

Year 9 Higher Unit 1 – Number

Learning Outcome	Students will know and remember ...	So that they can....
Understand and manipulate positive numbers.	<p>The meaning of $<$, $>$, $=$, \leq, \geq</p> <p>That the commutative law means $a+b = b+a$ and that the associative law deals with the grouping of numbers in an operation $(a + b) + c = a + (b + c)$.</p> <p>That there is a hierarchy to perform calculations: Brackets/ Indices/ Division/ Multiplication/ Addition/ Subtraction.</p> <p>That a square number is a number multiplied by itself.</p> <p>That a cube number is a number multiplied by itself 3 times.</p> <p>That the square root is the inverse operation of squaring.</p> <p>That the cube root is the inverse operation of cubing.</p>	<p>Order positive integers and decimals using inequality symbols.</p> <p>Add, subtract, multiply and divide positive integers and decimals using inequality symbols.</p> <p>Perform calculations using the order of operations.</p> <p>Use the product rule for counting.</p>
Understand and manipulate negative numbers.	<p>That when you add a negative number it has the effect of subtracting it.</p> <p>That when you subtract a negative number it has the effect of adding it.</p> <p>When you multiply or divide 2 negative numbers the answer is always positive.</p> <p>When you multiply or divide a positive and a negative number the answer is always negative.</p>	<p>Order negative integers and decimals using inequality symbols.</p> <p>Add, subtract, multiply and divide negative integers and decimals using inequality symbols.</p> <p>Perform calculations using the order of operations.</p>
Understand the purpose of rounding.	<p>How to round numbers to their nearest integer, ten, hundred and decimal places.</p> <p>That rounding to one decimal place is the same as rounding to tenths.</p> <p>That rounding to two decimal place is the same as rounding to hundredths.</p> <p>That the most significant figure is the number in the largest place value column.</p> <p>When it is appropriate to use an estimate.</p> <p>That errors can be expressed using inequality notation $a \leq x < b$</p>	<p>Round answers to a suitable degree of accuracy.</p> <p>Round answers to a sensible degree of accuracy.</p> <p>Determine whether calculations will be an underestimate or overestimate</p> <p>Understand the impact of rounding errors.</p>
Understand exponents	<p>The notation of exponents.</p> <p>That an exponent can be called a power or index number and means how many times another number is to be multiplied by itself.</p> <p>That a fractional index refers to the "root" of the number.</p> <p>That anything raised to the index of zero equals one.</p> <p>That a negative index refers to the reciprocal of the number.</p>	<p>Write repeated multiplications of the same number in index form.</p> <p>Perform calculations with powers of any number.</p> <p>Simplify calculations using the index laws.</p>

	<p>That a reciprocal is 1 divided by the given number.</p> <p>When the base is the same and you are multiplying with powers, you add them.</p> <p>When the base is the same and you are dividing with powers, you subtract them.</p>	
Understand types of numbers.	<p>That a multiple is a number in the integer's multiplication times table.</p> <p>That a factor is a number that divides another number with no remainder.</p> <p>That a prime number has exactly 2 factors, 1 and itself.</p> <p>That any non-prime integer can be written as a product of its prime factors.</p> <p>That once a number has been reduced to its prime factors this can be used to identify LCM's and HCF's using a venn diagram.</p> <p>That a surd is square root.</p> <p>That $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$</p> <p>That $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{a/b}$</p> <p>That $\sqrt{a} \times \sqrt{a} = a$</p>	<p>Identify factors and multiples and list all factors and multiples of a number systematically to be able to find common factors and common multiples of two numbers.</p> <p>Perform prime factor decomposition of positive integers and write as a product using index notation;</p> <p>Find the LCM and HCF of two numbers, by using prime factors:</p> <p>Solve problems using HCF, LCM and prime numbers.</p> <p>Simplify surd expressions.</p> <p>Rationalise the denominator of a fraction involving a surd.</p>
Understand standard form	<p>That large and small numbers can be written as a number multiplied to the power of ten.</p> <p>That standard form starts with a number larger than 1 but less than 10.</p>	<p>Convert large and small numbers into standard form and vice versa.</p> <p>Add and subtract numbers in standard form.</p> <p>Multiply and divide numbers in standard form.</p> <p>Interpret a calculator display using standard form and know how to enter numbers in standard form.</p>

Year 9 Higher Unit 2 – Algebra

Learning Outcome	Students will know and remember ...	So that they can....
Understand and simplify the language of algebra.	<p>That an equation has an equal's sign.</p> <p>That \equiv is the sign for an identity.</p> <p>That letters represent variables.</p> <p>That the multiplication sign is not used in expressions.</p> <p>That the same variable can be "collected" but different variables cannot</p> <p>x multiplied by x is represented as x^2</p>	<p>Manipulate and simplify algebraic expressions by collecting 'like' terms.</p> <p>Multiply together two simple algebraic expressions.</p> <p>Use index notation and the index laws when multiplying or dividing algebraic terms.</p> <p>Expand a bracketed algebraic expression.</p> <p>Factorise an algebraic expression by identifying common factors, including a quadratic expression.</p>
Understand and manipulate formulae.	<p>That once a variable is a given a value, the expression will have a value</p>	<p>Calculate the value of an expression by substituting positive and negative numbers.</p> <p>Appreciate the value of an expression can change when the variable does.</p> <p>Change the subject of a formula</p>
Form and solve linear equations.	<p>That there is one solution to a linear equation.</p>	<p>Find the solution to an equation.</p>

	<p>That inverse operations are used to solve equations.</p> <p>That solutions can be positive, negative or fractional.</p> <p>That a problem can be represented pictorially or algebraically.</p>	<p>Use algebra to represent a problem and solve it.</p>
<p>Understand and generate sequences.</p>	<p>That a linear arithmetic sequence increases by a constant.</p> <p>That a geometric sequence increases by a common ratio.</p> <p>That a term-to-term rule tells you how to continue a sequence once started.</p> <p>That a position to term rule generates any term of a sequence.</p> <p>That when finding terms in a sequence you use substitution</p> <p>That linear sequences have an nth term rule in the form $an+b$</p> <p>That a quadratic sequence has a constant second difference.</p>	<p>Use a rule to generate a sequence.</p> <p>Recognise when to substitute numbers into algebra.</p> <p>Understand that the nth term rule allows you to calculate any term of the linear sequence.</p> <p>Determine whether a number is a term of a given sequence.</p> <p>Find the nth term of a quadratic sequence.</p>
Year 9 Higher Unit 3 – Graphs and Charts		
<i>Learning Outcome</i>	<i>Students will know and remember ...</i>	<i>So that they can....</i>
<p>Use charts to represent statistics.</p>	<p>That pictograms, bar charts and pie charts are used to represent qualitative data.</p> <p>That histograms are similar to bar charts but have unequal bars and represent frequency density, not frequency.</p> <p>That bar charts, line charts, time-series, stem and leaf diagrams and frequency polygons are used to represent quantitative data.</p> <p>That two-way tables and frequency tables group data.</p> <p>That scatter graphs are used for bivariate data.</p>	<p>Understand data can be displayed in a variety of ways.</p> <p>Choose the most appropriate chart to display information.</p> <p>Argue the advantages and disadvantages of charts.</p> <p>Interpret misleading graphs.</p>
<p>Recognise relationships between bivariate data represented on a scatter graph.</p>	<p>That bivariate data is displayed on a scatter graph</p> <p>That positive correlation is represented by both variables increasing.</p> <p>That negative correlation is represented by one variable increasing and the other decreasing.</p> <p>A line of best fit can help make an estimate.</p>	<p>Draw scatter graphs and identify outliers, positive, negative and no correlation.</p> <p>Draw the line of best fit on a scatter diagram and use to make predictions.</p> <p>Interpolate and extrapolate apparent trends whilst understanding the dangers of so doing.</p> <p>Interpret the relationships displayed on a scatter graph.</p>
<p>Interpret Pie Charts.</p>	<p>That pie charts can represent categorical data or discrete/continuous numerical data.</p> <p>That the frequency represented by corresponding sectors in two pie charts is dependent upon the total</p>	<p>Draw and interpret pie charts.</p> <p>Find the mode and the total frequency from a pie chart.</p> <p>Compare pie charts that represent different-sized samples.</p>

	populations represented by each of the pie charts.	
Understand how to calculate averages from charts and tables.	That from a stem and leaf diagram you can interpret: the mode, median, range, greatest and least values. That from a frequency table you can calculate: mean, mode, median and range. Frequency tables can group data. That the mean from a frequency table is an estimate.	Analyse data sets represented by stem and leaf diagrams, frequency tables,
Year 9 Higher Unit 4 – Fractions, Percentages and Ratio.		
Learning Outcome	Students will know and remember ...	So that they can....
Understand fractions and their equivalence.	That a fraction represents part of a whole. That an equivalent fraction is a multiple of the original fraction's numerator and denominator.	Create equivalent fractions. Simplify fractions by finding common factors. Order fractions. Compare fractions using inequality signs. Convert between mixed numbers and improper fractions. Find the reciprocal of an integer, decimal or fraction.
Understand fraction and decimal equivalence	That tenths, hundredths, thousandths etc can be represented by fractions and decimals. That place value is used to convert decimals to fractions. That short division is used to convert fractions to decimals	Convert between fractions and decimals. Use the most appropriate type of number to perform a calculation efficiently.
Perform calculations with fractions	That to add and subtract a fraction, you must use a common denominator. That to multiply fractions you multiply the numerators and denominators. That the reciprocal of a number is its inverse. That to divide fractions you use the reciprocal and the inverse operation.	Add, subtract, multiply and divide fractions. Calculate fractions of a quantity. Calculate areas and perimeters accurately.
Express a number as a fraction of another.	That the number given is the numerator. That the number "out of" is the denominator.	
Find percentages of an amount.	That percentage means out of 100. That a percentage can be more than 100. That percentages can be converted to decimals and fractions.	Calculate a percentage of a given amount
Describe one number as a percentage of another	That as a fraction, the total amount is the denominator and the given amount the numerator. That a fraction can be written as a percentage.	Compare quantities by calculating numbers as percentages of others.
Find percentage increases and decreases.	That a percentage increase will mean the result is more.	Calculate the result after a specific percentage increase or decrease.

	That a percentage decrease will mean the result is less. That a multiplier can be used to perform the action in one calculation.	Calculate simple and compound interest.
Understand percentage profit or loss.	That profit and loss is the difference between the amount of money made and the amount paid. That the profit or loss is compared the original spend. That a decimal is converted to a percentage by multiplying by 100.	Calculate percentage profit or loss
Calculate a reverse percentage.	That calculating a reverse percentage uses the inverse operation of dividing. That the divisor will be the decimal equivalent of the percentage.	Calculate the original value given the final value after a stated percentage increase or decrease
Understand the link between ratios and fractions.	That a ratio represents the parts that make up a whole. That a ratio tells you the parts and the whole so fractions can be created.	Change from ratio's to fractions and vice versa.
Understand the notation of ratio.	A colon is used to separate parts of a ratio.	Simplify ratio's. Describe ratio's. Write a ratio as a unit ratio. Use ratio to describe rates and scale up recipes. Write ratio's in the form 1:m
To divide a quantity into a given ratio.	That the parts of a ratio are added to find the whole. That they need to divide to find one part of the ratio.	Use number lines or bar models to divide in a ratio. Find the totals related to the parts in a given ratio.
To find the original quantity given a ratio and a part.	That the part given is represented by the part in the ratio. That the whole will be larger than the part given.	Use number lines or bar models to divide part of a ratio. Find the total of a ratio when given a part.

Year 9 Higher Unit 5 –Pythagoras and angles

Learning Outcome	Students will know and remember ...	So that they can....
Understand angles created by intersecting lines and parallel lines.	That a pair of intersecting lines create vertically opposite angles. Vertically opposite angles are equal. That parallel lines will never meet. A line crossing 2 parallel lines is called a transversal. Parallel lines and a transversal create 3 types of angles. Alternate angles are equal. Corresponding angles are equal. Co-interior angles add up to 180 degrees.	Calculate missing angles in parallel and intersecting lines.
Understand angles in triangles and quadrilaterals.	That angles in a triangle sum to 180 degrees. That angles in a quadrilateral sum to 360 degrees.	Calculate missing angles in triangles and quadrilaterals.
Understand angles in polygons.	That the exterior angles of a polygon sum to 360 degrees.	Calculate missing angles in polygons.

	That an interior angle and an exterior angle of a polygon sums to 180 degrees. That the sum of interior angles of a polygon can be calculated using $(\text{sides} - 2) \times 180$.	Calculate the number of sides on a polygon given the interior or exterior angles.
Understand Pythagoras theorem.	That the longest side on a triangle is called the hypotenuse. That answers can be given in surd form.	Calculate the missing sides on right angled triangles. Justify whether a triangle is right angled.
Understand trigonometry.	That the side opposite the angle is called the hypotenuse and the side next to the angle is called the adjacent. That there are 3 trigonometric ratios – sine, cosine and tangent. That the exact values of trigonometry can be derived from isosceles and equilateral triangles.	Calculate missing sides and angles in right angled triangles. Calculate angles of elevation and depression; Know the exact values of $\sin \vartheta$, $\cos \vartheta$ and $\tan \vartheta$ for $\vartheta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90° ;
Year 9 Higher Unit 6 –Graphs		
Learning Outcome	Students will know and remember ...	So that they can....
Generate and plot coordinates.	That graphs have 4 quadrants That coordinates are always written (x, y) That the x axis is horizontal and the y coordinate is vertical That a straight line extends infinitely	Find the coordinates of the midpoint of a line segment. Calculate the length of a line. Draw straight line graphs.
Interpret real-life graphs.		Draw distance–time graphs and velocity–time graphs. Calculate the speed and acceleration of individual sections, total distance and total time. Identify direct proportion.
Understand gradient and straight-line graphs.	That the form $y = mx + c$ represents a straight line. That the m is the value of the gradient. That the c is where the line crosses the y axis. The same gradient means the lines will be parallel. That perpendicular means at right angles to. That perpendicular gradients have a product of negative 1.	Find the gradient of a straight line from real-life graphs. Interpret gradient as the rate of change in distance–time and speed–time graphs, graphs of containers filling and emptying, and unit price graphs. Identify parallel and perpendicular lines from their equations. Find approximate solutions to a linear equation from a graph. Find the equation of a straight line from a graph; Find the equation of the line through one point with a given gradient.
Recognise types of graphs.	That a linear graph is in the form $y = mx + c$. That a quadratic graph is in form $y = x^2$. That a cubic graph is in form $y = x^3$. That the graph of a circle is in form $x^2 + y^2 = r^2$.	Identify and plot graphs in any form. Find solutions to graphs.

	That a reciprocal graph is in form $y = 1/x$.	
Year 9 Higher Unit 7 - Perimeter, area and volume		
Learning Outcome	Students will know and remember ...	So that they can....
Understand metric units.	That 1km = 100m That 1m = 100cm That 1cm = 10mm That 1 litre = 1000ml That 1kg = 1000g	Convert between units of measure: length, area and volume and capacity
Calculate the area of shapes.	That area is the space inside a shape. That the area of a rectangle = length x width. That the area of a triangle = $\frac{1}{2}$ (length x width). That the area of a parallelogram = length x perpendicular height. That the area of a trapezium = $\frac{1}{2}$ (a + b) h. A shape can be split into other shapes to find its total area – “compound area”.	Find the area of rectangles, triangles, parallelograms and trapezia. Find the area of compound shapes.
Investigate the surface area of 3D shapes.	That nets are made up of 2D shapes. How to find the areas of quadrilaterals and triangles.	Calculate the surface area of 3D shapes.
Understand volume of 3D shapes.	That volume is the space a 3D solid takes up. That volume is calculated by multiplying the cross-sectional area by its depth.	Calculate volume of cubes, cuboids, triangular prisms, cylinders, pyramids, cones and spheres.
Know the relationship between the circumference and diameter of a circle.	That the circumference of a circle can be defined as πd That the distance across the circle at its widest point is called the diameter. That half a diameter is called a radius.	Calculate the circumference of a circle given its radius or diameter. Calculate the radius or diameter of a circle given its circumference. Calculate perimeters and areas of composite shapes made from circles and parts of circles. Calculate arc lengths of sectors of circles. Calculate the angles of sectors of circles when given the arc length.
Know the relationship between the area and radius of a circle.	That the area of a circle can be defined as πr^2	Calculate the area of a circle given its radius or diameter. Calculate the radius or diameter of a circle given its area. Calculate areas of sectors of circles. Calculate the angles of sectors of circles when given the area.
Understand accuracy.	When it is appropriate to use an estimate. That errors can be expressed using inequality notation $a \leq x < b$	Calculate the upper and lower bounds of numbers. Calculate the upper and lower bounds of calculations.

		Understand when a calculation is an under or over estimate.
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