GEOMETRY – GUIDE TO 9 – 1 Levels

TOPIC	3	4	5	6	7	8	9
ANGLES	Angles on a line sum to 180° Angles at a point sum to 360° Derive and use the sum of the interior angles of a triangle is 180° Derive and use the sum of the exterior angles of a polygon is 360° Find the sum of the interior angles of a polygon using triangulation Find the interior angle of a regular polygon. Understand and use the angle properties of parallel lines ① alternate ② supplementary ③ corresponding			Apply angle properties in more formal proofs of geometrical results.			
PROPERTIES OF POLYGONS	Know and use the properties of isosceles, equilateral and right-angled triangles. Know and use the properties of the square, rectangle, parallelogram, trapezium, kite & rhombus. Identify reflection and rotation symmetries of triangles, quadrilaterals and polygons.						
CIRCLE GEOMETRY					Prove and use the facts that: ① angle between a tangent and radius is 90° ② tangents from an external point are equal in length. ③ two radii form an isosceles triangle ④the perpendicular bisector of a chord passes through the centre ⑤ the angle at the centre is twice the angle at the circumference ⑥ the angle in a semi-circle is 90° ⑦ angles in the same segment are equal ⑧ opposite angles in a cyclic quadrilateral are equal ⑨ the alternate segment theorem	
CONGRUENCE AND SIMILARITY			Prove the congruence of triangles using; SSS, SAS, ASA and RHS Understand similarity (enlargement w. SF) Prove similarity; ① equal angles ② same ratio sides ③ 2 sides in same ratio & angle betwn is the same				
PLANS & VIEWS	Draw and interpret plans and elevations of 3D solids inc. use of isometric paper						
AREAS AND VOLUMES	Use terms; vertices, edges and faces; Euler theorem Recall and use formulae $C = 2\pi r$ or $C = \pi d$, $A = \pi r^2$ Know and use formulae for the areas of; ① triangle ② parallelogram ③ trapezium Calculate areas of composite shapes Surface area of cuboids, prisms inc. cylinders		Surface area and volumes of ; ① sphere ② cone ③ pyramid formulae will be given Areas of sectors and segments	Surface area of a; ① hemisphere ② pyramid ③ composite shapes Volumes of a; ① frustums ② 3D composite shapes	Understand how enlargement affects area and volume Know and apply the formula: area = ½*ab sin c*	Rates of flow; cm^3/s into L/min	
LOCI AND CONSTRUCTION	Ruler and compass construction; Construct a triangle with sides 3cm, 4cm and 5cm	Construct 4 key loci; ① fixed distance from a pt ② fixed distance from a line ③ equidistant from two lines ④ equidistant from two given pts					
BEARINGS	Find or plot bearings with use of a scale; know the 3 key words					Plot a bearing & calc. a distance /angle using sine/cosine rules;	
PYTHAGORAS & TRIGONOMETRY		Know, derive & apply Pythagoras' theorem; $a^2 + b^2 = c^2$ to find lengths in right-angled triangles in 2D figures.		Apply Pythagoras' theorem in more complex figures, including 3D figures.			
			Know and apply the trig. ratios, SOH CAH TOA	Apply the trigonometry of right-angled triangles in more complex figures, including 3D figures.			
			Know the exact trig. values of special angles 30°, 45°, 60° and 90°.	Know and apply both Sine and Cosine rules, including 3d figures			
VECTORS			Know vector notation Addition, subtraction and scalar multiplication			Use vectors to show points lie on a straight line or are parallel	Vectors involving ratios
TRANSFORMATIONS	Reflect 2D shapes Identify the equation of reflection Translate a shape using a column vector Rotate shapes with/without a grid & describe rotations		Enlarge a shape inc. fractional SF Identify the SF & C of E Combine transformations	Enlarge a shape by a negative SF, with or without the use of a grid			

ALGEBRA – GUIDE TO 9 – 1 Levels

TOPIC	3	4	5	6	7	8	9
ALGEBRA BASICS	Simplify/collect like terms; Multiply letters $(gn)^2 = gxgxnxn$						
	Expand single brackets	Expand double brackets			Expand triple brackets		
		Factorise $3x^2 + 6x$	Factorise $6xy + 15y^2$	Difference of two squares Factorise $x^2 - 16y^2$	Factorise ① $\frac{6x-42}{x^2-49}$		
SOLVING AND SIMPLIFYING	Solve equations: $2x + 5 = 17 - 4x$	Solve equations: $4(y+3) = 3y + 16$	Solve equations: ① $\frac{3x+4}{5} + \frac{4x-1}{4} = 14$ ② $2x^2 + 8 = 80$	Simplify algebraic fractions; $\frac{21x^3y^2}{14xy^3}$	Simplify algebraic fractions; $\frac{x^4 - 4y^2}{x^3 - 2xy}$	Simplify algebraic fractions; $\frac{2}{x+5} + \frac{3}{x-2}$	
REARRANGING	Rearrange formulas; $y = mx + c$ (m)		Rearrange formulas; ① $a = (v-u)/t$ (v) ② $x = y^2/4$ (y)	Rearrange formulas; $x = \frac{y}{y-z}$ (y)			
SEQUENCES	Types of sequence; Arithmetic (+0.2) Geometric (x 0.5) Fibonacci	Find the 'n'th term rule for a linear sequence Decide if a term is in the sequence		Using sequences to solve problems;	Find the 'n'th term rule for a quadratic sequence		
INEQUALITIES	Use inequality symbols	Show inequalities on a number line	Solve inequalities inc. flip the inequality sign	Show inequalities on a graph		Solve quadratic inequalities (use a sketch to help)	
ITERATIVE METHODS					Use iterative methods to find approx. solutions. Know related notation		
PROOF		Proof by counter - example; Prove the difference between two consecutive nrs is not always prime.	Proof by rearranging; ie show LHS = RHS $(n+3)^2 - (n-2)^2 = 5(2n+1)$ Geometric proof; Prove the sum of ext angle in a triangle sum to 360° Proof by counter – example, inequalities; If $x > y$, then $x^2 > y^2$ is this always true?	Prove things are odd, even or multiples; ① Prove the sum of any three odd numbers is odd. ② $4x + 2 = 3(3a + x)$ for odd integer values of a prove x is never a multiple of 8			
QUADRATICS			Factorise quadratics coefficient of x^2 is 1 $x^2 - 9x + 22 = 2$ Plot quadratic graphs from a table; $Y = 2x^2 + 3$		Factorise quadratic expression; coefficient of $x^2 > 1$ $3x^2 + 10x - 8 = 0$ Know and use the quadratic formula Sketch a quadratic graph and label; turning pts, x and y intercepts, line of symmetry	Complete the square; $x^2 - 12x + 23$ in the form $(x+p)^2 + q$ Use graphs to estimate solutions; $2x^2 - 3x = 7$	Complete the square $2x^2 + 3x - 5$ in the form $a(x+p)^2 + q$ Hence sketch the graph
LINEAR GRAPHS	Plot linear graphs from a table Find the gradient of a line	Plot linear graphs; rearrangment into the form $y = mx + c$ Find the equation of a line given the graph	Find the equation of a line given two points Find the midpoint of a line segment Find the equation of parallel lines passing thru a given point		Find the equation of the perpendicular bisector		
SIMULTANEOUS EQUATIONS			Solve simultaneous equations both linear; use substitution and elimination methods Graphical solutions		Solve simultaneous equations, linear, quadratic and circle		
HARDER GRAPHS			Recognise and plot from a table polynomial and reciprocal graphs $y = x^3 - 2x$ $y = \frac{1}{x}$ $2x + 3y = 6$	Know the reciprocal graphs; $y = \frac{A}{x}$	Know the equation for a circle; $x^2 + y^2 = r^2$ Know Exponential (growth) graphs; $y = k^x$ or $y = k^{-x}$	Know the trig. graphs; $y = \sin x$, $y = \cos x$ $y = \tan x$ Solve trig equations using graphs; $\sin x = 0.7$ where $-360° \leq x \leq 360°$	Find the equation of the tangent to a circle at a given point
GRAPH TRANSFORMATIONS					Graph translations; parallel to y axis $f(x) \pm a$	Graph translations; parallel to x axis $f(x \pm a)$ Graph reflections; in x axis $-f(x)$ in y axis $f(-x)$	
REAL-LIFE GRAPHS	Reading from simple graphs inc. dist-time		Gradient of a graph represents the rate; m/s, litres/sec, people/min	Graphs showing rates of change; Filling different shaped glasses Reading from velocity-time graphs inc area under graph = total distance	Finding the average gradient between two point on a curve	Estimating the rate at a given point on a curve by drawing the tangent	Estimating the area under a curve using trapeziums

GCSE NUMBER – GUIDE TO 9 – 1 Levels

TOPIC	2	3	4	5	6	7	8	9
INTEGERS, RECIPROCALS, FACTORS, MULTIPLES AND PRIME NUMBERS	Use times tables to do division	Do calculations using BIDMAS	Write a number as a product of prime factors inc. use of powers	Irrational and rational numbers (3 sorts integer, fraction, decimal)				
	Find the factors of a number	Know negative number rules						
	Put a list of integers in order	Know multiples, factors and prime numbers	Find reciprocals of numbers inc. use of negative indices	Find the LCM or HCF of numbers				
	Know inverse ops							
ROUNDING AND APPROXIMATIONS	Round to the nearest integer, 10, 100 or 1000	Round to a given number of decimal places	Estimating calculations inc. division by less than 1	Estimate square roots	Know not to round intermediate calculations.	Max and min. values in calculations		
	Estimate answers to dec calculations	Round given number of significant figures		Use inequality notation eg error intervals If x = 2.1 rounded to 1 dp 2.05 ≤ x < 215 If x = 2.1 truncated to 1dp, 2.1 ≤ x < 2.2	Upper and lower bounds			
WHOLE NUMBER AND DECIMAL CALCULATIONS	Order a list of decimal numbers	Multiply and divide decimals inc negatives 0.3 ÷ 0.6						
	Multiply and divide whole nrs							
	Add, subtract decimals	Convert a terminal decimal to a fraction and vice versa						
FRACTIONS	Find equivalent fractions	Fractions of a quantity	Use division to convert fractions to decimals		Convert recurring decimals to an equivalent fraction 0.4141.. = 41/99			
	Calculations with simple fractions	Calculations with fractions	Calculations with improper fractions					
	Simplifying	Common denominators: ordering fractions						
		Find one number as a fraction of another						
		Convert mixed numbers to improper fractions						
SQUARES, CUBES, POWERS, SURDS AND ROOTS	Know square and cubic numbers	Use the function keys on a calculator for powers and roots		Know the key rules for indices; ① multiplying ② dividing ③ raising one power by another ④ powers of 1 & 0 ⑤ 1 to any power is 1 ⑥ raising fractions to powers		Know the harder rules; negative, fractional and two-stage fractional	Simplify expressions using the key rules	
	Know square & cube roots of nrs					Manipulating surds using the key rules		
						Rationalising the denominator		
POWERS OF 10 AND STANDARD FORM	Know how to multiply by 10, 100 or 1000	Know how to multiply by 0.1, 0.01 or 0.001	Convert between ordinary and standard form notation	Calculations with standard form both with and without a calculator		Write 2^25 x 5^27 in standard form		
	Know how to divide by 10, 100 or 1000	Understand the effect of multiplying or dividing by a nr. between 0 and 1						
PERCENTAGES	Know percentage equivalents of common fractions	Work out a percentage of an amount inc. simple interest	Find the percentage change	Working with percentages and using a multiplier				
		Increase or decrease a given quantity by a percentage	Find the original value (reverse percentage)	Understand and work out compound percentage growth and decay				
		Express one quantity as a percentage of another						
		Convert between fractions, decimals and percentages						
RATIO AND PROPORTION	Write down a ratio from given information	Write a ratio as a fraction	Sharing in a ratio	Solve more complex ratio problems inc. write ratios as equations and solve simultaneously				
		Simplify a ratio inc. decimals, fractions, mixed units and	Solve ratio problems using the unitary method			Solve direct and inverse proportion problems		
		Reduce to the form 1 : n eg 50cm : 1.5m	Direct and inverse proportion $y \propto kx$ or $y \propto k/x$ (no powers or roots)			Interpret the graphs of direct and inverse proportion relationships		
UNITS AND MEASUREMENTS	Use and convert standard units of measurement for length, area, volume/capacity, mass, time and money.		Converting area and volume measurements					
		Use and convert compound units; speed, rates of pay, unit pricing						
		Know and apply speed = dist /time	Know and apply density = mass/vol pressure = force/area					
CONVERSIONS		Convert metric measures	Convert area and volume measures					

PROBABILITY AND STATISTICS – GUIDE TO 9 – 1 Levels

TOPIC	3	4	5	6	7	8	9
BASIC PROBABILITY	All probabilities are between 1 and 0 on a probability scale	Listing all outcomes and finding probabilities from sample space diags eg show sum of throwing two dice	The AND rule giving P(both events happening) ie. P(A and B) = P(A) x P(B)	Conditional probabilities P(A and B) = P(A) x P(B given A) Use tree diagrams; eg You may watch TV or read before bed. The P(watch TV) is 0.3. If you read the P(tired the next day) is 0.8. Show that P(you read and are not tired the next day) = 0.14			
	Probability formula	Estimating probabilities using relative frequency	The OR rule giving P(at least one event happens) ie. P(A OR B) = P(A) + P(B) – P(A and B)				
	Probabilities add up to 1	Record results in frequency trees	Use tree diagrams inc independent and dependent (conditional) events structure given				
		Use probability to find an 'expected frequency'					
VENN DIAGRAMS		Use two circle Venn diagrams to classify outcomes and calculate probabilities.	Construct a Venn diagram to classify outcomes and calculate probabilities.	Construct a Venn diagram to classify outcomes and calculate probabilities inc. conditional; Out of 80 students buying ice cream; 48 had syrup, 28 sprinkles, 16 had both Show on a Venn diagram & find P(student doesn't have either given they don't have sprinkles)			
		Use set notation; A = {even numbers}	Use set notation; A = {x: x is prime}				
POPULATIONS & SAMPLING		Understand the difference between population and sample. Define a population. Know what is meant by simple random sampling and bias in sampling.					
DATA	Know different types of data; • categorical, numerical • discrete, continuous						
	Design tables to classify/capture data. No surveys required						
REPRESENTING & ANALYSING DATA	Interpret and construct; Pie charts, pictograms, composite bar chart	Find averages from freq. tables	Find averages from grouped freq. tables	Interpret and construct; Cumulative frequency graphs and box plots Make comparisons of distributions using the medians and IQR	Interpret and construct Histograms		
	Calculate the mean, median, mode and range inc. calc new statistic as a result of changes to original set		Interpret and plot scatter diagrams & lines of best fit, recognise outliers				
			Interpret and construct graphs from Time series data and identify trends (eg. seasonal)				