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| Strand: Number | Topic: Multiplication and division |
| Foundation Level: Level statementStudents are developing a notion of counting and an awareness of number and money. Number names are becoming more meaningful. |
| Example learning outcomes:Students share a quantity of everyday objects with their peers. |
| Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically |
| Students know: ‘groups’ means making collections ‘sharing’ means everyone must be given somethingeveryday language that relates to grouping and sharing. | Students may:participate in familiar songs and games that involve making ‘groups’ and ‘sharing’participate in making piles, groups or bundles of familiar everyday objects and identify these using everyday language share objects or food among peersallocate items and know when to stop (e.g. when setting a table)use everyday language to indicate the sharing process (e.g. ‘some for you, some for me’, or ‘one for you, one for me’). |

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| Level 1: Level statement Students are developing a sense of number by knowing number names and counting in sequence. They recognise, compare, order and represent small whole numbers and use concrete materials to explore the concept of parts of a whole. They are developing an awareness of the cost of goods and recognise and represent notes and coins. Students identify and distinguish between situations that require them to add or subtract, to share equally or to create equal groups. |
| Core learning outcome: N 1.3Students identify and describe equal groups and equal sharing within everyday situations.  |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | **Core content** |
| Students know:equal means the same how to distinguish between equal and not equal groupsways to make equal groupshow to describe equal groups how to describe equal sharing. | Students may:identify a collection as a groupexplain ways of making equal groupsmake groups of equal numbers for numbers up to 10 and describe how the groups are equalidentify ways to check that groups are equalexplain ways of sharing a collection to make equal groupsshare a collection equally into a given number of groups and describe how the groups are equalidentify ways to check that each group is the same. | Multiplicationmodels and language* set (equal groups)

Divisionmodels and language* partition (sharing equally)

ConnectionsFractions and proportionMental computation strategies*Multiplication**Division*Computation methods |
| At each level, investigations should occur in a range of contexts. For example, students could investigate:groups of given numbers formed for games and musical activitieshow to deal cards resources shared equallylolly bags filled with combinations of different lollies.  |
| Level 2: Level statement Students demonstrate their developing number sense by comparing, ordering and representing whole numbers to 999 and understanding that the value of a digit in a number determines its place value. They understand that a whole can be made up of equal parts and use concrete materials to represent halves and quarters. When using money to purchase goods, they tender different combinations of notes and coins. Students are beginning to recall or work out some addition, subtraction and multiplication number facts. They use a range of computation methods, including mental, written and calculator,to solve problems. |
| Core learning outcome: N 2.3Students identify and solve multiplication and division problems involving whole numbers, selecting from a range of computation methods, strategies and known number facts. |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | **Core content** |
| Students know:* how to distinguish between situations that require multiplication or division of whole numbers
* ways of representing multiplication problems
* ways of representing division problems
* the connections between multiplication and models for division
* mental computation strategies and computation methods for solving problems involving multiplication
* how to solve multiplication and division problems involving whole numbers
* how to recall some multiplication facts.
 | Students may:* identify whether a problem requires multiplication or division and give reasons for the decision
* use calculators and appropriate materials to demonstrate that skip counting (e.g. counting in 2s or 5s) can be used for multiplication
* represent arrays in different ways (e.g. using different materials or different arrays for the same number)
* work out different representations of equal groups or equal sharing
* make connections between models for multiplication and division (e.g. represent groups on a number line)
* relate multiplication facts to division
* use a calculator to demonstrate the connections between multiplication and division
* work out relevant number facts (to x 9) using jottings as required
* recall number facts
* select and compare different computation methods that could be used to solve a problem
* explain computation methods
* use different ways to check the reasonableness of answers (e.g. calculator or alternative methods)
* create and solve simple sharing problems and simple problems requiring multiplication.
 | Multiplicationmodels and language* set (equal groups)
* area (arrays)
* linear (number lines)

multiplication facts * recall 2s, 4s, 5s and 1s to x 9

Divisionmodels and language * partition (sharing equally)
* quotition (equal groups)

Connectionsinverse (backtracking)* division undoes multiplication
* multiplication undoes division

Fractions and proportionMental computation strategies*Multiplication*to work out basic facts* skip counting
* doubles
* double doubles
* turnarounds (commutativity)

student-generatedgeneralisations about multiplication *Division*Computation methodsmental computations * exact

written recordings* language for multiplication (groups of, rows of, jumps of)
* language for division (share between, share)

calculatorssymbols for multiplication (x) and division (÷) |
| At each level, investigations should occur in a range of contexts. For example, students could investigate:organisation of items for a display, such as arranging works of art onto display boardsorganisation of marching teams or marching bands for a demonstrationways of dividing a large collection or quantity into smaller portions, such as food portions, lollies into bags for salecatering for food stalls at fetes.  |

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| Level 3: Level statement Students compare, order and represent whole numbers to 9 999, common and decimal fractions and recognise the value of each digit. They tender appropriate amounts of money for cash transactions and identify other methods of paying for goods and services. Students recall or work out all addition, subtraction and multiplication number facts and some division facts. They use a range of computation methods, including mental, written and calculator, to solve problems that involve whole numbers and decimal fractions in context. |
| Core learning outcome: N 3.3Students identify and solve multiplication and division problems involving whole numbers and decimal fractions in context, selecting from a range of computation methods, strategies and known number facts. |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | **Core content** |
| Students know:how to distinguish between multiplication and division in situations involving whole numbers and decimal fractions in contextways of representing multiplication and division problemsmultiplication and related division number factsconnections between multiplication and divisionmental computation strategies and computation methods for solving problems involving whole numbers and decimal fractions in context how to solve multiplication and division problems involving whole numbers and decimal fractions in context how to use the inverse relationship between multiplication and division to solve problemshow to recall or work out multiplication facts to x 9how to recall or work out division facts. | Students may:identify whether a problem requires multiplication or division and give reasons for the decisionexplain whether an exact or approximate solution is requireddescribe ways to represent a problemmake the whole numbers and decimal fractions manageable, as necessary, and explain the process e.g. make to the nearest thousand, nearest oneselect from a range of computation methods, strategies and known number facts to solve a problem and justify choice/sexplain connections between multiplication and divisionuse backtracking (inverse), where appropriate, to find missing factorsdetermine the reasonableness of an answer and check using a calculator or alternative methodapply mental computation strategies to extend basic facts to larger numbersidentify and describe possible computation methods and strategies appropriate for a particular problem. | **Multiplication*** models and language
* combinations of whole numbers and decimal fractions in context
* multiplication facts
* recall 2s, 4s, 5s and 1s to x 9
* work out remaining facts

**Division*** models and language
* partition (sharing equally)
* quotition (equal groups)
* involving single-digit whole number divisors
* division facts
* recall 2s, 4s, 5s and 1s
* work out remaining facts

**Connections*** inverse (backtracking)
* related multiplication and division facts
* missing factor

**Fractions and proportion*** reducing numbers by ½
* enlarging numbers by multiples of ½ (e.g. 1½)

**Mental computation strategies** *Multiplication** to work out basic facts
* double, double doubles (x 8)
* build up, build down to known facts
* turnarounds (commutativity)
* extend basic facts strategies to larger numbers
* student-generated
* generalisations about multiplication

*Division** related multiplication facts
* extend basic facts to other numbers
* student-generated
* generalisations about division

Computation methods* mental computations
* exact
* approximate
* written recordings
* student-generated
* traditional methods (single-digit whole number multipliers and divisors)
* calculators/computers

link × and ÷ with \* and / symbols |
| At each level, investigations should occur in a range of contexts. For example, students could investigate:payments for recurring events, such as comparisons between a season pass and weekly attendance at eventscosts for groups to attend performances or events (per capita payments)how to share class resources how to order beverages or craft supplies in bulkgroup bookings for outings.  |

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| Level 4: Level statement Students compare and order whole numbers and common and decimal fractions. They identify fractions expressed in different ways and make connections between common fractions, decimal fractions and percentages. They identify a range of factors such as advertising, discounts and methods of payment that may influence financial decisions. Students recall all addition, subtraction, multiplication and division number facts. They use a range of computation methods to solve problems that involve whole numbers, common and decimal fractions, percentages and rates.  |
| Core learning outcome: N 4.3Students identify and solve multiplication and division problems involving whole numbers, decimal fractions, common fractions, percentages and rates, selecting from a range of computation methods, strategies and known number facts. |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | **Core content** |
| Students know:how to distinguish between multiplication and division in situations involving whole numbers, decimal fractions, common fractions, percentages and rates multiplication and division factsdifferent representations of division mental computation strategies and computation methods and strategies for solving problems involving whole numbers, decimal fractions, common fractions, percentages and rateshow to solve multiplication and division problems involving whole numbers, decimal fractions and common fractionshow to use the inverse relationship between multiplication and division to solve problems links between common fractions, decimal fractions and percentageshow to solve problems involving percentages rates represent relationships between quantities how to solve problems involving rates. | Students may:identify whether a problem requires multiplication or division and give reasons for the decisionexplain whether an exact or approximate solution is required represent the problem in a number of ways make generalisations about rules related to multiplication and divisionidentify and describe the key components of common fractionsdetermine equivalent forms of key percentages, unit fractions (common fractions with a numerator of 1) and decimal fractions as required to assist calculations (e.g. multiply by 0.25 or ¼ to find 25% of an amount)identify situations that involve percentagessolve problems selecting from a range or combination of computation methods, strategies and known number facts and give reasons for the selectionidentify situations that involve rates and describe the rate in terms of unit per unitselect an appropriate multiplication or division method or strategy to solve problems involving ratesuse backtracking (inverse) where appropriate to find unknown values or to check answersdetermine the reasonableness of an answer and check using a calculator or alternative method. | Multiplicationwhole numberscommon fractionsdecimal fractions to hundredths recall multiplication facts to 9 x 9Divisionwhole numbers decimal fractions to hundredths recall division factsConnections relationship between division and common fractionsinverse (backtracking)Fractions and proportion *Fractions*unit fractions as operators (e.g. ⅛ of 120)vinculum for division (horizontal line separating the numerator from the denominator)links between key percentages, unit fractions and decimal fractions*Rates* simple everyday rates such as kilometres per hourMental computation strategies for beyond basic facts* extensions of all multiplication and division facts
* doubling
* halving
* student-generated
* place value
* adjusting numbers
* build up, build down

generalisations about multiplication and divisionComputation methodsmental computations * exact
* approximate

written recordings* student-generated
* traditional methods (one- and two-digit multipliers; single-digit whole number divisors)
* formats for recording division
* 13/4

  calculators, computers |
| At each level, investigations should occur in a range of contexts. For example, students could investigate:discounts on purchaseselection results in terms of the percentage of votes for candidates in an electorateimmigration statisticsrates of travel for various modes of transportthe speed at which balls, or other sporting implements, travelinterest rates for various types of bank accountsdomestic water consumption.  |

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| Level 5: Level statementStudents compare and order positive and negative integers and explain and record index notation. They interpret and use conventions for expressing rates and ratios. They identify methods of saving and investigate the factors affecting debit and credit transactions. They understand that the purchase of goods and services may attract fees or charges. Students use a range of computation methods to solve problems that involve positive rational numbers, rates, ratios and direct proportions. |
| Core learning outcome: N 5.3Students identify and solve multiplication and division problems involving positive rational numbers, rates, ratios and direct proportions, using a range of computation methods and strategies. |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | **Core content** |
| Students know:how to distinguish between multiplication and division in situations involving positive rational numbers, rates, ratios and direct proportions how to identify different representations for ratios and direct proportion to solve problems rates represent relationships between unlike quantitiesratios represent relationships between like quantitiesdirect proportion is the equivalence of two ratiosthe similarities and differences between rates, ratios and direct proportionsmental computation strategies and computation methods for solving problems involving positive rational numbers, rates, ratios and direct proportionshow to use the inverse relationship between multiplication and division to solve problems how to solve problems involving positive rational numbershow to solve problems involving rateshow to solve problems involving ratios how to solve problems involving direct proportions. | Students may:decide if an exact or approximate answer is requiredselect and justify computation methods and strategies used to solve problemsexplain the difference between rates and ratios and explain ‘rate’ as being the relationship between ‘unlike’ unitsexplain ‘ratio’ as being the relationship between ‘like’ unitsexplain ‘direct proportion’ as being the equivalence of two ratios (e.g. 1:2 and 2:4 or 2:3 and 4:6)explain the difference between ratios and direct proportionrecord ratios for different situations using the appropriate symboluse the relationship between units to calculate quantities, such as cost, number of items, or length of timber, and involve percentages as appropriatedetermine and record rates for situations where the rate is unknownpose and solve problems involving rational numbers, rates, ratios and direct proportionscheck reasonableness of solutions. | Multiplicationpositive rational numbers* whole numbers
* common fractions
* decimal fractions
* numbers with indices

Divisionpositive rational numbers* whole numbers
* common fractions
* decimal fractions

Connectionsinverse (backtracking)Fractions and proportion*Fractions*percentages, common fractions, decimal fractions*Rates*calculations involving everyday rates (e.g. mobile phone charges)*Ratio*simple everyday ratios (e.g. 1 part juice concentrate to 4 parts water) symbol for ratio ( : )*Direct proportion*calculations with direct proportion (including graphical representations)Mental computation strategiesrelevant to whole numbers, common and decimal fractions, percentages* links
* student-preferred

generalisations about multiplication and divisionComputation methodsmental computations * exact
* approximate

written recordings* student-generated
* traditional methods

calculators, computers |
| **At each level, investigations should occur in a range of contexts. For example, students could investigate:**financial transactions involving percentage discountsmeasurement situations involving area and volumescale for plans and mapsrelationships between quantities represented on graphsrecipes that require an increase or decrease in the quantities of ingredients used* handicap systems in a variety of sports.
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| Level 6: Level statementStudents compare and order rational numbers and use scientific notation as a short-hand method of representing very large or very small numbers. They develop personal plans, consider financial options and monitor financial situations using available information. Students use a range of computation methods and strategies to solve problems that involve rational numbers, rates, ratios and direct and inverse proportions. |
| Core learning outcome: N 6.3Students identify and solve multiplication and division problems involving rational numbers, rates, ratios and direct and inverse proportions using a range of computation methods and strategies. |
| **Elaborations — To support investigations that emphasise thinking, reasoning and working mathematically** | **Core content** |
| Students know:how to distinguish between situations that require multiplication, division or both and involve rational numbers, rates, ratios, direct and inverse proportions inverse proportion represents one quantity increasing while the other decreases by the same factormental computation strategies and computation methods for solving problems involving rational numbers, rates, ratios and direct and inverse proportions how to solve problems involving rational numbers how to solve problems involving rates how to solve problems involving ratios how to solve problems involving direct and inverse proportions. | Students may:decide if an exact or approximate answer is required explain inverse proportion as being when the value of one quantity increases as the quantity of the other variable decreases by the same factor explain the difference between direct and inverse proportionselect and justify computation methods and strategies used to solve problemscheck reasonableness of solutionspose and solve problems involving rational numbers, rates, ratio, direct and inverse proportions. | Multiplicationrational numbers* negative numbers (with calculator)

DivisionConnectionsinverse (backtracking) Fractions and proportion*Fractions*fractional percentages of numbers*Rates*comparisons of rates expressed in various forms*Ratio and proportion*as direct proportionas inverse proportionMental computation strategiesrelevant to rational numbersgeneralisations about multiplication and divisionComputation methodsmental computations* exact
* approximate

written recordings* student-generated
* traditional methods

calculators, computers |
| At each level, investigations should occur in a range of contexts. For example, students could investigate:media claims involving the interpretation of rates and ratios from survey and census data sporting statistics, such as run rates in cricket, split times in swimming, track events or cyclingDuckworth-Lewis method of determining the winner of a cricket matchspecific fuel consumption with variations in speedrelationships between quantities represented on graphsrelationship between speed of a skateboard or bicycle and the time taken to travel a distancethe relationship between fuel quantity remaining in the fuel tanks of an aircraft and the time spent airborneconverting imperial measures, such as in tool sizes, to metric measuresscientific laws, such as for energy or gravitydaily credit card interest ratesrequirements for sustainability of populations. |