DRAFT NATIONAL MATHEMATICS CURRICULUM
Selected Statements

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The following statements and proposals are taken from the draft National Mathematics Curriculum (version 1.0.1). We find all of them troublesome: either substantially wrong or seriously misguided, or simply clumsy up to the level of pointlessness or meaninglessness.

This compilation does not address our other major concerns with the draft Curriculum: extremely poor writing; critical omissions; a relentless advocacy of calculators and other "technology"; splintering of topics; a preponderance of oversold "real life" applications at the expense of ideas; an under-emphasis of proof; an inappropriate weighting upon statistics; an emphasis upon vaguely defined exploration at the expense of clearly defined skills and knowledge; a lack of concern for fun or beauty; an overall lack of focus or purpose or meaning.

We regard the systemic nature of these problems as compelling evidence that the responsible committee lacks either the required focus or mathematical expertise to compose a satisfactory mathematics curriculum. Thus, we believe that the only reasonable response to the draft Curriculum is to recommend it be thrown out, and to begin again with a committee exhibiting substantially greater mathematical expertise and insight.

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Headings refer to section of the draft Curriculum. Bold statements are Key.

RATIONALE/AIMS

"Digital technologies are contributing to this expansion of [mathematical] ideas and provide access to new tools for continuing mathematical exploration and invention."

"and in English, deriving quantitative and spatial information is an important aspect of making meaning of texts."

CONTENT STRANDS

"They recognise equivalence and solve equations and inequalities."

"It is expected that mathematics classrooms will make use of all available ICT in teaching and learning situations. Notwithstanding this, there will be occasions where teachers will ask students to undertake tasks without using the technology. For example, it is still important for students sometimes to make geometric constructions using a ruler and compass or to work out calculations using mental or written strategies."

"Intercultural understanding can be enhanced if students are exposed to other cultures' view of mathematics, for example, through examining Aboriginal and Torres Strait Islander peoples' perceptions of time and weather patterns, the networks embedded in family relationships and the algebraic concepts inherent in storytelling. It is equally important for mathematics classes to explore the influences and contributions of many cultures, from the early work on geometry by the philosophers of ancient Greece to the origins of algebra that can be found in ancient Indian mathematics."

IMPLICATIONS FOR TEACHING AND LEARNING

"The idea of using symbols as a way of generalising relationships can be enhanced by drawing on the perspectives of Indigenous Australians."

"The cross-curriculum dimension of commitment to sustainable living and the knowledge and understandings related to Asia and Australia's engagement with Asia provide engaging and rich contexts for mathematics learning."

"numeracy can be understood and acquired only within the context of the social, cultural, political, economic and historical practices to which it is integral. Students need to be able to draw on quantitative and spatial information to derive meaning from certain types of texts encountered in the subject of English."

KINDERGARTEN (PREP)

“using a calculator to develop understanding of counting patterns (eg count by adding 1 each time, beginning with 0 and press +1 = = repeatedly)”

YEAR 1

“using a calculator to increase understanding of counting patterns (eg count by adding 2 each time, beginning with 0 and press +2 = = repeatedly)”

“splitting an object into two equal pieces, such as folding a kindergarten square, and describing how the pieces are equal, that each part is a half and that there are different ways of doing this, all being equivalent”

“demonstrating understanding that additive situations involve addition and/or subtraction and that these two operations are inverses and can undo each other”

recognising that additive situations involving subtraction can be classified as either takeaway (eg 'I have 12 peanuts. I eat 4 peanuts. How many do I have left?') or as difference (eg 'I have 12 peanuts and you have 4 peanuts. What is the difference between the number of peanuts that we have?')

YEAR 2

“Say, understand and reason with number sequences increasing by twos, fives and tens from any starting point including using calculators”

“Recognise, model and represent numbers to 130, and read, write and order those numbers”

“Model, represent and make connections between simple additive situations, solving them using efficient written and calculator strategies and explaining the choice of strategy”

“Model, represent and make connections between simple multiplicative situations such as groups of, arrays, sharing, solving them using efficient mental and written strategies and calculators and explaining their choice of strategy”

“recognising that these two types of multiplicative situations (groups and arrays) are both similar and different, and that it is helpful to understand the way that situations can be modelled and represented”

“Predict and draw the effect of 1-step sliding, flipping and turning of familiar shapes and objects including using digital technology and identify half and quarter turns from any starting point”

“solving a variety of multiplicative problems by imagining the situation and selecting the appropriate operation to key into a calculator to solve the problem and explain reasoning”

“recognising that describing patterns is one of the key aspects of learning mathematics, and lays the foundations for later study of algebra”

“using ICT to create flips, slides and turns of graphics in a word document”

“using the constant addition function on a calculator and describing the patterns observed”

“By the end of Year 2, students are able to understand the sequence of numbers to 130, recognising patterns in units of 10 and 100.”

YEAR 3

“investigating, describing and recording the effects of counting by twos, fives and tens from any starting point (eg by using equipment such as calculators, number lines and hundreds charts)”

“Model, represent and solve problems involving additive situations using efficient mental and written strategies and calculators”

“Measure and compare areas using uniform informal units, explaining reasoning in everyday language”

“exploring and developing increasingly efficient mental, written and calculator strategies for representing and solving problems involving additive (addition and subtraction) situations”

“Model, represent and solve problems involving multiplicative situations including 'for each' and 'times as many' using efficient mental and written strategies and calculators”

“Create angles and recognise that equivalence in angles such as two quarter turns is the same as a straight angle”

“exploring and developing increasingly efficient mental, written and calculator strategies for representing and solving problems involving multiplicative situations”

“demonstrating the inverse relationship between multiplication and division (ie that multiplication by a number followed by division by the same number results in no change to the original number)”

“using the distributive law to assist with multiplication and division calculations (eg 10 × 5 = 50, and three more fives make 65 so 65 ÷ 5 = 13; 5 × 7 is the same as 2 × 7 plus 2 × 7 plus one more 7, so 5 × 7 = 14 + 14 + 7 which is 35)”

“Understand and become fluent with addition and related subtraction facts to 10 plus 10 and multiplication facts of 1, 2, 5 and 10”

“generating and recording number patterns in number sequences, such as by using the constant function on a calculator 4 + 5 = = = to generate the pattern 9, 14, 19, 24, 29 and noticing that the units digit alternates between 4 and 9”

“They apply this understanding to choose efficient strategies (mental, written and calculator) to solve problems in everyday situations.”

YEAR 4

“investigating, describing and recording number sequences involving repeated addition or subtraction of numbers including 2, 5 and 10, and, relating the numbers in the sequence to the repeated addend and number of additions or subtractions (eg repeatedly adding rows of five to created an array and recognising 20, the 4th number in the sequence 5, 10, 15, 20, 25, 30 …, as the product of 5 (the repeated addend) and 4 (the number of fives that have been added))”

“(ie saying that the number of triangular faces on a pyramid is the same as the number of sides on the base of the pyramid)”

“exploring everyday uses of fractions to develop understanding of equivalent fractions”

“explaining the meanings of volume and capacity and being able to differentiate between these attributes (eg by saying the volume of this box is 10 units because it took 10 cubes to completely fill it but its capacity is 1 cup of water)”

“(eg a box of assorted chocolates was shared equally between eight children and three children received the only caramel chocolates.”

“Understand fractions as rational numbers”

“Understand and become fluent with multiplication facts and related division facts of 2, 3, 5 and 10 extending to 4, 6, 8 and 9”

“identifying that angles have arms,”

“Select, explain, justify and apply mental, written strategies and use calculators to solve problems involving addition, subtraction and multiplication with one- and two-digit numbers and division by one digit numbers without remainders”

“applying a range of mental and written strategies and the use of calculators to develop efficient strategies for calculation”

“understanding that being able to visualise combinations of shapes, without having to actually combine them, is a useful life skill, as is being able to consider all of the possibilities of arrangements of particular shapes”

YEAR 5

“extending the place value pattern of grouping in tens from whole numbers to tenths and hundredths (eg by using equipment such as place value blocks and the constant function place value blocks and the constant function on calculators to perform 100 ÷ 10 = = =)”

“understanding that there are equivalences between fractional, decimal and percentage representations of numbers and that choosing the form judiciously can aid in solving problems”

“using equivalences with fractions to calculate 50%, 25% and 10% of quantities”

“understanding that reading scales on measuring instruments is critical for measurement”

“Explore different ways of calculating perimeter and area of rectangles and volume of rectangular prisms using metric units”

“exploring efficient ways of finding the areas of rectangles, such as saying that a 4 by 3 rectangle on a square centimetre grid has three rows of four squares making the area 12 square centimetres;”

“solving realistic additive problems involving fractions to develop understanding of equivalent fractions and the use of fractions as operators”

“exploring efficient ways of finding the volumes of rectangular prisms”

“using equivalence to add and subtract fractions with related denominators,”

“identifying and generalising number patterns as a beginning of algebraic thinking”

“writing word rules that link the value of a variable to a position in a pattern”

“using informal symbols to describe rules for functional relationships”

“investigating and describing properties of whole numbers and relationships between various types of numbers to develop the ability to reason about numbers and solve problems”

“Visualise, demonstrate and describe the effects of translations, reflections, and rotations of two-dimensional shapes and describe line and simple rotational symmetry, including using ICT”

“They use measurements effectively including time and can devise and use efficient ways of calculating perimeter, area and volume.”

YEAR 6

“Apply multiplication and related division facts to solve realistic problems efficiently using mental and written strategies and calculators justifying the reasonableness of answers and explaining reasoning”

“extending and consolidating place value understanding to three decimal places to begin to develop an appreciation of the continuous nature of the set of real numbers”

“identifying that angles have arms and a vertex, and the size is the amount of turn required for one arm to coincide with the other; the size is measured in degrees with a protractor using the two alternate conventions for naming angles”

“understanding that rates are particular ratios between quantities measured in different units, such as speed is the ratio distance : time and pricing rate is cost”

“Describe patterns in terms of reflection and rotational symmetry, and translations including identifying equivalent transformations using ICT”

“understanding and using the fact that equivalent division calculations result if both numbers are multiplied or divided by the same amount”

“comparing and ordering fractions by identifying equivalent representations with like denominators, such as identifying the larger of 3/ 4 and 2/3 by recognising that 3/4 is equivalent to 9/ 12 and 2/3 is equivalent to 8 / 12, ie constructing a 4 × 3 array to represent both quarters and thirds and using it to show that 3/ 4 = 9/12 and 2/3 = 8/12”

“understanding that some numbers have special properties and that these properties can be used to solve problems”

YEAR 7

"Order, add and subtract integers fluently and identify patterns for multiplication and division including using ICT"

"Understand and become fluent with written, mental and calculator strategies for all four operations with fractions, decimals and percentages"

"using appropriate manual and ICT techniques to establish that the area of any triangle is half the area of an appropriate rectangle and using the formula A = ½bh where b is the base and h is the perpendicular height of the triangle"

"understanding that arithmetic laws are powerful ways of describing and simplifying calculations and that using these laws leads to the generality of algebra"

"understanding that the laws that apply to number can be generalised using variables"

"representing equivalences with algebraic equations, to begin to understand the use and meaning of algebraic notation"

"using variables to symbolise simple linear equations and using a variety of strategies to solve them"

"solving real life problems by using pronumerals to represent the unknown, writing an equation, estimating the answer, solving and checking solution"

YEAR 8

"understanding that index laws apply to variables as well as numbers"

"using division or patterns to explain the meaning of an index of zero and confirming this is consistent with the division rule for indices"

"recognising terminating, recurring and non-terminating decimals and choosing their appropriate representations"

"working fluently with a range of strategies, including the use of calculators and technology, for multiplying and dividing fractions and decimals"

"Investigate the relationship between features of circles such as circumference, area, radius and diameter and generalise these to solve problems involving circumference and area"

"determining whether a simplified expression is correct by substituting numbers for variables"

"generalising word problems to create linear equations and functions and solving the problem in a number of ways, such as algebraically, by using a table of values or by graphing the function using technology"

"Plot graphs of linear functions and use these to find solutions of equations including using ICT"

"comparing graphs of linear functions using technology, identifying similarities and differences and relating these to the equations of the graphs, such as noticing that parallel lines have the same gradient and that the y-intercept is represented by the constant term b in the gradient intercept form of the straight line $y = mx + b$"

YEAR 9

"Solve problems in financial mathematics including applications of simple and compound interest including using ICT and judge reasonableness of results"

"Investigate properties of polygons and circles, including lines and angles, forming generalisations, explaining reasoning and solving problems"

"using technology and other techniques to investigate relationships between lines, angles and circles"

"recognising that right-angled triangle calculations may generate results that can be integral, fractional or irrational numbers known as surds"

"using ICT to explore Pythagorean triples and reasoning that multiples of a Pythagorean expressions with indices to illustrate the triple will produce a Pythagorean triple"

"connecting different strategies for simplifying expressions with indices to illustrate the meaning of negative indices, such as applications of index laws $x^2 \div x^5 = x^{-3}$"

"Solve problems involving linear simultaneous equations, using algebraic and graphical techniques including using ICT"

YEAR 10

"Solve problems in financial mathematics including ones using recursive techniques, and extend these techniques to investigate growth and decay including using ICT"

"choosing suitable strategies, such as applications of the formula or appropriate software, to compare the effects of changing the length of the compounding periods on the future value of an investment or loa,n [sic] and justifying the choice of investment or loan"

"recognising that direct proportion where both variables are linear, can be represented by a straight line graph of the form y = mx,"

"recognising that inverse proportion where both quantities are linear can be represented by a graph of the form y = a/x using graphical strategies to find the constant of proportionality"

"developing fluency with coordinate geometry calculations to lay the foundation for connecting graphical and analytical representations using graphical techniques, including investigations with dynamic software, to find the distance between two points on a number plane, recognising the formula as an application of Pythagoras' theorem and choosing an appropriate strategy, such as applying the formula to find distance"

"using graphical techniques, including investigations with dynamic software, to find the midpoint of an interval joining two points on the number plane, identifying the x and y coordinates of the midpoint as being the average of the x and y coordinates of the two points respectively and using an appropriate strategy, such as applying the formula, to find the coordinates of the midpoint"

"recognising that two events are mutually exclusive if they are disjoint,"

"using a range of strategies, including appropriate technology, to investigate the effect of multiplying by a constant term, including negative numbers connecting the graphical and algebraic representations and describing the resulting transformation"

"Solve non-linear equations algebraically and graphically and using technology"

"solving quadratic equations such as $x - 4 = 0$, $x^2 - 3x - 4$ and simultaneous equations such as $y = x^2$ and $y = 4x - 4$ including using technology"

YEAR 10A

“understanding that the real number system includes irrational numbers and that certain subsets of the real number system have particular properties”

“understanding that rational numbers can be multiplied and divided by other rational numbers, and irrational numbers can be multiplied and divided by other irrational numbers, and simplifying expressions involving multiplication and division of surds”

“solving simple exponential equations such as $2^x = 8x - 1$”

“understanding that trigonometric functions are periodic and that this can be used to describe motion”

“Solve a wide range of quadratic equations and construct graphs of parabolas and circles”

“using a range of strategies, including appropriate technology, to construct parabolas of the form $y = ax^2 + bx + c$”