Subject	Higher Mathematics	Exam Board	AQA	Course Code	8300

Overview

Mock Assessments
One Non-Calculator Paper (Paper 1) 90 minutes. Two Calculator Papers (Papers 2 and 3) 90 minutes for each paper. Full mathematics equipment required.

AQA Higher Mathematics – Revision List

Number

order positive and negative integers, decimals and fractions	
use the symbols =, ≠, <, >, ≤, ≥	
apply +, - , × and ÷ to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative	
understand and use place value	
recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions)	
be able to use order of operations, including brackets, powers, roots and reciprocals (BIDMAS)	
use the concepts and vocabulary of prime numbers, factors (divisors), multiples, HCF, LCM, prime factorisation, including using product notation and the unique factorisation theorem	
apply systematic listing strategies, including the product rule	
use positive integer powers and associated real roots (squares up to 15 × 15, cube and higher), recognise powers of 2, 3, 4, 5	
estimate powers and roots of any given positive number	
Know that $1000 = 10^3$ and 1 million = 10^6	
Calculate with roots and with integer and fractional powers	
Give exact answers as fractions and/or multiples of π	
calculate exactly with surds, simplify surd expressions involving squares and rationalise denominators	
Understand and perform calculations involving numbers in standard form	
work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$)	
change recurring decimals into their corresponding fractions and vice versa	
identify and work with fractions in ratio problems	
interpret fractions and percentages as operators	
use standard units of mass, length, time, money and other measures (including standard compound measures)	
know and use metric conversion factors for length, area, volume and capacity.	
estimate answers	
check calculations using approximation and estimation, including answers obtained using technology (mainly calculators)	
round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures)	
specify error intervals using inequalities e.g. $4.5 \leq x < 5.5$	
understand not to round values unless it is the final answer	
apply and interpret limits of accuracy e.g. to the nearest cm, including using upper and lower bounds	

Algebra

use and interpret algebraic notation, including: • ab in place of a × b • 3y in place of y + y + y and 3 × y • a^2 in place of a × a, a^3 in place of a × a × a, a^2b in place of a × a × b • $\frac{a}{b}$ in place of a ÷ b • coefficients written as fractions rather than as decimals • brackets	
substitute numerical values into formulae and expressions	
understand and use the concepts and vocabulary of expressions, equations, formulae, inequalities, terms and factors	
simplify and manipulate algebraic expressions (including those involving surds) by: • collecting like terms • multiplying a single term over a bracket • taking out common factors • simplifying expressions involving sums, products and powers, including the laws of indices • expanding two or more brackets • factorising all quadratic expressions, including the difference of two squares	
understand and use standard mathematical formulae e.g $A = \pi r^2$	
be able to change the subject of a formulae	
know the difference between an equation and an identity	
argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments, including proofs	
where appropriate, interpret simple expressions as functions with inputs and outputs	
understand functions, including inverse and composite functions i.e. f(x) fg(x), gf(x) and $f^{-1}(x)$	
work with coordinates in all four quadrants	
plot graphs of equations that correspond to straight-line graphs in the coordinate plane	
use the form y = mx + c to identify parallel and perpendicular lines	
find the equation of the line through two given points, or through one point with a given gradient	
identify and interpret gradients and intercepts of linear functions graphically and algebraically	
identify and interpret roots, intercepts and turning points of quadratic functions graphically - find roots algebraically	
deduce turning points of a graph by completing the square, identify the symmetry property of a quadratic	
recognise, sketch and interpret graphs of linear functions and quadratic functions, including simple cubic functions, the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$, exponential functions, $y = k^x$ and the trigonometric functions	
understand what happens when you transform a graph	
plot and interpret graphs, and graphs of non-standard functions in real life contexts	
find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration, including reciprocal and exponential graphs	
calculate or estimate gradients of graphs and areas under graphs and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts	
recognise and use the equation of a circle with centre at the origin	
find the equation of a tangent to a circle at a given point	
solve linear equations in one unknown algebraically, including those with the unknown on both sides of the equation and those with brackets	
find approximate solutions to an equation using a graph	
solve quadratic equations algebraically by factorising, completing the square and by using the quadratic formula including those which need to be rearranged,	
find approximate solutions of a quadratic using a graph	
be able to form and solve expressions from a given situation	
be able to form an equation (or two simultaneous equations), solve the equation(s) and interpret the solution	
solve linear inequalities in one or two variable(s), and quadratic inequalities in one variable	
represent the solution set of inequalities on a number line, using set notation and on a graph	
generate future terms of a sequence using a term-to-term rule or the nth term	
recognise and use sequences of triangular, square and cube numbers and others including Fibonacci-type sequences, quadratic sequences, and others where r is a surd	
Understand simple arithmetic and geometric progressions	
deduce expressions to calculate the nth term of linear and quadratic sequences	

Ratio, proportion and rates of change

change freely between and use related units (e.g. time, length, area, volume/capacity, mass) and compound units (e.g. speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts	
use scale factors, scale diagrams and maps	
express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1	
use ratio notation, including reduction to simplest form	
divide a given quantity into two parts in a given part : part or part : whole ratio	
express the division of a quantity into two parts as a ratio	
apply ratio to real contexts and problems including better value or best-buy problems.	
express a multiplicative relationship between two quantities as a ratio or a fraction	
understand and use proportion as equality of ratios	
relate ratios to fractions and to linear functions	
define percentage as 'number of parts per hundred'	

interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively	
express one quantity as a percentage of another	
compare two quantities using percentages	
work with percentages greater than 100%	
solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics	
solve problems involving direct and inverse proportion, including graphical and algebraic representations	
use compound units such as speed, rates of pay, unit pricing,	
compare lengths, areas and volumes using ratio notation	
understand scale factors	
make links to similarity (including trigonometric ratios)	
understand that X is inversely proportional to Y is equivalent to X is proportional to $\frac{1}{X}$	
construct and interpret equations that describe direct and inverse proportion	
interpret the gradient of a straight-line graph as a rate of change	
recognise and interpret graphs that illustrate direct and inverse proportion	
set up, solve and interpret the answers in growth and decay problems, including compound interest and work with general iterative processes	
interpret the gradient at a point on a curve as the instantaneous rate of change	
apply the concepts of average and instantaneous rate of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts	

Geometry and Measures

use conventional terms, vocabulary and notations	
use the standard conventions for labelling and referring to the sides and angles of triangles e.g. labelling angle ABC	
draw diagrams from written description	
use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); use these to construct given figures and solve loci problems, including constructing an angle of 60°.	
know that the perpendicular distance from a point to a line is the shortest distance to the line	
apply the properties of angles at a point (the angles total 180°), angles at a point on a straight line (the angles total 360°) and vertically opposite angles	
understand and use alternate and corresponding angles on parallel lines	
derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons)	
derive and apply the properties and definitions of: special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus and triangles and other plane figures using appropriate language	
use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)	
apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras' theorem and the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs	
identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement, including fractional and negative scale factors	
describe the changes and invariance achieved by combinations of rotations, reflections and translations	
identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment	
solve geometrical problems on coordinate axes	
know and be able to apply circle theorems	
identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres	
interpret plans and elevations of 3D shapes	
construct and interpret plans and elevations of 3D shapes	
use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money etc.)	
measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings including the eight compass point bearings and three-figure bearings.	
know and apply formulae to calculate: area of triangles, parallelograms, trapezia;	
volume of cuboids and other right prisms (including cylinders)	
know the formulae for circumference and area of a circle,	
calculate perimeters of 2D shapes, including circles, areas of circles and composite shapes	
surface area and volume of spheres, pyramids, cones and composite solids including frustums.	
calculate arc lengths, angles and areas of sectors of circles	
apply the concepts of congruence and similarity, including the relationships between lengths, areas and volumes in similar figures	
know the formulae used for Pythagoras' theorem and trigonometric ratios and apply them to find angles and lengths in right-angled triangles in 2D and 3D	
know and be able to use the sine and cosine rules	
know and use the area of a triangle using the sine area rule	
know the exact values of sin θ, cos θ and tan θ for θ = 0°, 30°, 45°, 60°, 90°	
describe translations as 2D vectors	
apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors	
use vectors to construct geometric arguments and proofs	

Probability

be able to use tables and frequency trees to display the outcomes of probability experiments	
calculate the expected outcome of future (or given) probability events	
using appropriate language and the 0 to 1 probability scale to describe a theoretical probability	
apply the property that the probabilities of all outcomes in an event sum to 1	
apply the property that the probabilities of mutually exclusive events sum to 1	
understand that an increase in the sample size (the number of trials) will result in a more reliable result.	
understand sets and combinations of sets systematically, using tables, grids, Venn diagrams, including using tree diagrams	
understand and construct probability sample spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities	
calculate the probability of two or more events, whether independent or dependent	
calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams	

Statistics

infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling	
interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data, tables and line graphs for time series data and know their appropriate use	
construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use	
interpret, analyse and compare the distributions of data sets using either: • appropriate graphical representation involving discrete, continuous and grouped data, including box plots • appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers) including quartiles and inter-quartile range	
know and understand the terms: primary data, secondary data, discrete data and continuous data.	
apply statistics to describe a set of data	
use and interpret scatter graphs for bivariate data; know and understand the terms for correlation: positive, negative, no, weak and strong.	
draw estimated lines of best fit and make predictions	
use a line of best fit to predict a value from the trend line (extrapolation and interpolation) whilst knowing the limitation of using a line of best fit	

Useful revision resources

Websites

Mathswatch - https://vle.mathswatch.co.uk/vle/
Corbett Maths – https://corbettmaths.com/
GCSEPod - https://www.gcsepod.com/
Seneca Learning - https://senecalearning.com/en-GB/
BBC Bitesize Learning - https://www.bbc.co.uk/bitesize/examspecs/z8sg6fr
Oak National Academy - https://classroom.thenational.academy/subjects-by-key-stage/key-stage-4/subjects/maths

Recommended Revision Guides

Collins GCSE AQA revision guides - £4.50 from your mathematics teacher
Corbett Maths revision cards - £6.50 from your mathematics teacher

Recommended Calculators

Casio fx-83 GTX, fx-85 GTX, Casio Classwiz EX-991 (recommended if continuing onto A-Level Mathematics)

Revision Tips

Revision for Mathematics is based upon practice (and more practice). You need to be confident at the skills and concepts that make up the course in order to be able to work through the more challenging problems. Revision should be interactive, not just reading notes

Students can work through the Mathswatch 6 week plan (available from the Mathswatch Website under Extras > GCSE) or identify key topic areas via the Mathswatch list below. On the 6 week plan, students can split it up according to the two assessment periods)

A potential plan of action would be

- Work through the plans below watching the relevant videos (try the one minute videos first and if you do not understand then watch the longer videos)
- Attempting the interactive questions if needed
- Work through maths problems and past papers.
- Do not just read your notes/revision guides as you need to practice your Maths skills.

Any additional information will be placed into the GSHS Maths Revision Area http://bit.ly/GSHSMathsRevision

Perimeter, area and volume

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

Area of a trapezium $= \frac{1}{2}(a+b)h$

Volume of a prism = area of cross section × length

Where r is the radius and d is the diameter:

Circumference of a circle $= 2\pi r = \pi d$

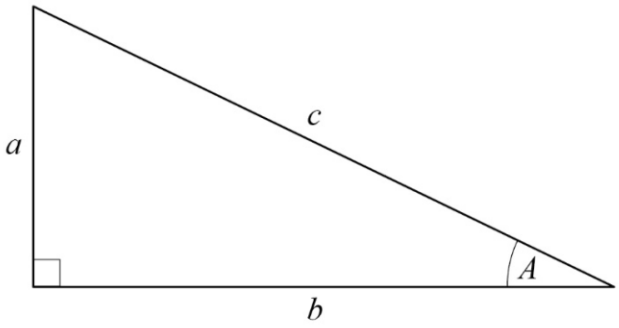
Area of a circle $= \pi r^2$

Quadratic formula

The solution of $ax^2 + bx + c = 0$ where $a \neq 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Pythagoras' Theorem and Trigonometry

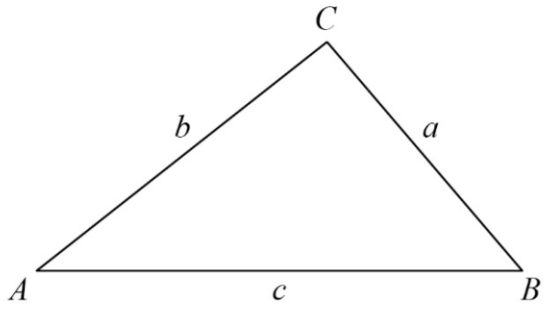


In any right-angled triangle where a, b and c are the length of the sides and c is the hypotenuse:

$$a^2 + b^2 = c^2$$

In any right-angled triangle ABC where a, b and c are the length of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c} \qquad \cos A = \frac{b}{c} \qquad \tan A = \frac{a}{b}$$



In any triangle ABC where a, b and c are the length of the sides:

sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$

Compound Interest

Where P is the principal amount, r is the interest rate over a given period and n is number of times that the interest is compounded:

$$\text{Total accrued} = P\left(1 + \frac{r}{100}\right)^n$$

Probability

Where $\mathrm{P}(A)$ is the probability of outcome A and $\mathrm{P}(B)$ is the probability of outcome B:

$$\mathrm{P}(A \text{ or } B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \text{ and } B)$$

$$\mathrm{P}(A \text{ and } B) = \mathrm{P}(A \text{ given } B)\ \mathrm{P}(B)$$