AQA GCSE Maths 8300 Topic List - HIGHER

	NUMBER	
N1	Order numbers	☐ Put in order of size, integers (whole numbers), decimals and fractions ☐ use the symbols =, ≠, <, >, ≤, and ≥ ☐ Understand and use positive and negative numbers on a number line
N2	Add, subtract, multiply, divide	☐ Add, subtract, multiply, and divide integers (whole numbers), decimals, simple fractions (including mixed numbers and improper fractions), both positive and negative ☐ Understand and use place value ☐ Understand the terms profit, loss, cost price, selling price, debit, credit, income tax, VAT and interest rate.
N3	Operations	☐ Understand inverse (opposite) operations; x and ÷, + and − ☐ Use correct order of operations (BIDMAS) ☐ Be able to understand and use brackets, powers, roots and reciprocals
N4	Factors, multiples and primes	Understand the terms; ☐ Prime number ☐ Factor ☐ Multiple ☐ Common factor ☐ Highest common factor ☐ Least (lowest) common multiple ☐ Express a number as a product of prime factors (factor tree) in index form and understand that this is unique for every number
N5	Listing and counting	☐ List things in a systematic way ☐ **Use the product rule for counting**

N6	Powers and roots	☐ Use positive integer powers and roots of numbers ☐ Recognise powers of 2, 3, 4 and 5 ☐ Know square numbers up to 15^2 ☐ Know that $10^3 = 1000$ and that $10^6 = 1$ million ☐ **Estimate powers and roots of any positive number**
N7	Powers and roots and fractional indices	☐ Calculate with roots and with whole number indices ☐ **Calculate with fractional indices**
N8	Exact calculations	☐ Calculate exactly with fractions ☐ Calculate exactly with multiples of π ☐ **Calculate exactly with surds** ☐ **Simplify surds (eg. $\sqrt{50} = 5\sqrt{2}$)** ☐ **Rationalise demoninators with surds**
N9	Standard form	☐ Understand numbers written in standard form ☐ Calculate with numbers in standard form
N10	Fractions and decimals	☐ Convert between fractions and decimals ☐ Be able to put fractions and decimals in order of size ☐ **Convert between recurring decimals and fractions**
N11	Fractions and ratios	☐ Be able to work with fractions in ratio problems
N12	Fractions and percentages	☐ Find a fraction of a quantity ☐ Find a percentage of a quantity ☐ Use a multiplier to increase of decrease a quantity (eg. use x 1.05 to increase by 5%, or 0.88 to decrease by 12%))
N13	Units of measurement	☐ Be able to use units of mass, length, time, money and other measures, including using decimal amounts ☐ Convert between metric measurements of length ☐ Convert between metric measurements of area ☐ Convert between metric measurements of volume and capacity ☐ NB. Imperial (old) units to metric units do not need to be known, and conversions will be given in the question if required
N14	Estimation	☐ Estimate answers (by rounding) ☐ Check calculations using approximation and estimation

N15	Rounding	☐ Round to an appropriate degree of accuracy ☐ Round to a number of decimal places ☐ Round to a number of significant figures ☐ Use inequality signs to show an error interval due to rounding, eg. $8.5 \leq a < 9.5$ ☐ Know not to round in the middle of a calculation, but just to round the final answer
N16		☐ Understand and use limits of accuracy ☐ **Understand and use upper and lower bounds**
	ALGEBRA	
A1	Basic notation	Understand and use algebraic notation, including ☐ ab, ☐ 3a ☐ a^2, a^3, a^2b, etc. ☐ $\frac{a}{b}$ ☐ Use fractions in algebra work instead of decimals ☐ Use brackets NB. Answers are expected to be given <u>in their simplest form</u> even when not asked to do so.
A2	Substitution	☐ Substitute numbers into formulas, and expressions, including scientific formulas which may not have been seen before
A3	Algebraic terms	Understand and use the terms; ☐ Expression ☐ Equation ☐ Formula ☐ Inequality ☐ Term ☐ Factor ☐ Identity

A4	Manipulate algebra	☐ Simplify by collecting like terms ☐ Multiply out a single bracket ☐ Factorise a single bracket by taking out common factors ☐ Expand two brackets ☐ Factorise quadratics (with a single x^2) into two brackets ☐ Factorise quadratics using the difference of two squares, eg. $a^2 - 9 = (a + 3)(a - 3)$ ☐ Simplify algebraic expressions by adding, subtracting and multiplying ☐ Use index laws ☐ **Expand three brackets** ☐ **Factorise quadratics with $3x^2$, $10x^2$ etc. into two brackets** ☐ **Manipulate algebraic expressions involving surds** ☐ **Manipulate algebraic expressions involving algebraic fractions**
A5	Formulae	☐ Understand and use mathematical formulae ☐ Rearrange a formula to change the subject
A6	Expressions	☐ Know the difference between an equation, like $2x + 3 = 17$, and an identity, like $2x \equiv x + x$ ☐ Be able to show that two expressions are equal ☐ **Use algebra in proofs**
A7	Functions	☐ Understand functions with inputs and outputs ☐ **Understand inverse functions** ☐ **Understand composite functions (two functions)** ☐ **Understand and use function notation, eg. f(x), gf(x) etc.**
A8	Graphs	☐ Work with graphs in all four quadrants (ie. with negative values as well as positive)
A9	Straight line graphs	☐ Plot straight line graphs ☐ Use $y = mx + c$ to find parallel graphs ☐ Find the equation of a line when given the gradient and one point ☐ Find the equation of a line when given two points ☐ **Use $y = mx + c$ to find perpendicular graphs**

A10	Gradients and intercepts	☐ Find and use gradients and intercepts of graphs
A11	Key features of graphs	Look at a quadratic graph and identify from it ☐ Roots (where a graph crosses the x axis) ☐ Intercept (where it crosses the y axis) ☐ Turning points ☐ Find the roots of a quadratic using algebra ☐ **Find the turning points of a graph by completing the square** ☐ Understand the symmetry of a quadratic graph
A12	Other graphs	Recognise, sketch or interpret other graphs, including ☐ Cubic functions (x^3, etc.) ☐ Reciprocal functions ($\frac{1}{x}$, etc.) ☐ **Exponential functions ($y = 5^x$, etc.)** ☐ **y = sin x** ☐ **y = cos x** ☐ **y = tan x**
A13	**Transformations of graphs**	☐ **Sketch translations and reflections of functions**
A14	Real life graphs	☐ Plot and interpret graphs of speed, distance and time ☐ Use graphs to find solutions with problems of speed, distance and acceleration ☐ Understand and use reciprocal graphs ☐ **Understand and use exponential graphs**
A15	**Distance-time graphs and speed-time graphs**	☐ **Find gradients of distance-time graphs to estimate speed** ☐ **Find gradients of speed-time graphs to estimate acceleration** ☐ **Find area under a distance-time graph to estimate distance**
A16	**Graph of a circle**	☐ **Recognise and use the equation of the graph of a circle (with centre at the origin only)** ☐ **Find the equation of a tangent to a circle**

A17	Linear equations	☐ Solve linear equations ☐ Solve equations with x on both sides ☐ Solve equations with brackets ☐ Find a solution to a linear equation by reading it from a graph
A18	Quadratic equations	☐ Solve quadratic equations by factorising into 2 brackets ☐ Find solutions to a quadratic equation by reading them from a graph ☐ **Solve quadratic equations that need rearranging first** ☐ **Solve quadratic equations using the quadratic formula** ☐ **Solve quadratic equations by completing the square**
A19	Simultaneous equations	☐ Solve simultaneous linear equations ☐ Find solutions simultaneous equations by reading them from a graph ☐ **Solve simultaneous equations when one is linear and the other is quadratic**
A20	**Iteration**	☐ **Find approximate solutions to equations by using iteration**
A21	Creating expressions and equations	☐ Create an expression from a word or shape problem ☐ Create an equation from a word or shape problem and solve it
A22	Inequalities	☐ Solve linear inequalities ☐ Represent solutions to linear inequalities on a number line ☐ **Solve linear inequalities with two variables** ☐ **Solve quadratic inequalities** ☐ **Represent solutions to inequalities on a number line, using set notation, or on a graph** NB. On a number line, open circles and closed circles must be used correctly, and on a graph, dashed lines and solid lines must be used correctly.
A23	Sequences	☐ Generate a sequence from a term-to-term rule or an nth term expression ☐ Generate a sequence from patterns

A24	Sequences	Recognise and use sequences, including ☐ Square numbers ☐ Cube numbers ☐ Triangular numbers ☐ Arithmetic (linear) sequences ☐ Fibonacci sequences ☐ Simple geometric sequences (eg. doubling or multiplying each term by 3) ☐ **Other sequences** ☐ **Sequences involving surds**
A25	Nth term of a sequence	☐ Find the nth term of a linear sequence ☐ **Find the nth term of a quadratic sequence**
	RATIO, PROPORTION AND RATES OF CHANGE	
R1	Units	Change between units for ☐ Time ☐ Length ☐ Area ☐ Volume/capacity ☐ Mass Change between units for compound measures of ☐ Speed ☐ Rates of pay ☐ Density ☐ Pressure
R2	Scale	☐ Use scale factors, scale diagrams and maps
R3	Finding a fraction	☐ Express one quantity as a fraction of another NB. The result may also be greater than one or a top-heavy fraction.
R4	Simple ratios	☐ Use ratio notation ☐ Simplify a ratio

R5	Using ratios	☐ Dividing a quantity into a given ratio ☐ Make a division into two parts into a ratio ☐ Use ratio in problems, including mixing substances, conversions, scale problems, and best value for money, etc.
R6	Writing as a ratio	☐ Express two amounts as a ratio or fraction
R7	Proportion	☐ Understand and use proportion
R8	Ratio and fractions	☐ Understand the relationship between ratio and a fraction or a linear function
R9	Percentages	☐ Understand the meaning of percentage ☐ Change percentages to fractions or decimals and the other way round ☐ Use percentages, fractions and decimals to multiply ☐ Express one amount as a percentage of another ☐ Compare two quantities by using percentages ☐ Use percentages greater than 100% ☐ Solve problems using percentage change ☐ Work with percentage increase and decrease ☐ Calculate an original value (reverse percentages) ☐ Find simple interest
R10	Proportion	☐ Solve problems involving direct proportion ☐ Solve problems involving inverse proportion ☐ Understand graphs of direct and inverse proportion
R11	Compound units	Use units for compound measures of ☐ Speed ☐ Rates of pay ☐ Density ☐ Price per item/amount ☐ Pressure
R12	Comparisons	☐ Compare lengths, areas and volumes using ratio notation ☐ Apply ratio comparisons in similar shapes or in trigonometry ratios

R13	Direct and inverse proportion	☐ Understand that x inversely proportional to y means x is proportional to $\frac{1}{y}$ ☐ Use equations for direct and inverse proportion ☐ **Construct and use equations for direct and inverse proportion**
R14	Graphs and proportion	☐ Understand and use the gradient of a straight line graph as a rate of change ☐ Recognise and use graphs that show direct or inverse proportion
R15	**Graphs and proportion**	☐ **Understand and use the gradient at a point on a curve as an instantaneos rate of change** ☐ **Understand average rate of change (gradient of a chord) and instantaneous rate of change (gradient of a tangent)**
R16	Growth and decay	☐ Set up and solve problems of growth and decay ☐ Set up and solve problems of compound interest ☐ **Work with iterative processes**
	GEOMETRY AND MEASURE	
G1	Understanding terms	☐ Understand and use the terms points, lines, vertices and planes ☐ Understand and use the terms parallel, perpendicular and right angle ☐ Understand and use the terms polygon and regular polygon ☐ Understand symmetry and rotational symmetry of polygons ☐ Understand labelling of sides and angles on shapes ☐ Draw a diagram from a description

G2	Constructions	Use ruler and compasses to construct ☐ Perpendicular bisector of a line ☐ Perpendicular at a point on a line ☐ Perpendicular from a separate point to a line ☐ Angle bisector ☐ An angle of 60° ☐ Use constructions in loci problems ☐ Know that the perpendicular from a point to a line is the shortest distance from the point to the line
G3	Basic angle facts	Know and use ☐ Angles at a point add up to 360º ☐ Angles at a point on a straight line add up to 180º ☐ Vertically opposite angles are equal ☐ In parallel lines, alternate angles are equal ☐ In parallel lines, corresponding angles are equal ☐ Angles in a triangle add up to 180º ☐ Be able to find the sum of angles in any polygon ☐ Be able to find exterior and interior angles of any regular polygon NB. In parallel lines, “Z angles” and “F angles” are not allowed as reasons

G4	Triangles, quadrilaterals and other polygons	Know and use the special properties of quadrilaterals: ☐ Square ☐ Rectangle ☐ Parallelogram ☐ Trapezium ☐ Kite ☐ Rhombus Know and use the special properties of triangles: ☐ Isosceles triangle ☐ Equilateral triangle ☐ Scalene triangle ☐ Right-angled triangle ☐ Acute angled triangle ☐ Obtuse angled triangle Know and use the names of polygons: ☐ Pentagon ☐ Hexagon ☐ Octagon ☐ Decagon
G5	Congruent triangles	☐ Know and use the criteria for congruent triangles: SSS, SAS, ASA and RHS
G6	Applying angle facts and other properties	☐ Apply angle facts and facts about congruence and similar shapes to find angles and sides ☐ Use Pythagoras' theorem ☐ Use base angles in an isosceles triangle are equal ☐ Use angle facts and other properties for simple proofs

G7	Transformations	☐ Identify, describe or draw similar shapes ☐ Identify, describe or draw congruent shapes Describe and use transformations: ☐ Rotation ☐ Reflection ☐ Translation (including using vectors) ☐ Enlargement ☐ Describe and use enlargements with fractional scale factors ☐ **Describe and use enlargements with negative scale factors**
G8	**Combinations of transformations**	☐ **Describe and use combinations of rotations, reflections and translations** ☐ **Identify invariant points from transformations**
G9	The circle	Know and use definitions and properties of circle parts: ☐ Centre ☐ Radius ☐ Chord ☐ Diameter ☐ Circumference ☐ Tangent ☐ Arc ☐ Sector ☐ Segment

G10	**Circle theorems**	**Apply <u>and prove</u> circle theorems:** ☐ **Angle at the centre is double the angle at the circumference** ☐ **Angle in a semicircle is 90º** ☐ **Angles in the same segment are equal** ☐ **Opposite angles in a cyclic quadrilateral add up to 180º** ☐ **Angle between a tangent and a radius is 90º** ☐ **Tangents from an external point are equal in length** ☐ **The perpendicular from the centre to a chord bisects the chord** ☐ **Alternate segment theorem**
G11	Geometry on a grid	☐ Solve geometrical problems on a coordinate grid
G12	Solid shapes	Know properties of the faces, surfaces, edges and vertices of ☐ Cubes ☐ Cuboids ☐ Prisms ☐ Cylinders ☐ Pyramids ☐ Cones ☐ Spheres
G13	Plans and elevations	☐ Draw and interpret plans and elevations of 3D shapes
G14	Units of measure	☐ Use standard units of measure for length, area, volume/capacity, mass, time, money, etc.
G15	Maps and scale drawings	☐ Measure and use lines and angles in diagrams ☐ Use maps and scale drawings ☐ Use bearings, including the 8 compass points and 3-figure angles for bearings

G16	Area and volume	Know and use formulas to calculate ☐ Area of a triangle ☐ Area of a parallelogram ☐ Area of a trapezium ☐ Volume of a cuboid ☐ Volume of a prism ☐ Volume of a cylinder
G17	Circles and other shapes	☐ Know and use the formula for circumference of a circle ☐ Know and use the formula for area of a circle ☐ Calculate perimeters of 2D shapes ☐ Calculate areas of compound shapes Find the surface area and volume of ☐ Sphere ☐ Pyramid ☐ Cone ☐ Frustum ☐ Composite solids NB. Answers may be asked for in terms of π
G18	Sectors and arcs	☐ Calculate length of an arc ☐ Calculate area of a sector ☐ Calculate the angle of a sector
G19	Congruence and similarity	☐ Understand congruent shapes ☐ Understand similar shapes ☐ Calculate lengths in similar shapes ☐ **Understand the relationship between lengths, areas and volumes of similar shapes** ☐ **Calculate lengths, areas and volumes in similar shapes**
G20		☐ Know and use the formula for Pythagoras' Theorem to find a length ☐ Know and use the sin, cos and tan ratios to find a length ☐ Know and use the sin, cos and tan ratios to find an angle ☐ **Use Pythagoras and sin, cos and tan in three dimensional shapes**

G21	Exact values of sin, cos and tan	☐ Know the exact values of sin and cos for angles of 0º, 30º, 45º, 60º and 90º ☐ Know the exact values of tan for angles of 0º, 30º, 45º, and 60º
G22	**Sine and cosine rules**	☐ **Know and use the sine rule to find lengths and angles** ☐ **Know and use the cosine rule to find lengths and angles**
G23	**Area of a triangle using sin**	☐ **Know and use the formula to find area of a triangle using sin** ☐ **Use the same formula to find a length or an angle**
G24	Vectors for translations	☐ Use a vector to describe a translation
G25	Using vectors	☐ Add and subtract vectors ☐ Multiply a vector by a number ☐ Use column vectors and vectors on diagrams ☐ **Use vectors in vector geometry problems and proofs**
	PROBABILITY	
P1	Basic probability	☐ Use tables and probability trees to show outcomes and probabilities NB. Probabilities should be shown as fractions, decimals or percentages
P2	Random, fair and equally likely events	☐ Understand and use ideas of random events, fairness, and equally likely events ☐ Use these ideas to calculate expected outcomes
P3	Relative frequency	☐ Understand the relationship between relative frequency and probability
P4	Exhaustive outcomes	☐ Understand and use the fact that the probabilities of exhaustive outcomes (all possible outcomes) add up to 1
P5	Experimental probability	☐ Understand that the greater the sample size or number of events in experimental probability, the closer the results will be to the theoretical probability

P6	Diagrams	Use diagrams for showing and calculating sets of data, including ☐ Tables and grids ☐ Venn diagrams ☐ Tree diagrams
P7	Sample spaces	☐ Use sample spaces for single or combined events with equally likely outcomes ☐ Use sample spaces to calculate theoretical probabilities
P8	Probability trees	☐ Use tree diagrams to represent independent events ☐ Use tree diagrams to represent dependent events ☐ Use adding and multiplying correctly for combined probabilities
P9	**Conditional probabilities**	☐ **Understand and calculate conditional probabilities, using two-way tables, tree diagrams and Venn diagrams**
	STATISTICS	
S1	Sample populations	☐ Understand how a sample of a population can be used to represent the whole population
S2	Graphs and diagrams	Construct and use ☐ Frequency tables ☐ Bar charts ☐ Pie charts ☐ Pictograms ☐ Vertical line charts ☐ Tables and line graphs for time series data
S3	**Grouped data**	☐ **Construct and use histograms** ☐ **Construct and use cumulative frequency graphs**

S4	Measures of data	☐ Be able to represent data in graphs or diagrams ☐ **Use box plots to represent data** Understand and use ☐ Median ☐ Mean ☐ Mode and modal class ☐ Range ☐ **Lower quartile and upper quartile** ☐ **Inter-quartile range** Know and understand the terms ☐ Primary data ☐ Secondary data ☐ Discrete data ☐ Continuous data
S5	Describing a population	☐ Describe a population, eg. using range, median, etc.
S6	Scatter graphs	☐ Use and interpret scatter graphs ☐ Recognise correlation (positive or negative, and strong or weak, or no correlation) ☐ Understand that a correlation doesn't mean that one variable is a cause of the other ☐ Draw a line of best fit ☐ Use a line of best fit to predict results ☐ Extrapolate data, but understand why this is not always advisable