Mathematics Progression Points: Year 6 – v8.0

Independent Schools Queensland (ISQ) has developed this version of the Progression Points to support teachers in independent schools with implementation of version 8 of the Australian Curriculum. This work has been done with support from officers at ACARA.

Teachers of Prep to Year 2 will find significant changes in English from previous versions of the Australian Curriculum – particularly with the inclusion of more specific references to phonics and phonemic awareness. Changes to the curriculum have also been made in all other year levels in both English and mathematics.

A word document version of the Progression Points is available so that teachers can rearrange the sequences of learning.

Personnel in independent schools are encouraged to consider how the Progression Points could be used to:-

* diagnose through formative assessment, the capabilities, strengths and weaknesses of individual students
* plan teaching programs to meet the needs of individuals and groups of students
* formally assess the progress of individuals and groups of students
* report to parents on the achievements of their children against the Australian Curriculum.

As with previous versions of the Progression Points, the “demonstrating” column accurately reflects the expectations of version 8 of the Australian Curriculum achievement standards – however with more detail and examples included.

ISQ welcomes any suggestions for improvement from teachers working very closely with the Progression Points.

More information

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| **Year 6 Achievement Standard**  By the end of Year 6, students [recognise](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Recognise) the properties of prime, composite, square and triangular numbers. (MKU6.1) They [describe](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Describe) the use of integers in everyday contexts. (MKU6.2) They [solve](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Solve) problems involving all four operations with whole numbers. (MKU6.3) Students connect fractions, decimals and percentages as different representations of the same number. (MKU6.4) They [solve](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Solve) problems involving the addition and subtraction of related fractions. (MKU6.5) Students make connections between the powers of 10 and the multiplication and division of decimals. (MKU6.6) They [describe](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Describe) rules used in sequences involving whole numbers, fractions and decimals. (MKU6.7) Students connect decimal representations to the metric system and choose appropriate units of measurement to perform a calculation. (MKU6.8) They make connections between capacity and volume. (MKU6.9) They [solve](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Solve) problems involving length and area. (MKU6.10) They [interpret](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Interpret) timetables. (MKU6.11) Students [describe](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Describe) combinations of transformations. (MKU6.12) They [solve](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Solve) problems using the properties of angles. (MKU6.13) Students [compare](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Compare) observed and expected frequencies. (MKU6.14) They [interpret](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Interpret) and [compare](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Compare) a variety of data displays including those displays for two categorical variables. (MKU6.15) They [interpret](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Interpret) secondary data displayed in the media. (MKU6.16)  Students [locate](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Locate) fractions and integers on a number line. (MS6.1) They [calculate](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Calculate) a simple fraction of a quantity. (MS6.2) They add, subtract and multiply decimals and divide decimals where the result is rational. (MS6.3) Students [calculate](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Calculate) common percentage discounts on sale items. (MS6.4) They write correct number sentences using brackets and order of operations. (MS6.5) Students [locate](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Locate) an ordered pair in any one of the four quadrants on the Cartesian plane. (MS6.6) They [construct](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Construct) simple prisms and pyramids. (MS6.7) Students [describe](http://www.australiancurriculum.edu.au/glossary/popup?a=F10AS&t=Describe) probabilities using simple fractions, decimals and percentages. (MS6.8) | | | | | | | | |
| **Strand** | **Emerging**  Beginning to work towards the achievement standard | **Developing**  Working towards the achievement standard | | **Demonstrating**  Demonstrating the achievement standard | | **Advancing**  Working beyond the achievement standard | | **Extending**  Extending with depth beyond the achievement standard |
| * *With explicit prompts (step-by-step oral scaffolding, concrete materials, reference to charts, etc)* * *In familiar contexts* * *Learning to follow procedures* | * *With prompts (oral or written questions, concrete materials, reference to charts, etc)* * *In familiar contexts* * *Attempts to explain* | | * *Independent (with access to concrete materials, charts, etc)* * *In familiar contexts* * *Explains basic understanding* | | * *Independent (with access to concrete materials, charts, etc)* * *Applying in familiar contexts* * *Explains with detail* | | * *Independent (with access to concrete materials, charts, etc)* * *Applying in new contexts* * *Explains with connections outside the teaching context* |
| Proficiency strands  *At this level:* | * Understanding *includes describing properties of different sets of numbers, using fractions and decimals to describe probabilities, representing fractions and decimals in various ways and describing connections between them, and making reasonable estimations.* * Fluency *includes representing integers on a number line, calculating simple percentages, using brackets appropriately, converting between fractions and decimals, using operations with fractions, decimals and percentages, measuring using metric units, and interpreting timetables.* * Problem Solving *includes formulating and solving authentic problems using fractions, decimals, percentages and measurements, interpreting secondary data displays, and finding the size of unknown angles.* * Reasoning *includes explaining mental strategies for performing calculations, describing results for continuing number sequences, explaining the transformation of one shape into another, explaining why the actual results of chance experiments may differ from expected results.* | | | | | | | |
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| **Relevant part of the Achievement Standard** | **Students recognise the properties of prime, composite, square and triangular numbers. (MKU6.1)** | | | | | | | |
| **Number and Algebra:**  Number and place value  [*ACMNA122*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA122) | **Students are beginning to:**   * **Identify** the prime numbers to 20 and explain why they are primes (e.g. say that a prime number must have exactly two factors...1 and the number itself) * **Identify and describe** the factors of many numbers and say that 2 is a factor of every even whole number. | **Students are developing the ability to:**   * **Identify** the square numbers to 100 and relate them to the associated multiplication facts (e.g. say that because we know 7 × 7 = 49, we also know that 49 is a square number) * **Identify** the factors of some numbers by recalling the divisibility rules (e.g. find a number whose digit sum is a multiple of 3 and say that 3 is a factor of that number). | | Students **independently**:   * **Identify** and **describe** properties of prime, composite, square and triangular numbers * **Represen**t composite numbers as a product of their prime factors and use this form to simplify some division calculations by cancelling common primes (e.g. when dividing 98 by 8 both numbers have a common factor (2), so the calculation can become  49 ÷ 4 without changing the result) * **Understand** that if a number is divisible by a composite number then it is also divisible by the prime factors of that number (e.g. say that if 220 is divisible by 20 then it is also divisible by its prime factors...2, 2 and 5). | | Students:   * **Identify** all of the prime numbers and describe the prime factors all of the composite numbers to 100 (e.g. say that 97 is a prime number because it has exactly two factors, but 98 is a composite number with prime factors of 2, 7 and 7). | | Students:   * **Investigate** larger prime numbers using calculators to check divisibility by larger numbers (e.g. to check whether 347 is prime, use the divisibility rules with the smaller numbers, but then use a calculator to check divisibility by 11, 13, 17 and 19 and find that 347 is prime). |
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| **Relevant part of the Achievement Standard** | **They solve problems involving all four operations with whole numbers. (MKU6.3)** | | | | | | | |
| Number and place value  [*ACMNA123*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA123) | **Students are beginning to:**   * **Use** known mental strategies to add and subtract two-digit numbers (e.g. say that 95 + 36 is the same as 100 + 31) * **Use** mental strategies to solve some multiplication and division situations with two-digit numbers (e.g. say that 45 × 4 can be worked out using the *double double* strategy to get 90 and then 180 as the answer). | **Students are developing the ability to:**   * **Identify and describe** the techniques within addition and subtraction situations that can be applied to reduce the complexity of calculations (e.g. show that 3000 – 1457 can be changed to 2999 – 1456 by making both numbers less by 1; or show that 2994 + 2877 can be written as 3000 + 2871 by making one number larger by 6 and the other smaller by 6) * **Demonstrate** that some multiplication and division techniques applied to smaller whole numbers can also be applied to larger numbers (e.g. show that when dividing by 4, the *halve and halve again* strategy can be used with both small and large numbers..76 ÷ 4..halve to get 38 and again to get 19; or 368 ÷ 4..halve to get 184 and again to get 92). | | They **independently**:   * **Select** and **apply** efficient mental and written strategies to solve problems involving all four operations with whole numbers (e.g. where mental strategies can be used they are generally faster than written methods) * **Use** appropriate digital technologies to solve problems involving all four operations with whole numbers (e.g. use calculators within problem situations to allow a closer focus on the features of the problem; practice arithmetic separately when necessary) * **Apply** a range of strategies to solve realistic problems and comment on the efficiency of different strategies (e.g. decide whether drawing a diagram would assist or whether the substitution of smaller or ‘friendlier’ numbers helps with a solution). | | Students:   * **Apply** the number properties as necessary to simplify or to check the results of calculations (e.g. say that 297 × 36 could be solved by working out 300 × 36 and then taking away 3 × 36). | | Students:   * **Investigate** methods of working out the sides of squares when given the areas of those squares (e.g. if the area of a square is 1225 mᶟ, find the prime factors of 1225....5, 5, 7 and 7...and work out that the side of the square is 35 metres). |
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| **Relevant part of the Achievement Standard** | **They describe the use of integers in everyday contexts. (MKU6.2)**  **Students locate fractions and integers on a number line. (MS6.1)** | | | | | | | |
| Number and place value  [*ACMNA124*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA124) | **Students are beginning to:**   * **Identify** everyday situations where negative numbers are used (e.g. locate cold places in the world say that some cities in Canada can have temperatures of - 30°C in winter). | **Students are developing the ability to:**   * **Identify and describe** examples of positive and negative numbers and now that these numbers are a set called the Integers (e.g. show that height above and below sea level, the scale on a thermometer and a bank balance are real life examples of integers). | | They **independently**:   * **Investigate** everyday situations that use integers (e.g. locate the use of integers in temperatures and thermometers) * **Locate** and **represent** these numbers on a number line (e.g. constructa number line that shows integers and demonstrate how it can be used to count in a positive or negative direction) * **Understand** that integers are -3, -2, -1, 0, 1, 2, 3….. * **Solve** every day additive problems using a number line * **Use** number lines to position and order integers around zero (e.g. show the symmetry of the positive and negative numbers either side of the zero point). | | Students:   * **Investigate** the use of number lines for adding integers (e.g. show that positive integers are added by moving them to the right in the number line, while negative integers are added by moving them to the left). | | Students:   * **Investigate** the use of number lines for subtracting integers (e.g. show that positive integers are subtracted by moving them to the left along the number line, while negative integers are subtracted by moving them to the right) * **Describe** the technique that applies to the addition and subtraction of negative integers and compare it to the same operations with positive integers (e.g. say that negative integers seem to operate in the opposite way to positive integers). |
| Fractions and decimals  [*ACMNA125*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA125) | **Students are beginning to:**   * **Count** using fractions with the same denominator and record the numbers on number lines * **Identify** equivalent forms including improper fractions and mixed numbers when counting in fractions (e.g. say that when is reached when counting in quarters, it can be read as 5 quarters or as 1 ). | **Students are developing the ability to:**   * **Identify and describe** proper fractions, improper fractions and mixed numbers represented using diagrams and models (e.g. say that the following diagram ●●◕ represents 11 quarters, and 2 ). | | They **independently**:   * **Compare** fractions with related denominators (e.g. say that fractions such as can be compared by changing them to a common denominator such as sixths or twelfths)- * **Locate** and **represent** fractions with related denominators on a number line * **Demonstrate** equivalence between fractions using drawings and models (e.g. construct fraction walls using computer software that represents a range of related fractions and identify pairs or groups of equivalent fractions). | | Students:   * **Investigate** fractions with larger denominators and compare them with the magnitude of the more common fractions (e.g. compare by changing both fractions to decimal form using a calculator). | | Students:   * **Investigate** fractions with uncommon denominators such as 33rds and use efficient strategies to place them on number lines (e.g. round fractions such as and place the fraction at a point just more than on a number line). |
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| **Relevant part of the Achievement Standard** | **They solve problems involving the addition and subtraction of related fractions. (MKU6.5)** | | | | | | | |
| Fractions and decimals  [*ACMNA126*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA126) | **Students are beginning to:**   * **Recognise** that counting using fractions along a number line is the same as addition (e.g. say that counting such as is the same as adding on to the previous number). | **Students are developing the ability to:**   * **Identify and describe** the different equivalent forms that numbers involving fractions can involve (e.g. show that the number can also be written as which are equivalent to ) * **Demonstrate** the equivalence of fractions using suitable models (e.g. show that all fall at the same point on a number line or that they line up exactly in a fraction wall that includes quarters, eighths and twelfths). | | They **independently:**   * **Solve** problems involving addition and subtraction of fractions with the same or related denominators * **Understand** and **demonstrate** the processes for adding and subtraction fractions with related denominators and fractions as an operator, in preparation for calculating with all fractions * **Solve** additive (addition and subtraction) problems involving fractions to develop understanding of equivalent fractions and the use of fractions as operators * **Model** and **solve** additive problems involving fractions (e.g.by using intervals on a number line or by making diagrams of fractions as parts of shapes). | | Students:   * **Investigate** efficient methods for finding the lowest common denominator for any pair of fractions (e.g. describe the link to the prime factors denominators have when finding the LCM). | | Students:   * **Develop and describe** an efficient written format for adding or subtracting fractions with related or unrelated denominators (e.g. describe each step of the procedure and explain any changes to the format of the fractions while maintaining their equivalence). |
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| **Relevant part of the Achievement Standard** | **They calculate a simple fraction of a quantity. (MS6.2)** | | | | | | | |
| Fractions and decimals  [*ACMNA127*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA127) | **Students are beginning to:**   * **Calculate** simple fractions of quantities using suitable concrete materials (e.g. count out 42 counters and work out 1 half of them by arranging the counters in two equal groups). | **Students are developing the ability to:**   * **Calculate** simple fractions of quantities by using suitable models such as circles and rectangles partitioned into fractional parts (e.g. find of 112 blocks by placing equal numbers of blocks in each of the eight identical sectors of a circle  ). | | They **independently**:   * **Find** a simple fraction of a quantity where the result is a whole number with and without digital technology * **Recognise** that finding one third of a quantity is the same as dividing by 3. | | Students:   * **Explain** the procedurefor multiplying numbers by fractions other than unit fractions (e.g. say that finding of 45 is the same as multiplying 45 by 3 then diving the answer by 5). | | Students:   * **Investigate** the procedures for finding a fraction of another fraction such as finding (e.g. show that the expression could be written on a single vinculum such as ) |
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| **Relevant part of the Achievement Standard** | **They add, subtract and multiply decimals and divide decimals where the result is rational. (MS6.3)** | | | | | | | |
| Fractions and decimals  [*ACMNA128*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA128)  Fractions and decimals  [*ACMNA129*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA129) | **Students are beginning to:**   * **Solve** simple addition and subtraction situations with decimal fractions by recording the procedures using place value charts. * **Recognise** the link between skip counting using decimal fractions and multiplication (e.g. say that the sixth step in the counting pattern...0.7, 1.4, 2.1, 2.8, 3.5, 4.2 is the same as the result of the multiplication 0.7 × 6). | **Students are developing the ability to:**   * **Identify** simple mental strategies for adding and subtracting small numbers with decimal fractions (e.g. say that 1 – 0.7 equals 0.3,  so 5 – 0.7 = 4.3 * **Explore** the repeated addition and subtraction of decimal fractions and **describe** patters that result (e.g. use a calculator to count forward from zero by 5 hundredths and say that the digits are the same as counting by 5s but they are hundredths not wholes) * **Describe** the ways that mental strategies used with whole number division can be similarly applied with the division of decimal fractions by whole numbers (e.g. say that the halve and halve again strategy when dividing by 4 can also be used with decimals...3.2 ÷ 4...halve 3.2 given 1.6, halve again to get 0.8) * **Demonstrate** how the place value names can be used to assist with the division of decimal fractions (e.g. say that the calculation 2.4 ÷ 3 can be written as 24 tenths ÷ 3 with the answer 8 tenths or 0.8). | | They **independently**:   * **Add** and **subtract** decimals, with and without digital technologies * **Use** estimation and rounding to check the reasonableness of answers * **Extend** whole-number strategies **to explore** and **develop** written strategies for addition and subtraction of decimal numbers to thousandths * **Explore** efficient methods for solving problems requiring operations on decimals * **Recognise** appropriate operations * **Multiply** decimals by whole numbers * **Perform** division by non-zero whole numbers where the results are terminating decimals (with and without digital technologies) . | | Students:   * **Investigate** the multiplication of whole numbers by decimal fractions and make predictions about the result (e.g. say that 35 × 1.1 will result in an answer just more than 35; and 48 × 0.9 will result in an answer a little less than 48) * **Investigate** the multiplication of decimal fractions by other decimal fractions (e.g. say that there is a pattern with the numbers of decimal places in the answers and when 1.5 is multiplied by 1.7, it can be written as or or 2.55 resulting in two decimal places). | | Students:   * **Investigate** the division of whole numbers by decimal fractions and make predictions about the results (e.g. say that dividing a whole number by a decimal fraction less than 1 will give a result larger than the original number) * **Investigate** the division of decimal fractions by other decimal fractions using a calculator (e.g. show that 5.52 ÷ 1.2 = 4.6 and that it is the same result as  55.2 ÷ 12) * **Investigate** the division of a particular whole number by smaller and smaller decimal fractions and comment on the result of dividing by zero (e.g. show that as the divisor gets smaller, the result becomes larger; division by zero would result in an impossibly large number – infinity – so there is no real answer to dividing by zero). |

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| **Relevant part of the Achievement Standard** | **Students make connections between the powers of 10 and the multiplication and division of decimals. (MKU6.6)** | | | | |
| Fractions and decimals  [*ACMNA130*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA130) | **Students are beginning to:**   * **Describe** the result when any whole number is multiplied by ten (e.g. say that because every digit becomes 10 times bigger, it moves a place to the left and a zero must be placed in the ones place; or say that if 45 × 10 the answer can be read as 45 tens and written as 450). | **Students are developing the ability to:**   * **Identify and describe** the result of dividing a whole number by ten (e.g. say that every digit in the number moves a place to the right and the Ones digit becomes the Tenths digit, so there is now one decimal place; so if 346 ÷ 10 the answer can be read as 346 tenths or 34.6) * **Identify and describe** the result of repeatedly dividing a whole number by ten (e.g. use a calculator to perform the calculations and record the results each time: 568 ÷ 10 = 56.8; 56.8 ÷ 10 = 5.68 5.68 ÷ 10 = 0.568 0.568 ÷ 10 = 0.0568). | They **independently:**   * **Multiply** and **divide** decimals by powers of 10 (e.g. say that 3.5 is the same as 3.5 × 100 or 350) * **Multiply** and **divide** decimals by multiples of powers of 10 (e.g. say that 6.4 × (3 × ) is the same as 6.4 × 3 × 1000 or 19.2 × 1000 = 19 200). | Students:   * **Explain** using a place value chart how multiplication and division by powers of ten works (e.g. explain the link between the size of the power and the number of place value columns that digits move). | Students:   * **Investigate** multiplication and division by larger powers of ten such as and where these kinds of very large and very small number occur). |
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| **Relevant part of the Achievement Standard** | **Students connect fractions, decimals and percentages as different representations of the same number. (MKU6.4)** | | | | |
| Fractions and decimals  [*ACMNA131*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA131) | **Students are beginning to:**   * **Identify** percentages in school activities and describe the relevance of the key percentages such as 100%, 50% and 0% (e.g. describe the link between the key percentages and test results in school and say that 100% means everything correct, 50% means half correct and 0% means nothing correct). | **Students are developing the ability to:**   * **Identify** links between some percentages and their use in daily life (e.g. say that percentages are used to show bank interest of fees and are often seen used in shopping discounts) * **Describe** the links between some key percentages, proper fractions and decimal fractions (e.g. say that if 100% means the whole or 1, then 50% will equal 0.5 and , and 25% will equal 0.25 and ). | They **independently**:   * **Make** connections between equivalent fractions, decimals and percentages (e.g. show that fractions such as halves, quarters and tenths can be represented in decimal form and as percentages) * **Connect** fractions, decimals and percentages as different representations of the same number (e.g. say that 25% can also be written as 0.25 and as ) * **Move fluently** between representations and choosing the appropriate one for the problem being solved. | Students:   * **Recognise and use** equivalent forms of fifths and eighths (e.g. say that has a decimal equivalent of 0.625 and can also be written as 62.5%). | Students:   * **Investigate** the decimal and percentage equivalents of a range of proper fractions such as sixteenths and twentieths (e.g. prepare a table that shows the three equivalent forms of numbers from ). |
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| **Relevant part of the Achievement Standard** | **Students calculate common percentage discounts on sale items. (MS6.4)** | | | | |
| Money and financial mathematics  [*ACMNA132*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA132) | **Students are beginning to:**   * **Calculate** percentage amounts based upon the link between 50% and one-half (e.g. say that if a discount of 50% was offered on a bicycle with a price tag of $180, then the new price would be $90). | **Students are developing the ability to:**   * **Identify and describe** the relationship between proper fractions and 10%, 25% and 50% (e.g. say that 10% = ; that 25% = and that 50% = ) * Calculate 10%, 25% or 50% of suitable amounts by using a mental strategy based around the equivalent proper fraction (e.g. say that 25% of $40.00 is the same as finding of $40.00). | They **independently**:   * **Investigate** and **calculate** percentage discounts of 10%, 25% and 50 % on sale items, with and without digital technologies (e.g. show how the percentage key can be used to calculate discounts on sale items) * **Recognise** that once discounts are calculated they must then be subtracted from the original price of an item to give the new sale price. | Students:   * **Generalise** about the method for finding discounts based on percentages that are multiples of ten (e.g. say that when finding 30% or 40% or 90% of an amount, find 10% or of the amount first, then multiply by the multiple). | Students:   * **Investigate** other percentage amounts including where fractions of percents such as 12.5% and 3.75% are involved (e.g. find 12.5% of an amount by using the percentage key on a calculator, or by saying it is equivalent to and dividing by 8). |
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| **Relevant part of the Achievement Standard** | **They describe rules used in sequences involving whole numbers, fractions and decimals. (MKU6.7)** | | | | |
| Patterns and algebra  [*ACMMA133*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA133) | **Students are beginning to:**   * **Identify and describe geometric** patterns (e.g. study the pattern on a checkerboard, describe how it is constructed and say how many of each square there are). | **Students are developing the ability to:**   * **Identify** **and describe** patterns such as those involving repeating numbers of shapes or colours (e.g. describe a tessellating pattern that has twice as many red as green squares and work out how many of each will be needed to cover a given surface) * **Recognise and describe** common whole number patterns including odds, evens, squares and those based around multiples of small numbers (e.g. study the sequence 6, 12, 18, 24, ...and say that it is the multiples of 6 and the next two elements are 30 and 36). | They **independently**:   * **Continue** and **create** sequences involving whole numbers, fractions and decimals (e.g. continue patterns like 12, 6, 3, 1.5, 0.75,.....for two more elements) * **Describe** the rules used to create sequences (e.g. analyse patterns to determine the rules used and describe them in simple terms) * **Identify** and **generalise** number patterns such as square and triangular numbers (e.g. recognise triangular number pattern and continue it for several more elements) * **Investigate** additive and multiplicative patterns. | Students:   * **Identify and describe** renowned patterns such as Fibonacci (e.g. say how the pattern develops and continue it as requested). | Students:   * **Investigate** patterns based around combinations of operations and **describe** the rules associated with them (e.g. write a pattern such as 2, 5, 8, 11, 14,... and work out that the rule could be × 3 – 1 and continue the pattern for two more elements). |
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| **Relevant part of the Achievement Standard** | **They write correct number sentences using brackets and order of operations. (MS6.5)** | | | | |
| Patterns and algebra  [*ACMMA134*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMNA134) | **Students are beginning to:**   * **Recognise** that some operations take precedence over others when there is more than one operation present (e.g. say that multiplication is a higher order operation than addition and should be completed first in an expression such as: 5 + 7 × 2). | **Students are developing the ability to:**   * **Identify and describe** the order of operations (e.g. say that multiplication and division are the highest order and should be completed before addition or subtraction) * **Recognise and describe** the role of brackets within number expressions (e.g. say that brackets are used when a particular calculation needs to be completed before others, even if it involves a lower order operation). | They **independently**:   * **Explore** the use of brackets and order of operations to write number sentences * **Understand** **and demonstrate** the need for rules to complete multiple operations within the same number sentences (e.g. show that different answers are possible if rules are not followed with expressions like 3 + 8 × 5; if a left-to-right strategy is used, the result is 55, but if the correct order of operations is followed, the result is 43). | Students:   * **Analyse** given number sentences and apply brackets to indicate which operations should be completed first (e.g. study 12 + 8 ÷ 4 and rewrite it as 12 + (8 ÷ 4) to highlight that division takes precedence over addition). | Students:   * **Analyse** word problems and write number sentencesthat include the use of brackets to indicate the order of operations. |
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| **Relevant part of the Achievement Standard** | **Students connect decimal representations to the metric system and choose appropriate units of measurement to perform a calculation. (MKU6.8)** | | | | |
| **Measurement and Geometry:**  Using units of measurement  [*ACMMG135*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMMG135)  Using units of measurement  [*ACMMG136*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMMG136) | **Students are beginning to:**   * **Identify** the metric units and also common parts such as halves and represent them in equivalent ways including the decimal form (e.g. say that the unit for capacity is the litre and one and a half litres can be written as  1 L or as 1.5 L) * **Identify and describe** common equivalent metric measures involving related units (e.g. say that 1000 g = 1 kg; 1000 mL = 1 L; 1000 mm = 1 m and 100 cm = 1 m). | **Students are developing the ability to:**   * **Identify and describe** the commonly used metric prefixes such as milli-, centi- and kilo-, and the role they play in defining the size of each unit (e.g. say that *milli-* means , so a millilitre will mean one-thousandth of a litre) * **Recognise and describe** equivalent forms of common decimal representations of metric units (e.g. read 1.25 kg and say that it is equivalent to 1 kg and 1250 g or 1 kg and 250 grams). | They **independently:**   * **Connect** decimal representations to the metric system * **Recognise** the equivalence of measurement (e.g. use tape measures to show that 1.25 metres and 125 centimetres are the same measure) * **Convert** between common metric units of length, mass and capacity * **Identify** and **use** the correct operations when converting units including millimetres, centimetres, metres, kilometres, milligrams, grams, kilograms, tonnes, millilitres, litres, kilolitres, megalitres (e.g. show that when changing from a small unit to a large unit, division is the correct operation) * **Recognise** the significance of the prefixes in units of measurement. | Students:   * **Identify and describe** the use ofa wider range of metric prefixes such as Deca, deci, hecto, micro, Mega and Giga and use them to describe the size of larger and smaller units (e.g. identify the use of Giga- in everyday life and say that a Gigalitre pool holds 1 billion litres) * **Generalise** about the role of the metric prefixes when converting from one unit to another (e.g. use a ordered list of the more commonly used prefixes...: *milli-  centi-  deci-  basic unit 1 deca- 10 hecto- 100 kilo- 1000* and use them like the columns of a place value chart; three steps means to multiply or divide by 10×10×10 or 1000). | Students:   * **Investigate** the use of the metric prefixes in everyday life and describe their use (e.g. identify the use of *Tb* – terabytes – in the world of computers and related hardware; identify the use of *nano* – nanoseconds – in the science and science fiction fields to describe the briefest moment) * **Investigate** some of the less common prefixes and **identify** their meanings and use as part of units (e.g. identify *peta-* and *pico-* as prefixes and that the diameter of a hydrogen atom is about 70 pm (picometers) and find out that a Petabyte is equivalent to about 13.3 years of HDTV content or nearly 60 000 movies). |
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| **Relevant part of the Achievement Standard** | **They solve problems involving length and area. (MKU6.10)** | | | | |
| Using units of measurement  [*ACMMG137*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMMG137) | **Students are beginning to:**   * **Identify and describe** the important features of perimeters of shapes and distinguish perimeters from areas (e.g. say that perimeters are lengths of boundaries and areas involve the surfaces of shapes). | **Students are developing the ability to:**   * **Identify and describe** methods for finding the perimeters of any polygon including the formulae for regular shapes and rectangles (e.g. write down and use the formula for the perimeter of any rectangle and say that for regular shapes, perimeter is found by multiplying the length of one side by the number of sides) * **Demonstrate and describe** methods for finding the areas of rectangles including squares (e.g. show with grid paper how the areas of rectangles can be calculated and provide a general method for finding the area of any rectangle). | They **independently:**   * **Solve** problems involving the comparison of lengths and areas using appropriate units * **Recognise** and **investigate** the length and area properties of familiar objects using concrete materials and digital technologies. | Students:   * **Investigate** the areas of triangles and the relationship to the areas of related rectangles (e.g. use grid paper to show that the area of a triangle that has the same base and height as a rectangle has half the area of that rectangle). | Students:   * **Investigate** the areas of parallelograms and the relationship to the areas of related rectangles (e.g. use cut and paste to show that a parallelogram and rectangle with the same base and height have the same area). |
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| **Relevant part of the Achievement Standard** | **They make connections between capacity and volume. (MKU6.9)** | | | | |
| Using units of measurement  [*ACMMG138*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMMG138) | **Students are beginning to:**   * **Identify** that there is a connection between capacity and volume and that different units are used for each (e.g. say that both capacity and volume involve the use of space, even though capacity involved liquids and volume can involve a solid or an empty space). | **Students are developing the ability to:**   * **Identify** the common metric units for capacity including millilitres and litres, and use them for measuring the volume of liquids in various containers * **Identify** the common units for measuring volume including cubic centimetres and cubic metres and work out the volumes of objects within the classroom (e.g. use 1 cm cubes to construct a shape the same size as a small box and say that 24 cubes...4 by 3 by 2...were needed, so the volume of the box is 24 cubic centimetres). | They **independently:**   * **Connect** volume and capacity and their units of measurement (e.g. show that a small plastic box can be packed with 1 cm cubes to work out its volume, but water can also be poured into the same space to measure the capacity) * **Recognise** that 1 mL is equivalent to 1 cm3 (e.g. find the volume of a plastic box by packing it with 1 cm cubes and find that if water is poured into the same space, the numbers of millilitres and 1 cubic centimetre blocks are the same). | Students:   * **Construct** a range of prisms using cubic centimetre blocks and **describe** the volumes of those shapes (e.g. construct a 10 cm by 10 cm by 10 cm cube, work out that 1000 blocks were needed, and say that the volume of the shape is 1000 cmᶟ) * **Describe** the volumes of a range of irregular shapes by immersing them in water and working out how much the water level rises (e.g. fill a graduated container to a fixed point such as the 500 mL mark, gradually lower a small rock into the water and note the difference in the new water mark). | Students:   * **Generalise** the rule for finding the volumes of prisms from their constructions (e.g. say that the number of cubes and therefore the volume of a prism is the length of the shape × the width of the shape × the height of the shape – but they must all be in the same units). |
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| **Relevant part of the Achievement Standard** | **They interpret timetables. (MKU6.11)** | | | | |
| Using units of measurement  [*ACMMG139*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMMG139) | **Students are beginning to:**   * **Create and use** a simple daily timetable to record significant events (e.g. identify the start and finish times to the school day and record the activities in order). | **Students are developing the ability to:**   * **Read and interpret** simple timetables such as a daily diary (e.g. match activities and times to check when a current event is due to finish) * **Identify and describe** the structure of simple timetables (e.g. study a timetable and say whether it uses 12-hour or 24-hour times, and what information can be found by using the timetable). | They **independently:**   * **Interpret** and **use** timetables (e.g. plan a trip involving one or more modes of public transport) * **Develop** a timetable of daily activities (e.g. prepare the timetable for a series of 15 minute parent-teacher interviews from 2:30 p.m. till 6:00 p.m. and identify sufficient families to complete the schedule). | Students:   * **Interpret and use** timetables to plan a more complex itinerary of trips and visits to significant sites over several States and Territories (e.g. plan flights, accommodation, bus transfers and tours for a two week sight-seeing trip from Queensland to NSW and ACT). | Students:   * **Investigate** the impact of the International Date Line on a trip from Brisbane to a major city in Canada (e.g. say that when a flight from Brisbane takes off at 1550 on Sunday, the time in the arrival city Vancouver will be 2150 on Saturday night – so Vancouver is 18 hours behind Brisbane). |
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| **Relevant part of the Achievement Standard** | **They construct simple prisms and pyramids. (MS6.7)** | | | | |
| Shape  [*ACMMG140*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMMG140) | **Students are beginning to:**   * **Identify and describe** the general characteristics of pyramids (e.g. say that all pyramids have triangular faces that meet at a single point at the top). | **Students are developing the ability to:**   * **Identify and describe** the general characteristics of prisms (e.g. say that all prisms have identical top and bottom faces and rectangular faces that connect them) * **Recognise** that prisms and pyramids are generally named by the shapes of their based (e.g. say that a pyramid with a square base is called a *square-based pyramid* and a prism with a pentagonal base is called a *pentagonal-based prism*). | They **independently:**   * **Construct** simple prisms and pyramids from nets, and skeletal models (e.g. work out that a skeletal model of a triangular prism needs three pairs of identical sticks for the triangular ends and three more identical sticks to connect the corresponding vertices). | Students:   * **Identify and describe** the nets of all of the common 3D shapes including prisms, pyramids, cones and cylinders (e.g. say that the nets of all cylinders are rectangular with two circular end pieces whose circumference is the same as the length (or the width) of the rectangular piece). | Students:   * **Design** the nets of various 3D shapes such as prisms, cylinders and pyramids, and explain decisions about the size and shape of the parts of the nets (e.g. say that the net of a triangular pyramid has a triangular base plus three triangular faces of the same height and each of their bases must match one of the sides of the base of the pyramid). |
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| **Relevant part of the Achievement Standard** | **Students** **describe combinations of transformations. (MKU6.12)** | | | | |
| Location and transformation  [*ACMMG142*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMMG142) | **Students are beginning to:**   * **Identify and describe** the effects of single transformations on given shapes (e.g. say that when some letters such as A, H and M are flipped they look the same, but other letters such as L, Z and P look different when flipped). | **Students are developing the ability to:**   * **Identify and describe** the effect of a pair of transformations on given shapes (e.g. say whether a pair of different transformations can bring a Z shapes back to its original orientation). | They **independently:**   * **Investigate** combinations of translations, reflections and rotations (with and without the use of digital technologies) * **Understand** and **demonstrate** how translations, rotations and reflections can change the position and orientation but not shape or size. | Students:   * **Investigate and describe** ways of using transformations to move a given shape from one quadrant of a four-quadrant grid to another (e.g. use a rotation followed by a translation to move a triangle from the first quadrant to the third). | Students:   * **Investigate** the use of transformations within everyday life such as in paintings and other artworks (e.g. study *M.C.Escher’s Horseman* and describe how the artist has used transformations). |
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| **Relevant part of the Achievement Standard** | **Students locate an ordered pair in any one of the four quadrants on the Cartesian plane. (MS6.6)** | | | | |
| Location and transformation  [*ACMMG143*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMMG143) | **Students are beginning to:**   * **Recognise and use** alphanumeric reference grids to locate spaces or points (e.g. describe how to find the space identified by the B6 reference on a grid). | **Students are developing the ability to:**   * **Identify and describe** integers on a number line (e.g. clearly distinguish between the points -5 and +5 on a number line and show that they are symmetrical around the zero point) * **Identify and describe** the Cartesian plane as a grid consisting of two perpendicular number lines that cross at the zero point (e.g. play a game of Battleships that uses pairs of integers to locate each of the ships). | They **independently**   * **Use** the Cartesian coordinate system using all four quadrants (e.g. draw some simple polygons on the Cartesian grid and identify the coordinates of each vertex) * **Understand and demonstrate** how the Cartesian plane provides a graphical or visual way or describing locations(e.g. say that in the Cartesian system, the axes are known as *x* and *y* and when naming the coordinates of a point, the *x*-value is always named first). | Students:   * **Analyse and describe** the Cartesian system and work out the coordinates of shapes such as squares (e.g. say that a square with a side length of 5 units could have vertices with coordinates of (2,4), (7,4), (2,9) and (7,9) and show that the difference in the *x-coordinates* is 5 units and the same with the *y-coordinates*). | Students:   * **Investigate** the Cartesian system and work out the coordinates of shapes such as rectangles and triangles (e.g. say that a right angled triangle could have coordinates of (3,1), (3,7) and (6,1) and then draw the shape on a grid). |

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| **Relevant part of the Achievement Standard** | **They solve problems using the properties of angles. (MKU6.13)** | | | | |
| Geometric reasoning  [*ACMMG141*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMMG141) | **Students are beginning to:**   * **Identify and describe** common angles including 60°, 45° and 30° and their relationship to right angles (e.g. show a triangle that has a right angle and two other smaller angles or 60° and 30°). | **Students are developing the ability to:**   * **Identify and describe** common angles within different formats such as in 2D shapes (e.g. say that an equilateral triangle has three angles all of 60°) * **Identify** right angles as measuring 90° and use them as a benchmark to classify acute angles and obtuse angles (e.g. using the right angle as the benchmark, identify any angle that is less than 90° and label it an acute angle). | They **independently:**   * **Investigate** angles * on a straight line * angles at a point * vertically opposite angles  (with and without digital technologies) * **Use** results of investigations to find unknown angles * **Identify** the size of a right angle as 90° and defining acute, obtuse, straight, reflex angles (e.g. using the straight angle – two right angles or 180° – as the benchmark, identify any angle that is more than 180° and label it a reflex angle) * **Measure, estimate** and **compare** angles in degrees * **Classify** angles according to their sizes * **Recognise** and **use** the two alternate conventions for naming angles (e.g. say that single angles can be named with just a capital letter - ∠A – but if there is more than one angle at that point, the three letters that make up the two arms and the point of the angle should be used - ∠BAC; say that angles within shapes can be shown with an arc to clearly indicate the angle and they can be named using small letters - ∠a ). | Students:  **Explore** the scale on a 360° protractor and use it to plan and draw reflex angles (e.g. draw one arm of the angle, place the point of the protractor on one end of the line with the 0° point on the line, trace around the scale to find an angle of 275°, mark the point and then join that mark to the end of the line; use an arc to indicate the angle of 275°). | Students:  **Explore** the scale of the 360° protractor and use it to measure a variety of different angles, including reflex angles (e.g. study given angles, identify which part needs to be measured, demonstrate the use of the scale and name the size of the angle). |

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| **Relevant part of the Achievement Standard** | **Students describe probabilities using simple fractions, decimals and percentages. (MS6.8)** | | | | |
| **Statistics and Probability:**  Chance  [*ACMSP144*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMSP144) | **Students are beginning to:**  **Identify and describe** common chance events where the outcomes are equally likely and describe the probability of each outcome as a fraction (e.g. say that when a dice is rolled each number has a chance of occurring). | **Students are developing the ability to:**   * **Identify and describe** chance situations where the probabilities can be predicted (e.g. analyse a spinner that has half red and a quarter green and the other quarter blue and say that the probabilities are , and for red/green/blue). | They **independently:**   * **Describe** probabilities using fractions, decimals and percentages (e.g. describe the probabilities of known chance events such as tossing a coin and say that the chance of a ‘head’ is or 0.5 or 50%). | Students:  **Investigate** other common chance events such as activities involving playing cards and describe the probabilities of specific outcomes (e.g. say that the chances of picking an Ace from a shuffled deck would be 4 in 52 or ). | Students:  **Investigate** the probabilities of everyday chance events such as Scratch Tickets and identify the chances of not winning a major prize (e.g. find out that up to 4 million tickets might be sold in each $1 Scratch-it game, so the chances of not winning the first prize are  3 999 999 out of 4 000 000 or 99.999%). |
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| **Relevant part of the Achievement Standard** | **Students** **compare observed and expected frequencies. (MKU6.14)** | | | | |
| Chance  [*ACMSP145*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMSP145) | **Students are beginning to:**   * **Conduct** simple chance experiments such as rolling dice and tossing coins and record the results * **Make** simple predictions about simple chance experiments and comment on the results (e.g. say that while 20 coin tosses might have resulted in 10 heads/10 tails, it actually resulted in 12 heads and 8 tails). | **Students are developing the ability to:**   * **Identify** methods of recording data from chance events that assist with the summary and organisation of the data (e.g. use tables and tally marks to quickly record and arrange the data as it is collected). | They **independently:**   * **Conduct** chance experiments with both small and large numbers of trials (also with the use of appropriate digital technologies) * **Conduct** repeated trials of chance experiments and **identify** variations between trials (e.g. conduct 10 separate experiments with the same coin where it is tossed 20 times, and note the results are not all the same) * **Realise** that the results tend to the prediction with larger numbers of trials. | Students:   * **Apply** strict conditions to the conduct of a series of chance experiments to see whether the same results can be obtained repeatedly (e.g. toss the same coin or dice in the same way over a series of 20 trials, note the results and explain any differences as purely being by chance). | Students:   * **Investigate** ways of influencing the results of chance experiments to change the outcomes (e.g. experiment with ways of tossing a coin or dice that might make the result more predictable). |
| Chance  [*ACMSP146*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMSP146) | **Students are beginning to:**  **Observe** chance events where the predicted outcomes are not matched by the actual outcomes (e.g. say that while the weather bureau predicted rain, and there were many dark clouds, no rain actually fell at the school). | **Students are developing the ability to:**  **Identify** chance experiments where the data collected does not match the expected results and attempt to describe the reasons (e.g. say that if a 6 was rolled 10 times out of 20 rolls, the dice might not be a fair one). | They **independently:**   * **Compare** observed frequencies across experiments with expected frequencies (e.g. students should identify what the expected frequencies are, link this to the probability of each outcome and compare these to the actual outcomes of experiments) * **Predict** likely outcomes from chance events and distinguishing these from surprising results (e.g. explain variations about expected and actual outcomes to changed conditions when the experiment was conducted or say that the variations are due solely to chance because the conditions were tightly controlled). | Students:  **Design and conduct** a range of chance experiments, including trials and making predictions based on the outcomes of those trials (e.g. design a bean bag tossing experiment where students try to toss a bag into a basket from a set distance; collect trial data about several students abilities, make predictions and then conduct the experiment; compare results with predictions). | Students:   * **Investigate** methods of assigning probabilities to chance events where the outcomes are not equally likely such as in a cricket context, throwing down or missing the wickets from 20 metres (e.g. design an experiment, conduct trials to find the frequency of each outcome, assign probabilities, make predictions about the outcomes of 100 trials, carry out the 100 trials, compare predicted and actual outcomes and adjust the probabilities if necessary)   **Investigate** any changes to probabilities when the conditions of the chance event are changed (e.g. find out whether halving the distance of throws at a target such as cricket wickets, changes the frequency of hits and misses and therefore the probability of each outcome). |
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| **Relevant part of the Achievement Standard** | **They interpret and compare a variety of data displays including those displays for two categorical variables. (MKU6.15)** | | | | |
| Data representation and interpretation  [*ACMSP147*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMSP147) | **Students are beginning to:**   * **Create** simple column or bar graphs to represent data about one categorical variable (e.g. construct a bar graph to illustrate data about the favourite songs of Year 6 students). | **Students are developing the ability to:**   * **Read and interpret** the data displayed using side-by-side column graphs (e.g. describe the two columns as representing the views of boys / girls and say that the data is about favourite foods). | They **independently:**   * **Interpret** and **compare** a range of data displays, including side-by-side column graphs for two categorical variables * **Compare** different student-generated diagrams, tables and graphs, describing their similarities and differences and commenting on the usefulness of each representation for interpreting the data * **Understand** and **demonstrate** how data can be represented in different ways (e.g. one symbol representing more than one piece of data, read all information about a representation before making judgements. | Students:   * **Explore** given sets of data and **explain** why some data can be sorted neatly into categories and other data needs to be organised into groups (e.g. say that categorical data tends to be just a count of the number of ‘votes’ for a favourite food, song or pet, while other data is continuous including heights or masses, and needs to be summarised or grouped such as 161 cm – 165 cm because there could be far too many individual measures to make a meaningful graph). | Students:   * **Investigate and compare** different data displays including tables and graphs to check whether the original data can be retrieved (e.g. say that data can easily be retrieved from column and bar graphs because they show a count of each category, pie graphs often show a proportion or percentage of each category, so a calculation is necessary to find numbers for each category, but is the data has been grouped as in a range of heights or masses, the actual data cannot be retrieved using only the graph). |

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| **Strand** | **Emerging**  Beginning to work towards the achievement standard | **Developing**  Working towards the achievement standard | **Demonstrating**  Demonstrating the achievement standard | **Advancing**  Working beyond the achievement standard | **Extending**  Extending with depth beyond the achievement standard |
| **Relevant part of the Achievement Standard** | **They interpret secondary data displayed in the media. (MKU6.16)** | | | | |
| Data representation and interpretation  [*ACMMG148*](http://www.australiancurriculum.edu.au/curriculum/contentdescription/ACMSP148) | **Students are beginning to:**   * **Identify** the use of graphs and tables in the media and **observe** that they might not always present a balanced viewpoint (e.g. say that a particular graph emphasises very small changes by only showing a limited section of the scale on the *y-axis*). | **Students are developing the ability to:**   * **Identify** techniques that might be used in data displays to change the meaning or the emphasis (e.g. check whether the scale begins at zero and whether the scale suit the data being displayed, check that the sample size of the data is enough to provide reliable information). | They **independently:**   * **Interpret** secondary data presented in digital media and elsewhere (e.g. study data collected by someone else, decide whether it is appropriate as support for any statements made, and decide whether additional data should be collected in a local context) * **Investigate** data representations (e.g. in the media and discuss what they illustrate and the messages the people who created them might want to convey) * **Identify** potentially misleading data representations (e.g.in the media - graphs with broken axes, non-linear scales, graphics not down to scale, data not related to the population about which the claims are made, pie charts in which the whole pie does not represent the entire population about which the claims are made). | Students:   * **Explore** data representations where techniques have been used to emphasise a specific point of view and create new representations that only represent the available data (e.g. locate a graph that has truncated the numbered scale on the *y-axis* and create a new graph with a complete scale; compare the two graphs and check whether the original point of view is still current or whether a new perspective has become apparent). | Students:   * **Investigate** data representations where data collected from a sample is used to make statements or predictions about the whole population (e.g. identify data samples such as those used by newspapers to make suggestions about the way everyone thinks by just using a sample; discuss Newspoll and similar data collections about political views, the ways that samples are chosen and how reliable they are). |