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| Strand: Number | | Topic: Multiplication and division |
| Foundation Level: Level statement  Students 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 something  everyday 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 peers  allocate 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 1.3  Students 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 groups  ways to make equal groups  how to describe equal groups  how to describe equal sharing. | Students may:  identify a collection as a group  explain ways of making equal groups  make groups of equal numbers for numbers up to 10 and describe how the groups are equal  identify ways to check that groups are equal  explain ways of sharing a collection to make equal groups  share a collection equally into a given number of groups and describe how the groups are equal  identify ways to check that each group is the same. | Multiplication  models and language   * set (equal groups)   Division  models and language   * partition (sharing equally)   Connections  Fractions and proportion  Mental 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 activities  how to deal cards  resources shared equally  lolly 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 2.3  Students 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. | Multiplication  models and language   * set (equal groups) * area (arrays) * linear (number lines)   multiplication facts   * recall 2s, 4s, 5s and 1s to x 9   Division  models and language   * partition (sharing equally) * quotition (equal groups)   Connections  inverse (backtracking)   * division undoes multiplication * multiplication undoes division   Fractions and proportion  Mental computation strategies  *Multiplication*  to work out basic facts   * skip counting * doubles * double doubles * turnarounds (commutativity)   student-generated  generalisations about multiplication  *Division*  Computation methods  mental computations   * exact   written recordings   * language for multiplication (groups of, rows of, jumps of) * language for division (share between, share)   calculators  symbols 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 boards  organisation of marching teams or marching bands for a demonstration  ways of dividing a large collection or quantity into smaller portions, such as food portions, lollies into bags for sale  catering 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 3.3  Students 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 context  ways of representing multiplication and division problems  multiplication and related division number facts  connections between multiplication and division  mental 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 problems  how to recall or work out multiplication facts to x 9  how to recall or work out division facts. | Students may:  identify whether a problem requires multiplication or division and give reasons for the decision  explain whether an exact or approximate solution is required  describe ways to represent a problem  make the whole numbers and decimal fractions manageable, as necessary, and explain the process  e.g. make to the nearest thousand, nearest one  select from a range of computation methods, strategies and known number facts to solve a problem and justify choice/s  explain connections between multiplication and division  use backtracking (inverse), where appropriate, to find missing factors  determine the reasonableness of an answer and check using a calculator or alternative method  apply mental computation strategies to extend basic facts to larger numbers  identify 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 events  costs for groups to attend performances or events (per capita payments)  how to share class resources  how to order beverages or craft supplies in bulk  group 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 4.3  Students 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 facts  different representations of division  mental computation strategies and computation methods and strategies for solving problems involving whole numbers, decimal fractions, common fractions, percentages and rates  how to solve multiplication and division problems involving whole numbers, decimal fractions and common fractions  how to use the inverse relationship between multiplication and division to solve problems  links between common fractions, decimal fractions and percentages  how 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 decision  explain whether an exact or approximate solution is required  represent the problem in a number of ways  make generalisations about rules related to multiplication and division  identify and describe the key components of common fractions  determine 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 percentages  solve problems selecting from a range or combination of computation methods, strategies and known number facts and give reasons for the selection  identify situations that involve rates and describe the rate in terms of unit per unit  select an appropriate multiplication or division method or strategy to solve problems involving rates  use backtracking (inverse) where appropriate to find unknown values or to check answers  determine the reasonableness of an answer and check using a calculator or alternative method. | Multiplication  whole numbers  common fractions  decimal fractions to hundredths  recall multiplication facts to 9 x 9  Division  whole numbers  decimal fractions to hundredths  recall division facts  Connections  relationship between division and common fractions  inverse (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 hour  Mental 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 division  Computation methods  mental 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 purchases  election results in terms of the percentage of votes for candidates in an electorate  immigration statistics  rates of travel for various modes of transport  the speed at which balls, or other sporting implements, travel  interest rates for various types of bank accounts  domestic water consumption. | | |

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| Level 5: Level statement  Students 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 5.3  Students 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 quantities  ratios represent relationships between like quantities  direct proportion is the equivalence of two ratios  the similarities and differences between rates, ratios and direct proportions  mental computation strategies and computation methods for solving problems involving positive rational numbers, rates, ratios and direct proportions  how to use the inverse relationship between multiplication and division to solve problems  how to solve problems involving positive rational numbers  how to solve problems involving rates  how to solve problems involving ratios  how to solve problems involving direct proportions. | Students may:  decide if an exact or approximate answer is required  select and justify computation methods and strategies used to solve problems  explain the difference between rates and ratios and explain ‘rate’ as being the relationship between  ‘unlike’ units  explain ‘ratio’ as being the relationship between ‘like’ units  explain ‘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 proportion  record ratios for different situations using the appropriate symbol  use the relationship between units to calculate quantities, such as cost, number of items, or length of timber, and involve percentages as appropriate  determine and record rates for situations where the rate is unknown  pose and solve problems involving rational numbers, rates, ratios and direct proportions  check reasonableness of solutions. | Multiplication  positive rational numbers   * whole numbers * common fractions * decimal fractions * numbers with indices   Division  positive rational numbers   * whole numbers * common fractions * decimal fractions   Connections  inverse (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 strategies  relevant to whole numbers, common and decimal fractions, percentages   * links * student-preferred   generalisations about multiplication and division  Computation methods  mental 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 discounts  measurement situations involving area and volume  scale for plans and maps  relationships between quantities represented on graphs  recipes 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 statement  Students 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 6.3  Students 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 factor  mental 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 proportion  select and justify computation methods and strategies used to solve problems  check reasonableness of solutions  pose and solve problems involving rational numbers, rates, ratio, direct and inverse proportions. | Multiplication  rational numbers   * negative numbers (with calculator)   Division  Connections  inverse (backtracking)  Fractions and proportion  *Fractions*  fractional percentages of numbers  *Rates*  comparisons of rates expressed in various forms  *Ratio and proportion*  as direct proportion  as inverse proportion  Mental computation strategies  relevant to rational numbers  generalisations about multiplication and division  Computation methods  mental 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 cycling  Duckworth-Lewis method of determining the winner of a cricket match  specific fuel consumption with variations in speed  relationships between quantities represented on graphs  relationship between speed of a skateboard or bicycle and the time taken to travel a distance  the relationship between fuel quantity remaining in the fuel tanks of an aircraft and the time spent airborne  converting imperial measures, such as in tool sizes, to metric measures  scientific laws, such as for energy or gravity  daily credit card interest rates  requirements for sustainability of populations. | | |