MG

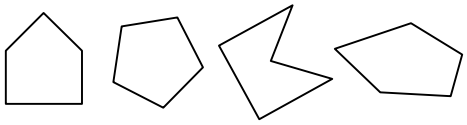
Students:

Investigate and describe features of two-dimensional shapes

- manipulate, compare and describe features of two-dimensional shapes, including the special groups of quadrilaterals: parallelograms, rectangles, rhombuses, squares, trapeziums and kites [L, N]
  - determine the number of pairs of parallel sides of each of the special groups of quadrilaterals (Reasoning)
- use measurement to establish and describe side properties of the special groups of quadrilaterals, eg the opposite sides of a parallelogram are the same length
- identify and name the special groups of quadrilaterals presented in different orientations [L], eg



- group parallelograms, rectangles, rhombuses, squares, trapeziums and kites using one or more attributes, eg those with parallel sides and right angles
- recognise and describe two-dimensional shapes as either regular or irregular [L, N]
  - identify regular shapes from a group that includes irregular shapes, eg identify a regular pentagon from a group of pentagons



(Reasoning)

  - explain the difference between regular and irregular two-dimensional shapes (Communicating, Reasoning) [L]
- make representations of two-dimensional shapes in different orientations
  - recognise that a particular shape can be represented in different sizes and orientations (Reasoning)
- construct two-dimensional shapes from a variety of materials, eg cardboard, straws and connectors
  - determine that a triangle cannot be constructed from three straws if the sum of the lengths of the two shortest straws is less than the length of the longest straw (Reasoning)
- compare the rigidity of two-dimensional frames of three sides with those of four or more sides
  - construct and manipulate a four-sided frame and then explain how adding a brace can make a four-sided frame rigid (Communicating, Reasoning) [CCT]

Mathematics • Stage 2

Measurement and Geometry

Two-Dimensional Space 1

Identify symmetry in the environment (ACMMG066)

- identify and draw lines of symmetry for a given shape, including the special groups of quadrilaterals
  - identify lines of symmetry in pictures, artifacts, designs and the environment, eg Aboriginal rock carvings or Asian Lotus designs (Reasoning) [CCT, AHC, A]
  - explain why any line through the centre of a circle is a line of symmetry (Communicating, Reasoning) [CCT]

Background information

It is important for students to experience a variety of shapes in order to develop flexible mental images. Students need to be able to recognise shapes presented in different orientations. At this Stage, students are expected to be able to distinguish between regular and irregular shapes. Regular shapes have all sides equal and all angles equal.

When constructing polygons using materials such as straws of different lengths for sides, students should be guided to an understanding that:

– sometimes a triangle cannot be made from 3 straws
– a shape made from 3 lengths, ie a triangle, is always flat
– a shape made from 4 or more lengths need not be flat
– a unique triangle is formed if given 3 lengths
– more than one two-dimensional shape can result if more than 3 lengths are used.

The special groups of quadrilaterals are: trapeziums, parallelograms, rectangles, rhombuses, squares and kites.

When using examples of Aboriginal rock carvings and art it is recommended that local examples should be used wherever possible. Consult with local Aboriginal communities and education consultants for such examples.

Language

Students should be able to communicate using the following language: special quadrilaterals, parallelogram, trapezium, kite, rhombus, properties, opposite, right angle, angles, regular, irregular, orientation, rigid, brace, centre.

The term ‘polygon’ (from the Greek meaning ‘many angles’) refers to closed shapes with three or more angles and sides. While the angles are the focus for the general naming system used for shapes, polygons are more usually understood in terms of the sides.

Students could explore the language origins of the names of polygons.

The term ‘diamond’ is often used in everyday contexts when describing a quadrilateral with four equal sides. However, ‘diamond’ is not mathematically correct; the correct term is ‘rhombus’.

At this Stage, students are expected to be able to describe a polygon as either regular or irregular, eg a regular pentagon has five equal sides and five equal angles.

Mathematics • Stage 2

Measurement and Geometry

Two-Dimensional Space 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- manipulates, classifies and sketches two-dimensional shapes, including quadrilaterals, and describes their features MA2-15MG

Students:

Compare and describe two dimensional shapes that result from combining and splitting common shapes, with and without the use of digital technologies (ACMMG088)

- create and combine simple shapes using computer software and describe the resulting shape [ICT]
- combine and split common two-dimensional shapes to construct and deconstruct composite figures, and compare the resulting shapes to each other

Create symmetrical patterns, pictures and shapes with and without digital technologies (ACMMG091)

- create tessellating designs by reflecting (flipping), translating (sliding) and rotating (turning) a two-dimensional shape
  - recognise and apply amounts of turn in clockwise and anti-clockwise directions, including half, quarter and three-quarter turns (Problem Solving)
  - use computer drawing tools to create a tessellating design by copying, pasting and rotating regular shapes (Communicating, Problem Solving) [ICT]
- describe designs in terms of reflecting, translating and rotating [L]
- use computer software to create simple shapes involving direction and angles [ICT]

Language

Students should be able to communicate using the following language: three-quarter turn, reflect, translate, symmetrical, combine, split, construct, deconstruct, composite shape, clockwise, anti-clockwise, direction, angle.

Mathematics • Stage 2

Measurement and Geometry

Angles 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- identifies, compares and describes angles MA2-16MG

Students:

Identify angles as measures of turn and compare angle sizes in everyday situations (ACMMG064)

- identify angles with two arms in practical situations, eg corners
  - identify examples of angles in the environment and as corners of two-dimensional shapes (Communicating)
- identify the arms and vertex of an angle [L]
- informally describe an angle as the amount of turning between the arms
  - recognise that the length of the arms does not affect the size of the angle (Reasoning)
- compare angles using informal means such as by placing one angle on top of another

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Background information

At this Stage, students need informal experiences of creating, identifying and describing a range of angles. This will lead to an appreciation of the need for a formal unit to measure angles which is introduced in Stage 3.

Language

Students should be able to communicate using the following language: corner, angle, arm, vertex, turn.

Mathematics • Stage 2

Measurement and Geometry

Angles 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- identifies, compares and describes angles MA2-16MG

Students:

Compare angles and classify them as equal to, greater than or less than a right angle (ACMMG089)

- compare and order angles using informal means such as by using an 'angle tester'
- identify and name perpendicular lines [L]
- describe angles using everyday language and use the term 'right' to describe the angle formed when perpendicular lines meet [L]
  - explain why a given angle is, or is not, a right angle (Communicating, Reasoning)
- classify angles as right, acute, obtuse, reflex, straight or a revolution [L]
- identify the arms and vertex of the angle in an opening, a slope and a turn where one arm is visible, eg the bottom of a door when it is open is the visible arm and the imaginary line at the base of the doorway is the other arm
- draw angles of various sizes by tracing along the adjacent sides of shapes and describing the angle drawn

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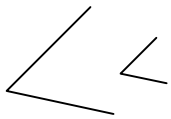
Background information

Paper folding is a quick and simple means of generating a wide range of angles for comparison and copying.



The arms of these angles are different lengths. However, the angles are the same size as the amount of turning between the arms is the same. Students may mistakenly judge one angle to be greater in size than another on the basis of the length of the arms of the angles in the diagram.

At this Stage, students need informal experiences of creating, identifying and describing a range of angles. This will lead to an appreciation of the need for a formal unit to measure angles which is introduced in Stage 3.

A simple 'angle tester' can be created by cutting the radii of two equal circles and sliding the cuts together. Another can be made by joining two narrow straight pieces of card with a split-pin to form the rotatable arms of an angle.

There are 360° in an angle of revolution.

Mathematics • Stage 2

Measurement and Geometry

Angles 2

Language

Students should be able to communicate using the following language: order, angle tester, perpendicular lines, right angle, acute angle, obtuse angle, reflex angle, straight angle, angle of revolution, slope, adjacent.

The terms ‘sharp’ and ‘blunt’ to describe acute and obtuse angles respectively are counterproductive in identifying the nature of angles and should not be used with students. They focus students’ attention on the external points of the angle rather than the amount of turning between the angle arms.

Mathematics • Stage 2

Measurement and Geometry

Position 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- uses simple maps and grids to represent position and follow routes, including directions using a compass MA2-17MG

Students:

Create and interpret simple grid maps to show position and pathways (ACMMG065)

- describe the location of an object using more than one descriptor, eg 'The book is on the third shelf and second from the left' [L]
- use given directions to follow a route on a simple map [L]
  - use and follow positional and directional language (Communicating) [L]
- use coordinates on maps to describe position, eg 'The lion cage is at B3' [L]
  - use coordinates in games, including using digital technology (Communicating) [L, ICT]
- construct simple maps and plans using a grid overlay, eg create a map of their bedroom
  - create a simple map or plan using computer technology (Communicating) [ICT]
  - compare different methods of identifying locations in the environment, eg compare the reference system used in Aboriginal Country maps with standard grid-referenced maps (Reasoning) [L, N, AHC]
- draw and describe a path or route on a simple map or plan [L]
  - use computer software involving maps, position and paths (Communicating) [N, ICT]
  - discuss the use of grids in the environment, eg zoo map, map of shopping centre (Reasoning) [L]
- interpret and use simple maps found in factual texts and in the media [L, N]
- draw maps and plans from an aerial view

Background information

Grids are used in many contexts to identify position. Students could create their own simple maps and, by drawing a grid over the map, they can then describe locations.

As a precursor to introducing the Cartesian plane in Stage 3, students should be taught to give map locations by giving the horizontal coordinate before the vertical coordinate.

Aboriginal people use an Aboriginal land map to identify and explain the relationship of a particular Aboriginal Country to significant landmarks in the area. They use a standard map of NSW to identify nearby towns and their proximity to significant Aboriginal landmarks and their unique relationship to land, Country and place.

Mathematics • Stage 2

Measurement and Geometry

Position 1

Language

Students should be able to communicate using the following language: grid map, grid overlay, route, coordinates, plan, aerial view.

Mathematics • Stage 2

Measurement and Geometry

Position 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- uses simple maps and grids to represent position and follow routes, including directions using a compass MA2-17MG

Students:

Use simple scales, legends and directions to interpret information contained in basic maps (ACMMG090)

- use a key or legend to locate specific objects on a map [L]
- plot points at given coordinates
- use a compass to find north and hence east, south and west and use N, E, S and W to represent these directions
- use north, south, east and west to describe the location of an object on a simple map, given an arrow that represents north, eg 'The treasure is east of the cave' [L]
- determine the directions north, south, east and west when given one of the directions
- use an arrow to represent north on a map and use a compass rose to indicate each of the key directions, including NE, SE, SW and NW [L]

  eg

- use NE, NW, SE and SW to describe the location of an object on a map, given a compass rose, eg 'The treasure is north-east of the caves' [L, N]
- determine the directions NE, NW, SE and SW when given one of the directions
- use scales involving simple multiples up to 10 to calculate the distance between two points on a map [N]
  - interpret simple scales on maps and plans, eg 'One centimetre on the map represents one metre in real life' (Reasoning) [L]
  - give reasons for using a particular scale on a map or plan (Communicating, Reasoning) [N, CCT]

Background information

Students need to have experiences identifying north from a compass in their own environment and then determining the other three key directions: east, west and south. This could be done in the playground before introducing students to using these directions on maps to describe the positions of various places. The four directions NE, NW, SE and SW could then be introduced to assist with descriptions of places that lie between N, S, E and W.

Measurement and Geometry
Position 2

Language

Students should be able to communicate using the following language: plot, compass, arrow, distance, scale, north, south, east, west, north-east, south-east, south-west, north-west.

Mathematics • Stage 2

Statistics and Probability

Data 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- selects and uses appropriate mental or written strategies, or technology, to solve problems MA2-2WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- selects appropriate data collection methods and constructs, compares and interprets data displays MA2-18SP

Students:

Identify questions or issues for categorical variables. Identify data sources and plan methods of data collection and recording (ACMSP068)

- recognise that data can be collected either by the user or by others
- identify possible sources of data collected by others, eg newspapers, government data collection agencies, sporting agencies, environmental groups [L, CCT, SE]
- pose and refine questions about an issue of interest to obtain information that can be recorded in categories
  - discuss and decide the most suitable question to investigate a particular issue, eg by narrowing the focus of a question from 'What is the most popular playground game?' to 'What is the most popular playground game among Year 3 students at our school?' (Communicating, Reasoning) [L, CCT]
- predict and create a list of categories for efficient data collection, eg 'Which breakfast cereal is the most popular with members of our class?' [L]
  - identify issues for data collection and refine investigations, eg 'What if some members of our class don't eat cereal?' (Problem Solving) [N, CCT]

Collect data, organise into categories and create displays using lists, tables, picture graphs and simple column graphs, with and without the use of digital technologies (ACMSP069)

- collect data and create a list or simple table to organise the data, eg collect data on the number of each colour of lollies in a packet [L, CCT]

Colour	Number of Lollies
Red	5
Blue	2
Yellow	7
Green	1

  - use computer software to create a table to organise collected data, eg a spreadsheet (Communicating) [N, ICT]
- construct vertical and horizontal column graphs and picture graphs that represent data using one-to-one correspondence
  - use grid paper to assist in constructing graphs that represent data using one-to-one correspondence (Communicating)
  - use graphing software to enter data and create a column graph that represents data using one-to-one correspondence (Communicating) [ICT]

Mathematics • Stage 2

Statistics and Probability

Data 1

- mark equal spaces on axes, label axes and name the display (Communicating) [L, N]

Interpret and compare data displays (ACMSP070)

- interpret data presented in simple tables, column graphs and picture graphs [N, L]
- represent the same data set using more than one type of display and compare the displays
  - discuss the advantages and/or disadvantages of different representations of the same data (Communicating, Reasoning) [N]

Background information

Data could be collected from the internet, newspapers or magazines.

At this Stage, students should consider the use of graphs in real-world contexts. Graphs are frequently used to persuade and/or influence the reader, and are often biased.

One-to-one correspondence in a column graph means that one unit (eg 1 cm) on the vertical axis is used to represent one response/item.

Categorical data can be separated into distinct groups, eg colour, gender, blood type. Numerical data has variations that are expressed as numbers, eg heights of students in a class, the number of children in families.

Language

Students should be able to communicate using the following language: data collection, table, column graph, axis, axes, vertical, horizontal, spreadsheet.

Column graphs consist of vertical columns or horizontal bars. However, the term ‘bar graph’ is reserved for divided bar graphs and should not be used for a column graph with horizontal bars.

Mathematics • Stage 2

Statistics and Probability

Data 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- selects and uses appropriate mental or written strategies, or technology, to solve problems MA2-2WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- selects appropriate data collection methods and constructs, compares and interprets data displays MA2-18SP

Students:

Select and trial methods for data collection, including survey questions and recording sheets (ACMSP095)

- create a survey and related recording sheet, considering appropriate organisation of categories for data collection
  - choose effective ways to collect and record data for an investigation, eg creating a survey with a scale of 1 to 5 to indicate preferences (1 – don't like, 2 – like a little, 3 – don't know, 4 – like, 5 – like a lot) (Communicating, Problem Solving) [L]
- conduct a survey to collect categorical data
  - after conducting a survey, discuss and determine possible improvements to the questions or recording sheet (Communicating, Reasoning) [CCT]
- compare the effectiveness of different methods of collecting and recording data, eg creating categories of playground games and using tally marks, compared to asking open-ended questions, eg 'What playground game do you like to play?' [CCT]
  - discuss the advantages and/or disadvantages of open-ended questions, compared to questions with pre-determined categories, in a survey (Communicating, Reasoning) [L, CCT]

Construct suitable data displays, with and without the use of digital technologies, from given or collected data. Include tables, column graphs and picture graphs where one picture can represent many data values (ACMSP096)

- represent given or collected categorical data in tables, column graphs and picture graphs, where one picture represents many data values, with and without digital technologies
  - discuss and determine a suitable many-to-one correspondence or key to draw graphs for large data sets, eg ☺ = 10 people if there are 200 data values (Communicating, Reasoning) [N, CCT]
  - use grid paper to assist in drawing graphs representing data using many-to-one correspondence (Communicating)
  - use data in a spreadsheet to create column graphs with appropriately labelled axes (Communicating, Problem Solving) [ICT]

Mathematics • Stage 2

Statistics and Probability

Data 2

Evaluate the effectiveness of different displays in illustrating data features including variability (ACMSP097)

- interpret and evaluate the effectiveness of various data displays found in media and in factual texts, where displays represent data using many-to-one correspondence [L, N, ICT, CCT, PSC, EU]
  - identify and discuss misleading representations of data (Communicating, Reasoning) [L, N, CCT, PSC, EU]
  - discuss and compare features of data displays, including considering the number and appropriateness of the categories used, eg a display with only three categories (blue, red, other) for car colour is not likely to be useful (Communicating) [L, N, CCT, EU]
  - discuss the advantages and disadvantages of different representations of the same categorical data, eg column graphs compared to picture graphs that represent data using many-to-one correspondence (Communicating) [N, CCT, EU]

Background information

Many-to-one correspondence in a picture graph or column graph means that one symbol or one unit on the vertical axis is used to represent more than one item or response, eg ☺ = 10 people, or 1 centimetre being used to represent 5 items/responses.

Language

Students should be able to communicate using the following language: survey, misleading.

Refer also to language in Data 1.

Mathematics • Stage 2

Statistics and Probability

Chance 1

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- checks the accuracy of a statement and explains the reasoning used MA2-3WM
- describes and compares chance events in social and experimental contexts MA2-19SP

Students:

Conduct chance experiments, identify and describe possible outcomes and recognise variation in results (ACMSP067)

- use the term 'outcome' to describe any possible result of a chance experiment [L]
- predict and list all possible outcomes in a chance experiment, eg list the outcomes when three pegs are randomly selected from a bag containing an equal number of pegs of two colours
- predict and record all possible combinations in a chance situation, eg the number of possible outfits when choosing from three different T-shirts and two different pairs of shorts [CCT]
- predict the number of times each outcome should occur in a chance experiment involving a set number of trials, carry out the experiment, and compare the predicted and actual results
  - keep a tally and graph the result of a chance experiment (Communicating) [N]
  - explain any differences between predicted results and actual results in a chance experiment (Communicating) [CCT]
  - make statements that acknowledge 'randomness' in a situation, eg 'The spinner could stop on any colour' (Communicating, Reasoning) [L, CCT]
  - repeat a chance experiment several times and discuss reasons why the results vary (Communicating) [CCT]

Background information

Random generators include coins, dice and spinners.

Language

Students should be able to communicate using the following language: outcome, combination, difference.

Mathematics • Stage 2

Statistics and Probability

Chance 2

Outcomes

A student:

- uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM
- describes and compares chance events in social and experimental contexts MA2-19SP

Students:

Describe possible everyday events and order their chances of occurring (ACMSP092)

- use the language of chance in everyday contexts, eg 'There is a fifty-fifty chance that you will get an even number when you roll a die' [L]
- compare familiar events and describe them as being equally likely or more or less likely to occur [L]
- order events from least likely to most likely, eg 'Having ten children away sick on the one day is less likely than having one or two away'
- compare the likelihood of outcomes in a simple chance experiment, eg from a collection of 7 red, 13 blue and 10 yellow marbles, name blue as being the colour most likely to be drawn out and recognise that it is impossible to draw out a green marble

Identify everyday events where one cannot happen if the other happens (ACMSP093)

- identify and discuss everyday events that cannot occur at the same time, eg when tossing one coin, you can only throw a head or a tail, not a head and a tail at the same time

Identify events where the chance of one will not be affected by the occurrence of the other (ACMSP094)

- identify and discuss events where the chance of one event will not be affected by the occurrence of the other, eg if rolling a die twice, the result of the first roll does not affect the result of the second roll
    - explain why the probability of each of the outcomes of a second toss of a coin does not depend on the result of the first toss, whereas drawing a card from a pack of playing cards and not returning it to the pack changes the probability of obtaining a particular card or cards in future draws (Communicating) [L, N, CCT]

Background information

Theoretically, when a fair coin is tossed, there is an equal chance of obtaining a head or a tail. If the coin is tossed and five heads in a row are obtained, there is still an equal chance of a head or a tail on the next toss, since each toss is an independent event.

Language

Students should be able to communicate using the following language: equally likely, less likely, more likely, occurring, occurrence, probability, chance.