



Newton Moore Senior High School

Mathematics

Year 8

2016



Course Description

The proficiency strands understanding, fluency, problem-solving and reasoning are an integral part of mathematics content across the three content strands: number and algebra, measurement and geometry, and statistics and probability. The proficiencies reinforce the significance of working mathematically within the content and describe how the content is explored or developed. They provide the language to build in the developmental aspects of the learning of mathematics. The achievement standards reflect the content and encompass the proficiencies.

At this year level:

- understanding includes describing patterns involving indices and recurring decimals, identifying commonalities between operations with algebra and arithmetic, connecting rules for linear relations with their graphs, explaining the purpose of statistical measures and explaining measurements of perimeter and area
- fluency includes calculating accurately with simple decimals, indices and integers; recognising equivalence of common decimals and fractions including recurring decimals; factorising and simplifying basic algebraic expressions and evaluating perimeters and areas of common shapes and volumes of three-dimensional objects
- problem-solving includes formulating and modelling practical situations involving ratios, profit and loss, areas and perimeters of common shapes and using two-way tables and Venn diagrams to calculate probabilities
- reasoning includes justifying the result of a calculation or estimation as reasonable, deriving probability from its complement, using congruence to deduce properties of triangles, finding estimates of means and proportions of populations.

Number and Algebra

- Use index notation with numbers to establish the index laws with positive integral indices and the zero index.
- Carry out the four operations with rational numbers and integers, using efficient mental and written strategies and appropriate digital technologies.
- Investigate terminating and recurring decimals
- Solve a range of problems involving rates and ratios, with and without digital technologies.
- Solve problems involving the use of percentages, including percentage increases and decreases, with and without digital technologies.

Measurement and Geometry

- Choose appropriate units of measurement for area and volume and convert from one unit to another.
- Find perimeters and areas of parallelograms, trapeziums, rhombuses and kites.
- Investigate the relationship between features of circles such as circumference, area, radius and diameter. Use formulas to solve problems involving circumference and area.

- Develop formulas for volumes of rectangular and triangular prisms and prisms in general. Use formulas to solve problems involving volume.
- Solve problems involving duration, including using 12- and 24-hour time within a single time zone.

Statistics and Probability

- Identify complementary events and use the sum of probabilities to solve problems.
- Describe events using language of 'at least', exclusive'.
- Represent events in two-way tables and Venn diagrams and solve related problems .
- Data representation and interpretation.
- Investigate techniques for collecting data, including census, sampling and observation.
- Explore the practicalities and implications of obtaining data through sampling using a variety of investigative processes.

Course Outline

		AC Content Elaborations		General
Term 1	1	Statistics & Probability	<p><i>ACMSP169</i> Identify & investigate issues involving numerical data collected from primary & secondary sources</p> <p><i>ACMSP170</i> Construct & compare a range of data displays including stem-&-leaf plots & dot plots</p> <p><i>ACMSP206</i> Explore the practicalities & implications of obtaining data through sampling using a variety of investigative processes</p> <p><i>ACMSP284</i> Investigate techniques for collecting data, including census, sampling & observation</p>	<p><u>"Getting to Know You"</u></p> <ul style="list-style-type: none"> • Collect data • Display data <ul style="list-style-type: none"> ○ tally table vs. frequency tables, ○ dot plots, ○ stem & leaf plots (inc. double), ○ pictographs, ○ column/bar graph vs. histogram ○ line graphs ○ pie graphs
	2		<p><i>ACMSP171</i> Calculate mean, median, mode & range for sets of data. Interpret these statistics in the context of data</p> <p><i>ACMSP172</i> Describe & interpret data displays using median, mean & range</p> <p><i>ACMSP293</i> Explore the variation of means & proportions of random samples drawn from the same population</p> <p><i>ACMSP207</i> Investigate the effect of individual data values, including outliers, on the mean & median</p>	<p><u>Statistics</u></p> <ul style="list-style-type: none"> • Analyse data (mean, mode, median, range) • Investigate effect of outliers • Investigate data from external sources
	3-4	Number & Algebra	<p><i>ACMNA149</i> Investigate index notation & represent whole numbers as products of powers of prime numbers</p> <p><i>ACMNA150</i> Investigate & use square roots of perfect square numbers</p> <p><i>ACMNA280</i> Compare, order, add & subtract integers</p> <p><i>ACMNA151</i> Apply the associative, commutative & distributive laws to aid mental & written computation</p> <p><i>ACMNA183</i> Carry out the four operations with rational numbers & integers, using efficient mental & written strategies & appropriate digital technologies</p>	<p><u>Real Number system</u> Define sets of numbers – whole, counting, rational, irrational, integer</p> <p><u>Whole Numbers and Integers</u></p> <ul style="list-style-type: none"> • Place value –whole numbers • Calculation and mental strategies-whole • Factors, Multiples and primes • Define square numbers (index & base) • Represent square numbers as grids of squares (up to 12², inc. 20²) • Introduce square root & apply to perfect square numbers <p><u>Order of Operations</u></p> <ul style="list-style-type: none"> • Review order of operation for the four operations (mental & written) • Extend order of operation to include brackets • Extend order of operation to include indices – introduce BMDAS • Indices greater than 2

Term 1	5-7	Number & Algebra		<p><u>Negative Numbers</u></p> <ul style="list-style-type: none"> Identify situations where negative integers & zero are used Review number line & placement of negative numbers Calculating with negative numbers
				<p><u>Decimals & Fractions</u></p> <ul style="list-style-type: none"> Understanding of fraction Placing fractions & decimals on a number line Converting decimals to fractions Converting fractions to decimals, including idea of terminating & recurring Rounding Making connections between equivalent fractions & decimals Add and subtract fractions and decimals Multiplication/Division <ul style="list-style-type: none"> By powers of 10 to whole numbers and decimals By multiples of 10 Decimal-decimal Fractions
			<p><u>Percentages</u></p> <ul style="list-style-type: none"> Understanding of percentage as "out of 100" Placing fractions, decimals & percentages on a number line Converting decimals to fractions to percentages, including idea of terminating & recurring 	
	8-9		<p><i>ACMNA152</i> Compare fractions using equivalence. Locate & represent positive & negative fractions & mixed numbers on a number line</p> <p><i>ACMNA153</i> Solve problems involving addition & subtraction of fractions, including those with unrelated denominators</p> <p><i>ACMNA154</i> Multiply & divide fractions & decimals using efficient written strategies & digital technologies</p> <p><i>ACMNA155</i> Express one quantity as a fraction of another, with & without the use of digital technologies</p> <p><i>ACMNA156</i> Round decimals to a specified number of decimal places</p> <p><i>ACMNA157</i> Connect fractions, decimals & percentages & carry out simple conversions</p> <p><i>ACMNA183</i> Carry out the four operations with rational numbers & integers, using efficient mental & written strategies & appropriate digital technologies</p> <p><i>ACMNA184</i> Investigate terminating & recurring decimals</p>	<p><u>Percentage Change</u></p> <ul style="list-style-type: none"> Explore idea of percentages greater than 100% Calculate percentage of quantities Express one quantity as a percentage of another ie. $\frac{4}{5} = 80\%$ Percentage increase Percentage decrease Discounts Commissions Profit & loss (inc. discussion GST)

Term 2	1-2	←	<i>ACMMG159</i>	<u>Perimeter & Area</u>
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3		<p><i>Establish the formulas for areas of rectangles, triangles & parallelograms & use these in problem solving</i> ACMMG195 Choose appropriate units of measurement for area & volume & convert from one unit to another ACMMG196 Find perimeters & areas of parallelograms, trapeziums, rhombuses & kites</p>	<ul style="list-style-type: none"> Choosing appropriate units Unit conversions Revise perimeter & area formula for squares, rectangles & triangles – apply practical situations allowing students to choose appropriate units & convert between units Introduce formula for perimeter & area of parallelograms, rhombuses, kites & trapeziums Area of composite shapes
		<p>ACMMG197 Investigate the relationship between features of circles such as circumference, area, radius & diameter. Use formulas to solve problems involving circumference & area</p>	<p><u>Circles</u></p> <ul style="list-style-type: none"> Revise parts of a circle Practical activity: draw & measure circles to derive circumference & diameter then calculating circumference divide diameter to derive pi Introduce formula for area of circle – compare to circumference formula
		<p>ACMMG199 Solve problems involving time duration, including using 12 & 24 hour within a single time zone</p>	<p><u>Time</u> Reading times in 12 and 24 hour time Reading timetables and understanding time taken; elapsed time for journeys Time zones-Australia & Asia</p>

Term 2	5	Number & Algebra	<p>ACMNA182 Use index notation with numbers to establish the index laws with positive integral indices & the zero index</p>	<p><u>Index Laws</u></p> <ul style="list-style-type: none"> Revise indices of whole numbers & extend to include the zeroth index law ($a^0=1$) Introduce each index law <ul style="list-style-type: none"> $a^m \times a^n = a^{m+n}$ $a^m \div a^n = a^{m-n}$ $(a^m)^n = a^{m \times n}$ $a^1 = a$ $a^0 = 1$ (if $a \neq 0$)
	6-8		<p>ACMNA175 <i>Introduce the concept of variables as a way of representing numbers using letters</i> ACMNA176 <i>Create algebraic expressions & evaluate them by substituting a given value for each variable</i> ACMNA177 <i>Extend & apply the laws & properties of arithmetic to algebraic terms & expressions</i> ACMNA179 <i>Solve simple linear equations</i> ACMNA192 Simplify algebraic expressions involving the four operations ACMNA194 Solve linear equations using algebraic & graphical techniques. Verify solutions by substitution</p>	<p><u>Algebra Rules & Expressions</u></p> <ul style="list-style-type: none"> Writing rules – word rules, algebra rules Following rules Concept of pronumerals Substitution – input/output Create tables of data from a linear rule Derive linear rules from tables of data Linear relationships (factors, multiples, etc.) Backtracking <p><u>Solving Equations</u></p> <ul style="list-style-type: none"> Balanced equations – show how equations remain balanced by performing the same operation on both sides Equations with one unknown <ul style="list-style-type: none"> single-step equations, two-step equations, equations with variables on both sides
	9-10		S & P	<p>ACMSP167 <i>Construct sample spaces for single-step experiments with equally likely outcomes</i> ACMSP168 <i>Assign probabilities to the outcomes of events & determine probabilities for events</i></p>

Term 3	1	Number & Algebra	<p>ACMNA153 Solve problems involving addition & subtraction of fractions, including those with unrelated denominators</p> <p>ACMNA154 Multiply & divide fractions & decimals using efficient written strategies & digital technologies</p> <p>ACMNA155 Express one quantity as a fraction of another, with & without the use of digital technologies</p>	<p><u>Fractions</u></p> <ul style="list-style-type: none"> Revise fractions Compare fractions Calculate fractions using four operations Solving problems Express one quantity as fraction of another
	2		<p>ACMNA173 Recognise & solve problems involving simple ratios</p> <p>ACMNA188 Solve a range of problems involving rates & ratios, with & without digital technologies</p>	<p><u>Ratios</u></p> <ul style="list-style-type: none"> Introduce meaning of ratio & everyday examples (investigate) Compare & contrast use of fractions, percentages & ratios to describe groups containing items in two different categories Calculate fractions, percentages & ratios of items in group Calculate ratios given from two fractions that make a whole Simplify ratios by a common factor Equivalent ratios Increase quantities in a recipe for increased number of people
	3		<p>ACMNA174 Investigate & calculate 'best buys', with & without digital technologies</p> <p>ACMNA180 Investigate, interpret & analyse graphs from authentic data</p> <p>ACMNA188 Solve a range of problems involving rates & ratios, with & without digital technologies</p>	<p><u>Rates</u></p> <ul style="list-style-type: none"> Investigate meaning of rates Identify common examples of rates (i.e. heart rate, interest rate) Calculate & measure rates Extend concept of rates that do not include time Best buys Speed/distance/time Explore how rates are represented on travel graphs Construct travel graphs from word descriptions & extract rates from travel graphs

Term 3	4	Measurement & Geometry		<p><u>Plotting Cartesian Coordinates</u></p> <ul style="list-style-type: none"> Revise coordinates Introduce Cartesian plan & coordinates, & define x-axis, y-axis, co-ordinates & quadrants Practice plotting Create & analyse line graphs from real data sets
	5		<p>ACMMG181 Describe translations, reflections in an axis, & rotations of multiples of 90° on the Cartesian plane using coordinates. Identify line & rotational symmetries</p> <p>ACMMG200 Define congruence of plane shapes using transformations</p>	<p><u>Transformations & Symmetry</u></p> <ul style="list-style-type: none"> Translation, reflection & rotation Apply translation to translation of points on the Cartesian plane Translate geometric shapes on Cartesian plane by translating co-ordinates of each of the vertices Line of symmetry Reflect geometric shapes across line of symmetry by reflecting the Cartesian coordinates of each vertice Rotate geometric shapes by 180 & 90 degrees around a point on Cartesian plane Identify combinations of three transformations & draw objects after more than one transformation.
	6		<p>ACMMG163 Identify corresponding, alternate & co-interior angles when two straight lines are crossed by a transversal</p>	<p><u>Angles & Parallel Lines</u></p> <ul style="list-style-type: none"> Revise angle types Construct & measure

Term 3	7	<p>ACMMG164 Investigate conditions for two lines to be parallel & solve simple numerical problems using reasoning</p>	<ul style="list-style-type: none"> Identify vertically opposite angles Investigate properties of complementary angles, supplementary angles & vertically opposite angles Identify corresponding, alternate & co-interior angles when two parallel lines are crossed by a transversal
		<p>ACMMG165 Classify triangles according to their side & angle properties & describe quadrilaterals</p> <p>ACMMG200 Define congruence of plane shapes using transformations</p> <p>ACMMG201 Develop the conditions for congruence of triangles</p>	<p><u>Congruence</u></p> <ul style="list-style-type: none"> Types of triangles – naming, classifying, angle relationships Find missing angle in triangle Define congruent shapes Labelling vertices & sides Show how two triangles are congruent using \equiv Practice writing congruence statements Introduce rules for congruence of a triangle <ul style="list-style-type: none"> SSS SAS RHS Examine when congruence isn't prescribed <ul style="list-style-type: none"> AAA ASS
		<p>ACMMG165 Classify triangles according to their side & angle properties & describe quadrilaterals</p> <p>ACMMG166 Demonstrate that the angle sum of a triangle is 180° & use this to find the angle sum of a quadrilateral</p> <p>ACMMG202 Establish properties of quadrilaterals using congruent triangles & angle properties, & solve related numerical problems using reasoning</p>	<p><u>Properties of Quadrilaterals</u></p> <ul style="list-style-type: none"> Review features of squares, rectangles, parallelograms, kites & trapeziums Examples of proofs utilising the properties of congruent triangles – i.e. show that in each case the interior angles sum to 360° by dividing quadrilaterals into two triangles Students to create own proofs based on congruent triangles
		<p>ACMMG160 Calculate volumes of rectangular prisms</p> <p>ACMMG161 Draw different views of prisms & solids formed from combinations of prisms</p> <p>ACMMG195 Choose appropriate units of measurement for area & volume & convert from one unit to another</p> <p>ACMMG198 Develop the formulas for volumes of rectangular & triangular prisms & prisms in general. Use formulas to solve problems involving volume</p>	<p><u>Surface Area & Volume</u></p> <ul style="list-style-type: none"> Examine the surface area of prisms made up of rectangles & triangles Drawing nets Revise units of volume & structure of prisms Introduce formula for volume of rectangular prisms Introduce formula for volume of triangular prisms
9-10			

Term 4	Number & Algebra	<p>ACMNA151 Apply the associative, commutative & distributive laws to aid mental & written computation</p> <p>ACMNA190 Extend & apply the distributive law to the expansion of algebraic expressions</p> <p>ACMNA192 Simplify algebraic expressions involving the four operations</p>	<p><u>Distributive Law</u></p> <ul style="list-style-type: none"> Expanding brackets <ul style="list-style-type: none"> $a(b + c)$ & $a(b - c)$ include variables involving indices Grouping like terms/simplifying Directed numbers, including negative multiplier
		<p>ACMNA149 Investigate index notation & represent whole numbers as products of powers of prime numbers</p> <p>ACMNA191 Factorise algebraic expressions by identifying numerical factors</p>	<p><u>Factorisation</u></p> <ul style="list-style-type: none"> Introduce as inverse process of expanding brackets Factorise to single & double brackets
		<p>ACMNA178 Given coordinates, plot points on the Cartesian plane, & find coordinates for a given point</p> <p>ACMNA193 Plot linear relationships on the Cartesian plane with & without the use of digital technologies</p> <p>ACMNA194 Solve linear equations using algebraic & graphical techniques. Verify solutions by substitution</p>	<p><u>Cartesian Coordinates</u></p> <ul style="list-style-type: none"> Revise Cartesian plane Examine number plane grid $-10 < y < 10$ & $-10 < x < 10$ with students reading off & plotting coordinates Review creating a table from a rule, plot the relationship & write the formula Graph linear functions <p><u>Plotting Linear Equations</u></p> <ul style="list-style-type: none"> ICT investigation using Excel or graphics
1-2	3	4-5	

			calculator experimenting with how changing m & c affects the shape of a linear function $y = mx + c$
	6	Statistics & Probability <i>ACMSP168</i> Assign probabilities to the outcomes of events & determine probabilities for events <i>ACMSP204</i> Identify complementary events & use the sum of probabilities to solve problems <i>ACMSP205</i> Describe events using language of 'at least', exclusive 'or' (A or B but not both), inclusive 'or' (A or B or both) & 'and'	<u>Complementary Events (Inclusive & Exclusive)</u> <ul style="list-style-type: none"> Revise probability Define complementary events & identify examples $P(A) + P(B) = 1$ Calculate probabilities of complementary events in word problems Language 'at least', exclusive 'or' (A or B but not both), inclusive 'or' (A or B or both) & 'and' Practice calculating probabilities of mutually exclusive events Contract exclusive 'or' & inclusive 'or'

Term 4	7	<i>ACMSP292</i> Represent events in two-way tables & Venn diagrams & solve related problems	<u>Venn Diagrams & Two-Way Tables</u> <ul style="list-style-type: none"> Introduce Venn diagrams to represent two inclusive events Identify examples of inclusive events might be represented by Venn diagrams & estimate overlap Introduce two-way tables to represent two pairs of mutually exclusive variables
	8	<i>ACMSP284</i> Investigate techniques for collecting data, including census, sampling & observation <i>ACMSP206</i> Explore the practicalities & implications of obtaining data through sampling using a variety of investigative processes <i>ACMSP293</i> Explore the variation of means & proportions of random samples drawn from the same population	<u>Sampling Techniques</u> <ul style="list-style-type: none"> Introduce idea of a population & compare terms census & sample – pros & cons ABS census data Use Excel to simulate probability experiments to produce large number of events Simple Random Sample Systematic Random Sample Stratified Random Sample Identify which technique was used from word problems Identify which technique should be used in various scenarios
	9-10	<i>ACMSP207</i> Investigate the effect of individual data values, including outliers, on the mean & median	<u>Representative Sample</u> <ul style="list-style-type: none"> Discuss reasons why a sample may not be representative of a population Biased surveys – students to identify bias in survey (how could survey be conducted differently to remove the bias?) Collect data on average house prices from a particular suburb. Explain why individual data sets may not be representative of the city

This course outline may be subject to change, any changes will be communicated to students.

Assessment Outline

Assessment Task	Number of Tasks	Task Weighting	Total Task Weighting
Tests (4)	4	10	40
Semester 1 and 2 Exam	2	15	30
Investigations (2)	2	15	30

Task	Assessment Task	Task Title	Task Weighting	Number & Algebra	Measurement & Geometry	Statistics & Probability
1	Test 1	Statistics & Number		✓		✓
2	Test 2	Fractions, Percentages & Decimals		✓		
3	Investigation 1	Averages in the Community		✓		✓
4	Exam Semester 1			✓	✓	✓
5	Test 3	Linear Equations/ Probability		✓		✓
6	Test 4	Algebra		✓	✓	
11	Investigation 2			✓	✓	
15	Exam Semester 2			✓	✓	✓

The above weightings are intended to show the importance of each task. The allocation of a grade at the end of a semester is determined based on grade related descriptors issued by School Curriculum and Standards Authority.

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