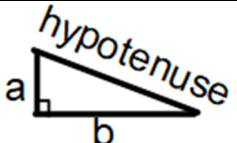
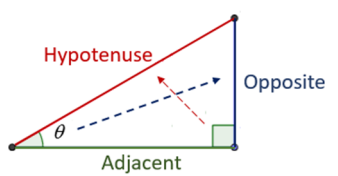

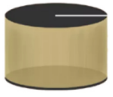
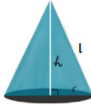
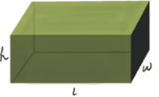
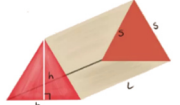


Knowledge Organiser- Years 9-11

Year	Unit Title	Formula and key facts	Content Overview	Linked topics	
9	Error! Reference source not found.	Factor trees Significant figures Truncation Error intervals	Calculations, checking, rounding and estimation Factors, Multiples and Primes Operations with Negative Numbers	Core skill, lots of links.	
	Error! Reference source not found.	Simplifying and collecting like terms Expanding and factorising	Expression, equation, formula and identity Substitution Multiplying single, double and triple brackets Linear and quadratic factorisation Rearranging formulae	Core skill, lots of links.	
	Error! Reference source not found.	Improper fractions Common denominators when adding and subtracting Cross cancelling when multiplying Multiplying by reciprocal when dividing Formal proof for recurring decimals to fractions	Four Operations with Fractions Recurring decimals <-> Fractions	Core skill, lots of links.	
	Y9 Test 1				
	Error! Reference source not found.	Sum of interior angles in a polygon = (number of sides -2) x 180 Sum of exterior angles = 360 Interior angle + exterior angle = 180	Angles in parallel lines Interior/Exterior angle sums in polygons	Algebra – 9.2	
	Error! Reference source not found.	Simplifying and combining two ratios	Using Ratios to solve complex problems Simple proportion problems	Algebra – 9.2 Fractions – 9.3	
	Error! Reference source not found.	Circumference = πd or $2\pi r$ Area = πr^2 Area/Arc length of a sector = Angle/360 x area/circumference	Area and Perimeter of all GCSE shapes Arc Length and Sector Area	Ratio – 9.5	

Error! Reference source not found.	$\sqrt{a} \times \sqrt{b} = \sqrt{ab}$ $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$	Multiplication and Simplification	Number properties – 9.1
Error! Reference source not found.	$a^2 + b^2 = \text{hyp}^2$ $a^2 = \text{hyp}^2 - b^2$		Pythagoras' Theorem in 2D and 3D Algebra – 9.2 Perimeter and area – 9.6 Surds – 9.7
Y9 Test 2			
Error! Reference source not found.	Mean = $\frac{\sum fx}{\sum f}$ Position of median = $(n+1)/2$	Mean Mode Median Range Mean from frequency tables (grouped) Finding the mean given other totals	Calculations – 9.1 Algebra – 9.2
9.10 Representing and interpreting data	Bar chart – gaps between bars and labels Pie chart – angle = $\frac{\text{frequency}}{\text{total frequency}} \times 360$ Frequency polygon – plot points at the midpoint of the interval and connect with straight lines	Dual/Composite Bar Charts Stem and Leaf Pie Charts Line Graphs Frequency Polygons	Averages and range – 9.9
Error! Reference source not found.	Maintain equality Elimination method Substitution method	Solving equations including fractions Solving simultaneous equations by elimination and substitution.	Algebra – 9.2 Fractions – 9.3
Error! Reference source not found.	<p style="text-align: center;">SOHCAHTOA</p>  <p style="text-align: center;"> SOH $\sin \theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$ CAH $\cos \theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$ TOA $\tan \theta = \frac{\text{Opposite}}{\text{Adjacent}}$ </p> Bearings – three digits, clockwise from North	Finding missing sides and angles using sohcahtoa. Bearings, including trigonometric problems Scale drawing	Ratio – 9.5 Perimeter and area – 9.6 Surds – 9.7 Pythagoras – 9.8
Y9 Exam			
Error! Reference source not found.	Correlation or Relationship Extrapolation or interpolation	Including drawing and interpreting a line of best fit.	Representing data – 9.10

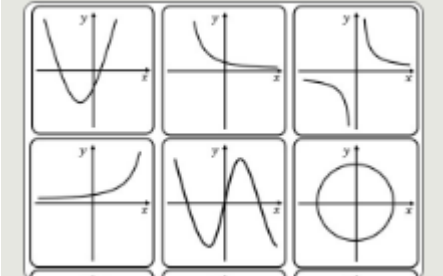
	Error! Reference source not found.	Y=mx + c where m is the gradient and c is the y intercept Parallel – same gradient Perpendicular – $m_1 = -\frac{1}{m_2}$	Equation of a straight line Parallel and perpendicular lines.	Algebra – 9.2 Fractions – 9.3 Ratio and proportion – 9.5	
	Error! Reference source not found.	Gradient represents the change in y for every unit increase in x	Interpretation of gradient using context	Linear graphs – 9.14	
10	Error! Reference source not found.	“n” is the position nth term is the formula to find term n Linear or quadratic	Linear and quadratic sequences	Algebra – 9.2	
	Error! Reference source not found.	Finding a percentage Increasing/decreasing by a percentage Working backwards to find an original value Compound/simple interest	Multipliers Reverse Percentages Compound and Simple interest	Fractions and decimals – 9.3 Ratio and proportion – 9.5 Perimeter and area – 9.6	
	Error! Reference source not found.	<ul style="list-style-type: none"> • $x^0 = 1$ • $x^{-n} = \frac{1}{x^n}$ • $x^n \times x^m = x^{n+m}$ Standard form - a x 10 ^b where 1≤a<10 and b must be an integer	<ul style="list-style-type: none"> • $x^n \div x^m = x^{n-m}$ • $(x^n)^m = x^{n \cdot m}$ • $x^{\frac{n}{m}} = \sqrt[m]{x^n}$ Negative and Fractional Indices Index laws Standard form Calculating with standard form (calc and non-calc)	Calculations (with decimals) – 9.1 Fractions – 9.3 Surds – 9.7	
	Y10 Test 1				
	Error! Reference source not found.	$\frac{a}{\sqrt{b}}$ by multiplying both the numerator and the denominator by \sqrt{b} $\frac{a}{\sqrt{b} \pm c}$ by multiplying both the numerator and the denominator by the conjugate of $\sqrt{b} \pm c$	Multiplying linear combinations of surds Rationalising the denominator, including use of conjugate.	Algebra (expanding brackets) – 9.2 Fractions – 9.3 Surds – 9.7	

<p>Error! Reference source not found.</p>	<p>Sphere  $SA = 4\pi r^2$ $V = \frac{4}{3}\pi r^3$</p> <p>Cylinder  $SA = 2\pi r^2 + 2\pi rh$ $V = \pi r^2 h$</p> <p>Cone  $SA = \pi r l + \pi r^2$ $V = \frac{1}{3}\pi r^2 h$</p> <p>Rectangular Prism  $SA = 2(lw + lh + wh)$ $V = lwh$</p> <p>Triangular Prism  $SA = bh + 2ls + lb$ $V = \frac{1}{2}(b)lh$</p> <p>Volume of Pyramid = $\frac{1}{3} \text{base area} \times \text{height}$</p>	<p>Surface area and volume of 3D Shapes</p>	<p>Perimeter, area, circles – 9.6 Pythagoras – 9.8</p>
<p>Error! Reference source not found.</p>	<p>For: $ax^2 + bx + c = 0, x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$</p>	<p>Solving by Factorisation Solving using the Quadratic Formula</p>	<p>Algebra – 9.3 Surds – 9.7</p>
<p>Error! Reference source not found.</p>	<p>Information required:</p> <ul style="list-style-type: none"> • Transformation with vector • Rotation with angle, direction if applicable and centre • Reflection with equation of the line of reflection • Enlargement with scale factor and centre 	<p>Rotational symmetry, Translations, reflections, rotations and enlargements. Describing and performing.</p>	<p>Fractions – 9.3 Ratio – 9.5 Graphs and coordinates – 9.14</p>
<p>Error! Reference source not found.</p>	<p>Relative Frequency = $\frac{\text{Observed Occurrences}}{\text{Total trials}}$ Estimated occurrences = Probability x number of trials</p>	<p>Probability of single events Combinations and Permutations</p>	<p>Fractions – 9.3 Ratio – 9.5</p>
<p>Error! Reference source not found.</p>	<p>Direct proportion in form $y=kt$ Indirect proportion in for $xy=k$</p>	<p>Simple direct/inverse proportion. Algebraic Proportion.</p>	<p>Algebra – 9.3 Ratio – 9.5</p>
Y10 Exam			
<p>Error! Reference source not found.</p>	<p>$A = \frac{1}{2} ab \sin C$ $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$</p>	<p>Sine, Cosine and Area Rule $A = \frac{1}{2} ab \sin C$</p>	<p>Angles – 9.4 Area and perimeter – 9.6</p>

	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $a^2 = b^2 + c^2 - 2bc \cos A$		Trigonometry (including bearings) – 9.12
Error! Reference source not found.	Area SF = <i>Linear scale factor</i> ² Volume SF = <i>Linear scale factor</i> ³	Scale factors for conversion between lengths, areas and volumes.	Ratio and proportion – 9.5 Area and perimeter – 9.6 Pythagoras (for problem solving) – 9.8 Percentages (multipliers) – 10.2 3D shapes (SA and V) – 10.5
Error! Reference source not found.	https://www.youtube.com/watch?v=2oudsylvuB8Y	Constructions with straight edge and compass. Solving loci problems through construction and scale drawing.	3D shapes (properties) – 10.5
Error! Reference source not found.	Cumulative Frequency – plot cumulative frequency values at the end of the interval and join up with lines or a smooth curve passing through all the points. Histograms – area of the bar is the frequency, plot frequency density where: $FD = \frac{\text{Frequency}}{\text{Class width}}$		Ratio and proportion – 9.5 Area – 9.6
Error! Reference source not found.	To estimate the speed on a curved distance time graph, draw a tangent and find its gradient To find the distance travelled on a speed time graph calculate or estimate, if curved, the area under the graph.	Drawing and interpreting graphs Calculating gradient and area under graphs. Estimating gradient and area under graphs.	Area – 9.6 Linear graphs – 9.14
Y10 Test 2			
Error! Reference source not found.	<ul style="list-style-type: none"> • Angle in a semi-circle is 90° • Angles subtended from the same arc at the circumference are equal • The radius meets a tangent at 90° 	Learn circle theorems and language to use to describe them.	Angles – 9.4 Algebra (forming equations) – 9.2 Trigonometry (problem solving) – 10.10

		<ul style="list-style-type: none"> The angle at the centre is double the angle at the circumference Alternate Segment theorem Distances from a point to where the tangents meet the circle are equal If a radius bisects a chord, it is perpendicular If a radius is perpendicular to a chord, it also bisects it Look out for isosceles triangles with two radii as sides 		
	Error! Reference source not found.	<p>Multiplying and dividing by a negative number reverses the inequality sign. For quadratic inequalities:</p> <ul style="list-style-type: none"> Find critical values by finding roots Use a graph or number line to determine inequality solution. 		Algebra – 9.3 Linear graphs – 9.14 Quadratics – 10.6
	Error! Reference source not found.	$Speed = \frac{Distance}{Time}$ $Density = \frac{Mass}{Volume}$ $Pressure = \frac{Force}{Area}$	Including Speed, Density and Pressure.	Area and perimeter – 9.6 3D shapes – 10.11
	Error! Reference source not found.	Capture/Recapture method Stratified sampling		Ratio and proportion – 9.5 Probability – 10.8
11	Error! Reference source not found.	Substitution method	Algebraic solving Solving using graphical methods.	Simultaneous equations – 9.11 Linear graphs – 9.14 Quadratics – 10.6
	Error! Reference source not found.	<p>Proof using 3 facts with reasons and a conclusion linked to either:</p> <ul style="list-style-type: none"> SAS ASA 		Angles (parallel lines) – 9.4 Area and perimeter (shape properties) – 9.6 Circle theorems – 10.15

	<ul style="list-style-type: none"> • RHS • SSS 		
Error! Reference source not found.	$P(A \text{ or } B) = P(A) + P(B)$, if mutually exclusive	Combined probabilities. Conditional probability using Venn Diagrams	Probability – 10.8 Quadratics – 10.6 (Algebraic fractions – 11.4.1)
Error! Reference source not found.	<p>Simplifying – factorise and cancel Adding/Subtracting – find a common denominator Multiplying and dividing – factorise and look to cross cancel when multiplying If the subject appears twice:</p> <ul style="list-style-type: none"> • Get all terms with the subject on one side and all others on the other • Factorise the subject out using one bracket • Divide by the bracket to get the subject on its own. 	Algebraic Fractions More complex Changing the subject	Fractions – 9.3 Algebra – 9.2 Equations – 9.11 Quadratics – 10.6 Probability (trees) – 11.3
Error! Reference source not found.	Work with $2n, 2n+2$ etc for consecutive even numbers and $2n-1, 2n+1$ etc for consecutive odd numbers	Algebraic Proof	Algebra – 9.2 Quadratics – 10.6
Error! Reference source not found.	<p>$f(x)$ is another notation for y. $f(2)$ is the y value when $x = 2$ $f^{-1}(x)$ is the inverse function (use the method linked to changing the subject) Iteration is substituting a starting value into a formula to get a second value. The substitution is then repeated with this second value to perform a second iteration.</p>	Functions Iteration	Algebra (substitution) – 9.2 Algebraic fractions – 11.4.1
Error! Reference source not found.	Upper and lower bounds Truncation Suitable degree of accuracy		Perimeter and area – 9.6 3D shapes – 10.11 Compound measure – 10.17
Error! Reference source not found.	Observe vector triangle law To prove two lines are parallel show that the vectors are multiples of each other		Algebra – 9.2 Fractions – 9.3

			Ratio – 9.5 Proof – 11.4.2																								
Error! Reference source not found.	$b^2 - 4ac > 0$ if there are 2 roots $b^2 - 4ac = 0$ if there is 1 root $b^2 - 4ac < 0$ if there are no roots When sketching, label the roots and y intercept and ensure the shape is correct and the turning point is in the right quadrant of the graph.	Discriminant Solving by completing the square Sketching	Quadratics – 10.6 Plotting graphs – 9.14																								
Error! Reference source not found.	Learn shapes of all three graphs and exact values for 30, 45 and 60 degrees <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>θ</th> <th>0°</th> <th>30°</th> <th>45°</th> <th>60°</th> <th>90°</th> </tr> </thead> <tbody> <tr> <td>$\sin(\theta)$</td> <td>0</td> <td>$\frac{1}{2}$</td> <td>$\frac{1}{\sqrt{2}}$</td> <td>$\frac{\sqrt{3}}{2}$</td> <td>1</td> </tr> <tr> <td>$\cos(\theta)$</td> <td>1</td> <td>$\frac{\sqrt{3}}{2}$</td> <td>$\frac{1}{\sqrt{2}}$</td> <td>$\frac{1}{2}$</td> <td>0</td> </tr> <tr> <td>$\tan(\theta)$</td> <td>0</td> <td>$\frac{1}{\sqrt{3}}$</td> <td>1</td> <td>$\sqrt{3}$</td> <td><i>undefined</i></td> </tr> </tbody> </table>	θ	0°	30°	45°	60°	90°	$\sin(\theta)$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	$\cos(\theta)$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	$\tan(\theta)$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	<i>undefined</i>	Sin, cos, tan graphs Solving simple trig equations Exact trig values	Trigonometry – 9.12 Further trigonometry (sine rule ambiguous case) – 10.10
θ	0°	30°	45°	60°	90°																						
$\sin(\theta)$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1																						
$\cos(\theta)$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0																						
$\tan(\theta)$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	<i>undefined</i>																						
Error! Reference source not found. Transformation of graphs	Learn shapes of different types of graphs 	Cubic, reciprocal, exponential, circle graphs Graph transformations, including trig graphs	Simultaneous equations – 9.11 Plotting graphs – 9.14 Sketching Quadratics – 11.7																								
Error! Reference source not found.	Equation of a circle with origin as the centre is: $x^2 + y^2 = r^2$ Tangent is perpendicular to the radius	Equation of circle centred at origin Finding equation of tangents.	Pythagoras – 9.8 Trigonometry – 9.12 Linear graphs – 9.14 Circle theorems – 10.15																								

