Expected Standards: C Grade Descriptors
Mathematics

Effective February 2011
Expected Standards: C Grade Descriptors

The Curriculum, Assessment and Reporting Policy requires all public school principals and teachers to make judgements of student achievement in relation to expected standards. In 2010, the Department of Education developed and released draft Expected Standards: C Grade Descriptors to assist principals and teachers in this process. The Department encouraged those who used the draft expected standards to provide feedback that would assist in validation and improvement. This consultation process has now been completed and minor amendments have been made to some learning areas. Decisions regarding ‘if’ and ‘how’ to use the expected standard descriptors continue to be made by individual schools.

The descriptors of expected standards were developed in close collaboration with focus groups of teachers. The development and review process also drew upon available data sets and Australian Curriculum Achievement Standards.

Teachers can use the Department of Education’s student A-E Exemplars to assist them to make judgements of student achievement in relation to expected standards:
- work samples that exemplify the standards associated with a ‘C’ grade are at the expected standard;
- achievement associated with the D (and where included, ‘E’) grade work samples does not meet the expected standard; and
- standards associated with the achievement of ‘A’ and ‘B’ grades exceed the expected standard.

The description of expected standards for each learning area does not attempt to encompass all of the knowledge, understandings and skills that should be taught in a particular year of schooling. Teachers may refer to the K-10 Syllabus for this information or to the Australian Curriculum, as they begin to familiarise themselves with available content. Teachers will continue to use a range and variety of assessment information collected throughout the year to determine a final grade for the purpose of reporting to parents. It is not intended that teachers use the descriptors of expected standards to assess individual pieces of work.

The descriptors of expected standards are available for Years 1-10 in English, Mathematics, Science and Society and Environment. For all other learning areas, in which learning contexts are not necessarily continuous, descriptors are available for Years 1, 3, 5, 7 and 9.

The Expected Standards: C Grade Descriptors and A-E Exemplars are accessible through the Department’s Portal and Curriculum Support website www.det.wa.edu.au/curriculumsupport.

Mathematics Learning Area

Descriptors of expected standards encompassing Number, Algebra, Measurement, Space and Chance and Data as described in the Curriculum Framework, are provided for Years 1-10. The Expected Standards: C Grade Descriptors were informed by population testing data, draft Australian Curriculum materials and the professional knowledge of experienced teachers.

In response to feedback received from teachers during 2010, the Expected Standards: C Grade Descriptors for Mathematics have been revised. Feedback from teachers throughout the consultation period has indicated that no amendments to Algebra and Chance and Data were necessary for Years K-7. The table on the next page summarises the revisions to Number, Measurement and Space. ‘Greyed’ cells indicate that no change has been made to related content.
Overview of revisions to *Expected Standards: C Grade Descriptors* - Mathematics

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Measurement</th>
<th>Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>• extent of numbers students are expected to count to and from, and use to solve problems is clarified</td>
<td>• clarification of what ‘to measure’ means as counting informal units to say how many fit</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>• inclusion of backwards counting • multiplication as repeated addition • sharing and grouping</td>
<td>• use of indirect comparison without units</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>• knowing composition of four-digit numbers no longer required • solve problems with two-digit numbers • know that subtraction is not commutative</td>
<td>• indirect comparison using units • direct comparison of area</td>
<td>• recognise rather than use symmetry</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
<td>• counting uniform units to find area • direct comparison of angle</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
<td>• use uniform units to compare area • count units to find the volume of rectangular-based objects</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>-</td>
<td>• shortcuts for finding area and perimeter • reading calibrated scales</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>• order of operations and brackets • computation with whole numbers, decimals and fractions</td>
<td>• establish formulas for area and volume</td>
<td>-</td>
</tr>
<tr>
<td>8-10</td>
<td>Several aspects of the expected standard have been revised and additional examples included to clarify the intended degree of difficulty. The order in which aspects of the standards are described also varies from the April 2010 version.</td>
<td></td>
<td></td>
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</tbody>
</table>
**Expected Standard: C Grade Descriptor – Mathematics Year 1**

By the end of Year 1, students quantify collections up to 20 by counting and they recognise collections in a familiar arrangement, such as seeing ‘ten’ as two groups of ‘five’. They say the number sequence in order to 100, and backwards from 10, and know the names of the decades. Students flexibly partition numbers to 10 and can read, write, order and model numbers into the twenties. They model and solve joining or separating situations involving small numbers and use the addition or subtraction sign to represent them. Students copy simple patterns, such as *clap, clap, turn around; clap, clap, turn around, or one green bead, two red beads; one green bead, two red beads*; and describe the repeated elements in words.

Students collect data about their world. They sort and record it with teacher guidance. Students may, for example, draw pictures of how they have sorted a collection of leaves and when asked, explain how they have grouped the leaves; or could draw a picture of their pet and when prompted, display it with those of other members of their group.

Students directly compare length, mass and capacity and use appropriate informal units to decide how many fit into, balance or match a provided object. They use hours (o’clock) to describe time. Students use everyday language to describe figures and objects, eg "This is a triangle. It has three sides and three pointy corners."

**Expected Standard: C Grade Descriptor – Mathematics Year 2**

By the end of Year 2, students use the patterns in the 1-100 sequence to count beyond 110 from any number, to count backwards from 100 and to represent collections larger than 100. They know that two-digit numbers are composed of tens and ones.

They solve problems involving addition and subtraction and use appropriate numbers and signs to represent them. They use repeated addition to represent multiplication. Students use materials or drawings to represent grouping and sharing (division) problems and use counting to solve them. They describe and continue number patterns, such as those found on a 100s chart. They recognise patterns that can be represented with the same numbers, for example, see that a pattern made with repetitions of *bead, leaf, leaf, shell, shell, shell, shell* and a pattern which shows repetitions of *clap, hop, hop, stamp, stamp, stamp, stamp*, can both be represented as a repetition of *1, 2, 4*.

Students make predictions based on previous experiences and knowledge, eg “I think it will be hard to throw a six.” They represent data in different ways, such as drawing pictures or tally marks to record the number of times a particular colour counter is chosen from a container.

Students indirectly compare length and capacity without counting units, eg to decide if their desk will fit into a space between two bookcases, they cut a length of string and use it to compare the width of the desk with that of the space; they compare the capacity of two containers by separately pouring the contents of each into a third container, marking the level of water each time and comparing the levels to decide which holds more. They choose appropriate informal units to decide *how long, how heavy* and *how many* a container holds. Students use a calendar, for example, to find the day on which their birthday will occur. They know some of the features of familiar types of figures eg “This is a rectangle because it has four sides and two of them are longer than the other two.” Students put key features from their environment on simple maps and plans, for example to show locations they pass on a drawing of their route to school, or to show the location of their desk on a plan of the classroom.
Expected Standard: C Grade Descriptor – Mathematics  

**Year 3**

By the end of Year 3, students describe the composition of three-digit numbers and use place value to read, write, order and model any number to 1000. They use numbers and symbols to represent problems based on familiar situations and solve them using place value and partitioning. They understand the range of situations that can be represented as subtraction, such as twenty take away seven, the difference between twenty and seven and twenty subtract seven which can all be represented as $20 - 7$. They solve problems involving two-digit numbers and use a calculator for computation with large numbers that they cannot work with mentally. They understand that addition is commutative and that subtraction is not. They share objects and collections into halves and quarters and use the language of one half or one quarter to describe the resulting parts. They skip count by 2, 5 and 10 and use the multiples of these numbers in a variety of situations, such as reading the time on clocks, counting money or large collections of objects. They describe a constant addition or subtraction rule in a number sequence, eg they describe the sequence 12, 16, 20, 24 as: “It starts with 12 and gets bigger by four each time.”

Students describe possible outcomes of simple chance events, such as “I could get a blue, a red or a green block from the box,” and collect, represent and interpret data in simple tables, graphs and diagrams.

Students use uniform, non-standard units to indirectly compare length, mass and capacity and say how much longer, heavier, or more something holds. They directly compare area by superimposing one surface over another. They read time to the quarter-hour on digital and analogue clocks. Students represent the location of key features on maps, plans and simple grids and recognise symmetry in designs.

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**Year 4**

By the end of Year 4, students use place value to read, write, order and model any number to 10 000. They are flexible and efficient users of mental and written strategies with one-and two-digit numbers. They use these strategies to solve problems involving addition, subtraction, multiplication or division. They use the commutative property and link addition and subtraction to solve problems where the starting quantity or change to it is unknown, for example, they think of the problem Tom had some cards. His friend gave him 8 more. Now he has 34. How many cards did Tom start with? as $? + 8 = 34$ and recognise they can solve this by working backwards and representing the situation as $34 - 8 = ?$. They recognise and describe number patterns with one operation and can find a missing term.

Students list all relevant and possible outcomes for ‘one-stage’ events, such as tossing two coins will produce two heads, or two tails, or one head and one tail. They pose questions and plan and undertake surveys. They represent their data in tables and bar graphs and describe what their data show.

Students use uniform units to indirectly compare length, mass and capacity and know the standard units associated with each of these attributes. They count uniform units to find the area of shapes and directly compare the size of angles. Students try to ensure there are no gaps or overlaps when measuring, for example, they make sure that a cup, which they are using as a unit, is filled to the same level each time. They apply their understanding of quarters and halves to problems including those involving time and angle and classify angles as being equal to, greater than, or less than a right angle. They predict the effect of flipping, sliding or turning on two-dimensional shapes and can identify the transformations in patterns, such as those found on wrapping paper or fabric.
### Expected Standard: C Grade Descriptor – Mathematics

**Year 5**

By the end of Year 5, students use place value to read, write, order and model any number into the tens of thousands and extend its use to two decimal places, for example when using money and measuring. They model and count with unit fractions and use their representations to relate commonly used fractions to their equivalent decimal or percentage representation, eg \( \frac{1}{4} = 0.25 = 25\% \). Students model problems involving addition, subtraction, multiplication or division (including money and measures) and choose efficient mental and written strategies for solving them. They represent their solutions with appropriate numbers and symbols. They know many basic multiplication facts and are beginning to link these to division. They use patterns in numbers to assist computation, for example, they work out 56 – 9 by relating to the pattern in 16 - 9 = 7, 26 – 9 = 17 and 36 - 9 = 27. They describe sequences involving more than adding or subtracting a constant amount. They write simple statements of equivalence using their knowledge of all four operations, eg \( 7 + 9 = 4 \times 4 \).

Students draw upon personal experience and the results of simple experiments involving chance to describe events as being more or less likely to happen. Students represent and interpret data in two-way tables, bar graphs, and many-to-one pictographs.

They use standard units to measure length (including perimeter), capacity, mass and time. They use uniform units to compare area and count units to find the volume of rectangular-based objects. They identify locations and use spatial language such as face, edge, vertex, prism and square pyramid to describe three-dimensional objects.

### Expected Standard: C Grade Descriptor – Mathematics

**Year 6**

By the end of Year 6, students use place value to read, write, order and model any number into the hundreds of thousands and can extend its use to hundredths. They model situations involving larger whole numbers or decimals and use numbers and symbols to represent their solutions. They add and subtract readily-visualised fractions and multiply unit fractions by a whole number multiple, for example \( \frac{1}{4} \times 28 \). Their use of multiplication extends beyond situations involving repeated addition, such as arrays, rates, combination problems and comparison problems, eg *Sam has 38 cards. Kim has six times as many. How many cards does Kim have?* They are flexible and efficient users of mental or written methods for whole numbers, fractions and decimals. They check the reasonableness of their calculations. Students conjecture a rule for a sequence and test that it works, for example when considering the following sequence, \( \text{a } \text{I} \text{I} \text{I} \text{I} \text{I} \text{I} \text{I}, \) students suggest that the rule for finding the number of blocks in the bottom row of the next shape would be "**Add two more blocks to the number of blocks in the last row.**"

Students make simple probability devices and are beginning to use numbers to describe expected outcomes, eg "*There’s a fifty – fifty chance it will be heads*," or "*There’s a one in three chance the spinner will stop on blue.*** They construct vertical and horizontal bar graphs where the frequency axis is scaled, for example, in multiples of two, five or ten.

Students find shortcuts for measuring the perimeter and area of rectangles using arrays. They read and use whole number calibrated scales where some of the marks are not labelled, for example where every fifth mark is labelled \( (5, 10, 15, 20...) \). Students attempt to include part units in their measurement of area. They visualise and connect two-and three-dimensional shapes, for example, they draw around the faces of an object to construct a net. They interpret legends and simple whole-number scales on maps.
By the end of Year 7, students use place value to read, write, order and model any number into the millions and extend its use to thousandths in practical situations, eg explaining that 0.05 L is 10 times smaller than 0.5 L and 10 times greater than 0.005 L. They model situations involving larger whole numbers, fractions and decimals using appropriate numbers and symbols. Their use of multiplication and division includes simple ratios, arrays, simple scales, combinations, products of measures and multiplicative comparisons, eg Jill has 28 marbles. How many times as many does Tanya have if she has 140? They calculate accurately with larger whole numbers, decimals and readily visualised fractions, including where problems involve more than one operation and brackets are included to indicate the order of operations. They work with negative integers in readily understood contexts, for example temperatures below zero. They use the associative property, for example (2 + 5) + 3 = 2 + (5 + 3), and distributive property, for example 2 x (3 + 4) = 2 x 3 + 2 x 4, to write equivalent statements, such as ‘an 8 x 3 rectangle covers the same area as an 8 x 2 rectangle plus an 8 x 1 rectangle’.

Students conduct systematic, data-based enquiry, choose appropriate representations, including bar graphs, histograms and line graphs and draw conclusions from data. They identify equally likely outcomes and use frequency tables to calculate probability. They establish formulas for finding the area of rectangles and right-angle triangles based on rectangles, and for the volume of rectangular prisms using cubes. They read a range of calibrated scales including decimal scales and use degrees to measure angles. Students have a sound understanding of the geometric properties of angles, triangles, and quadrilaterals and they interpret the two-dimensional views of three-dimensional objects.
Expected Standard: C Grade Descriptor – Mathematics

By the end of Year 8, students use appropriate mathematical terminology to communicate processes and solutions. They use the four operations with whole, decimal and mixed numbers in routine, inverse and word problems including finance, using suitable technology when appropriate. Students readily convert between common fractions, decimals, percentages, eg \( \frac{1}{4} = 0.125 = 12.5\% \) or \( \frac{1}{6} = 0.1666\% \). Without prompting they correctly apply the rule of order. They estimate and approximate using mental calculation skills including rounding. Students understand and find equivalent fractions, eg Find fractions that are equivalent to \( \frac{1}{4} \).

They solve routine problems involving positive and negative integers, eg in the context of differences in temperatures, and percentage increase and decrease such as calculating a discount or profit. Students calculate perimeters and areas of triangles and quadrilaterals including squares, rectangles, parallelograms and rhombuses. They calculate the surface area and volume of rectangular prisms. Given the diameter or radius, students find the area and circumference of a circle.

They construct numerical and graphical summaries of data including bar graphs, column graphs, pie graphs, histograms, line graphs, simple frequency tables and they interpret these to draw conclusions. Students calculate simple probabilities of one-step events and interpret these using their understanding of fractions, decimals and percentages. They represent the relationship between two variables graphically and interpret their representation, for example, graph height and weight data in the first quadrant and use this to conclude, eg that “\( a \) is taller than \( b \) but \( b \) weighs more than \( a \).”

They describe the linear relationship between two variables in words, connecting \( x \) with \( y \). For example they describe the relationship between posts and rails in a fencing problem where two rails are located between each post, as, “double the number of posts and subtract two to get the number of rails” or “the number of rails is twice the number of posts, take two.”

Students continue mathematical patterns, eg 150, 75, 37.5, … or 12.5, 7.5, 2.5, … and suggest a rule for connecting successive terms. They recognise algebraic conventions (notation, letters to represent numbers). They can simplify a product using index notation for whole numbers and variables, eg \( 2 \times 2 \times 2 = 2^3 \) or \( x^2 \times x^3 = x^5 \) and simplify simple expressions by collecting like terms, eg \( 2x + 3x = 5x \), \( 3x + 6 - 2x = x + 6 \). They solve simple equations, eg \( 2x + 3 = 8 \) or \( x/3 = 3 \) and evaluate simple formulas by substitution.

Students convert between common metric measures, eg 2400 g = 2.4 kg, 1200 mm = 1.2 m, = 10 000 m² = 1 hectare and units of time, eg 16.00 is 4pm and read timetables. They understand the geometric effect of scaling on two-dimensional shapes and three-dimensional objects, eg multiply the length of a given rectangle by three and write the resulting area and perimeter and know that if the dimensions are doubled the area is quadrupled or use cubes to build models that are twice the size of a given object.

Students visualise three-dimensional objects from two-dimensional representations including isometric drawings and plans. They produce orthogonal, oblique and isometric drawings for shapes built with cubes.
Expected Standard: C Grade Descriptor – Mathematics Year 9

By the end of Year 9, students use appropriate mathematical terminology to communicate processes and solutions. They use their understanding of integers and operations to solve routine problems involving number patterns, calculation of simple and compound interest, best buys and simple ratios. Students can correctly simplify expressions and use index laws to multiply and divide numbers and expressions with integer powers, eg
\[
\frac{x^2 \times x^3 \times x^3}{x^5} = x^3 \quad \text{or} \quad (x^2)^3 = x^6.
\]

Students understand and convert between the different representations of linear relationships (graphical, tabular and algebraic) and interpret these representations in context.

They calculate the area of triangles, circles, quadrilaterals and the surface area and volume of right prisms. They solve simple problems using Pythagoras’ Theorem. They have a sound understanding of linear functions and are developing fluency with simple non-linear functions, such as with patterns involving doubling.

Students plan and refine survey questions for the collection of data, calculate appropriate summary statistics (mean, mode, median and range) for ungrouped data and interpret and evaluate it, eg choose the median to evaluate house prices. They represent data in appropriate tables and graphs, including scatter graphs. They calculate probabilities of simple two-stage stage events by generating a sample space and can express them in fractions, decimals and percentages.

Students understand and use scale to interpret maps. They produce appropriate nets by visualising prisms and pyramids with given dimensions.

Expected Standard: C Grade Descriptor – Mathematics Year 10

By the end of Year 10 students use reasoning and justification to communicate their processes and solutions using appropriate mathematical terminology. They judge the reasonableness of results and evaluate the strategies and techniques used. Students perform operations with numbers and algebraic notation in problem solving situations including finance (simple and compound interest by table or spreadsheet), proportion, Pythagoras and the use of trigonometric ratios to solve routine right-angle-triangle problems. They recognise and match the algebraic, tabular and graphical representations of simple quadratic, exponential and reciprocal functions paying attention to details such as simple transformations. Students draw up a table and plot values given any equation in form \( y = f(x) \). They solve simultaneous linear equations graphically.

Students calculate the volume of spheres, prisms and pyramids. Given the required dimensions, they calculate the surface area of prisms and pyramids.

Students choose appropriate numerical, technological and graphical techniques to generate sample spaces, and determine probabilities for two-stage, linked events, eg determine the probability of selecting a particular coloured ball from a bag of different coloured balls, without replacement. They conduct systematic data-based enquiry using bi-variate data. They draw conclusions from graphical representations of bi-variate data regarding the strength of the relationship between the variables. Students are able to draw a line of best fit, by eye, and use this to make predictions.

Students draw accurate scale drawings, such as a map or a plan, and they can use a provided scale to calculate actual distances.