Mathematics Equivalence Test

To prepare for your equivalence test:

- Look at the content list for the current GCSE (see below). Your Equivalence test questions will cover a sample of the mathematics from the Foundation lists so check you are familiar with that content. Audit your skills against the list, look for specific support online.

- Try the sample papers provided by the University then mark them using the solutions, which include possible methods.

- Try the specimen GCSE papers from the four examination boards (see below).

- Try additional GCSE papers available from the examination boards and on the internet. The more recent papers are a better match to the question style than the older papers, but all will help to refresh your skills and understanding.

For specimen papers from each examination board see:

http://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300

http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html

http://www.eduqas.co.uk/qualifications/mathematics/gcse/

http://www.ocr.org.uk/qualifications/gcse-mathematics-j560-from-2015/

For additional support materials see:

http://www.mrbartonmaths.com/gcse.htm Try: Quiz a day ... Passports (grade C) ... all of it!

http://revisionmaths.com/gcse-maths-revision For notes and information

https://www.foundationonline.org.uk/course/view.php?id=27 For the self-evaluation tool (NB you will have to register)

http://www.bbc.co.uk/education/subjects/z38pycw Videos with questions

https://www.cgpbooks.co.uk/interactive_gcse_maths Short quizzes with answers

https://studymaths.co.uk/ Notes, games and online simple questions with checking

http://www.revisegcsemaths.co.uk/ Notes, questions and links to other resources

Content list

Audit your understanding and confidence with each item.

Number - Structure and calculation	
order positive and negative integers, decimals, fractions and use the symbols =, ≠, <, >, ≤, ≥	
apply the four operations, including formal written methods, to integers, decimals, simple fractions (proper and improper), and mixed numbers – all both positive and negative; understand and use place value (e.g. when working with very large or very small numbers, when calculating with decimals)	
recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions); use conventional notation for priority of operations, including brackets, powers, roots and reciprocals	
use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem	
apply systematic listing strategies	
use positive integer powers and associated real roots (square, cube and higher); recognise powers of 2, 3, 4, 5; calculate with roots, and with integer indices	
calculate exactly with fractions and multiples of π	
calculate with and interpret standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer	
Number - Fractions, decimals and percentages	
work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and 7/2 or 0.375 or 3/8)	
identify and work with fractions in ratio problems	
interpret fractions and percentages as operators	
Number - Measures and Accuracy	
use standard units of mass, length, time, money and other measures using decimal quantities where appropriate	
use standard units (including standard compound measures)	
estimate answers; check calculations using approximation and estimation, including answers obtained using technology	
round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places, to a specified number of significant figures.)	
use inequality notation to specify simple error intervals due to truncation or rounding	
apply and interpret limits of accuracy	
Algebra - Notation, vocabulary and manipulation	
use and interpret algebraic notation, including: ab in place of $a \times b$ $3y$ in place of $y + y + y$ and $3 \times y$ a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, $a^2 b$ in place of $a \times a \times b$ a/b in place of $a \div b$ - coefficients written as fractions rather than as decimals - brackets	
substitute numerical values into formulae and expressions, including scientific formulae	
understand and use the concepts and vocabulary of expressions, equations, formulae, identities 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 - expanding products of two binomials - factorising quadratic expressions of the form $x^2 + bx + c$, including the difference of two squares - simplifying expressions involving sums, products and powers, including the laws of indices	
understand and use standard mathematical formulae; rearrange formulae to change the subject	
where appropriate, interpret simple expressions as functions with inputs and outputs	
know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent; use algebra to support and construct arguments	

Algebra - Graphs

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 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	
identify and interpret roots, Intercepts and turning points of quadratic functions graphically; deduce roots *{of quadratic functions}* algebraically	
recognise, sketch and interpret graphs of linear, quadratic, simple cubic functions and the reciprocal function $y = 1/x$ with $x \neq 0$	
plot and interpret graphs including reciprocal graphs to find approximate solutions to problems	
plot and interpret graphs of non-standard functions in real contexts, to find approximate solutions to problems	
plot and interpret graphs to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration	

Algebra - Solving equations and inequalities

solve linear equations in one unknown algebraically including those with the unknown on both sides of the equation; find approximate solutions using a graph	
solve quadratic equations algebraically by factorising; find approximate solutions using a graph	
solve two simultaneous linear equations in two variables algebraically; find approximate solutions using a graph	
translate simple situations or procedures into algebraic expressions or formulae; derive and solve an equation (or two simultaneous equations) and interpret the solution	
solve linear inequalities in one variable; represent the solution set on a number line	

Algebra - Sequences

generate terms of a sequence from either a term-to-term or a position-to-term rule	
recognise and use sequences of triangular, square, cube numbers, simple arithmetic progressions	
recognise and use Fibonacci type sequences, quadratic sequences, simple geometric progressions (r^n where n is an integer, and r is a rational number > 0	
deduce expressions to calculate the nth term of linear sequences	

Ratio, proportion and rates of change

change freely between related standard units (e.g. time, length, area, volume/capacity, mass) in numerical contexts	
change freely between 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 (such as those involving conversion, comparison, scaling, mixing, concentrations)	
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 problems, 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 density and pressure	

compare lengths, areas and volumes using ratio notation and make links to scale factors and similarity (including trigonometric ratios)	
understand that X is inversely proportional to Y is equivalent to X is proportional to 1/Y 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 and solve growth and decay problems, including compound interest; interpret the answers	

Geometry and measures - Properties and constructions	
use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries	
use the standard conventions for labelling and referring to the sides and angles of triangles	
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; 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, angles at a point on a straight line, 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 or 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; triangles; 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 Pythagoras' Theorem, results about angles and sides including the fact that the base angles of an isosceles triangle are equal; use known results to obtain simple proofs	
identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment	
solve geometrical problems on coordinate axes	
identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms cylinders, pyramids, cones and spheres	
interpret and construct plans and elevations of 3D shapes	
Geometry and measures - Mensuration and calculation	
use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money, etc.)	
measure line segments and angles in geometric figures and scale drawings including interpreting maps Including use of bearings	
know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders)	
know the formulae: circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^2; calculate: perimeters of 2D shapes, including circles; areas of circles and composite shapes; surface area of spheres, pyramids, cones, composite solids; volume of spheres, pyramids, cones, composite solids	
calculate arc lengths, angles and areas of sectors of circles	
apply the concepts of congruence and similarity	
know the formulae for: Pythagoras' theorem, $a^2 + b^2 = c^2$; the trigonometric ratios, $\sin\vartheta = opposite/hypotenuse$, $\cos\vartheta = adjacent/hypotenuse$ and $\tan\vartheta = opposite/adjacent$; apply them to find angles and lengths in right-angled triangles in two dimensional figures	
know the exact values of $\sin\vartheta$ and $\cos\vartheta$ for $\vartheta = 0°$, 30°, 45°, 60° and 90°; know the exact value of $\tan\vartheta$ for $\vartheta = 0°$, 30°, 45° and 60°	
Geometry and measures - Vectors	
describe translations as 2D vectors	
apply addition and subtraction of vectors, multiplication of vectors by a scalar, diagrammatic and column representations of vectors	

Probability

record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees	
apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments	
relate relative expected frequencies to theoretical probability, using appropriate language and the 0 - 1 probability scale	
apply the property that the probabilities of an exhaustive set of outcomes and of mutually exclusive events sum to one	
understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size	
enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams	
construct theoretical possibility spaces for single and combined experiments with equally likely outcomes; use these to calculate theoretical probabilities	
calculate the probability of independent and dependent combined events including using tree diagrams and other representations and know the underlying assumptions	

Statistics

infer properties of populations and distributions from a sample whilst knowing the limitations of sampling	
interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts, pictograms for categorical data, vertical line charts for ungrouped discrete numerical data	
interpret and construct tables and line graphs for time series data and know their appropriate use	
interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: • appropriate graphical representation involving discrete, continuous and grouped data • appropriate measures of central tendency (median, mean, mode and modal class), spread (range including consideration of outliers)	
apply statistics to describe a population	
use and interpret scatter graphs of bivariate data, recognise correlation	
know that [correlation] does not indicate causation, draw estimated lines of best fit, make predictions, interpolate and extrapolate apparent trends whilst knowing the dangers of so doing	