**PGCE Mathematics Subject Knowledge Audit**

For the following questions, select the rating which most accurately matches your level of confidence (1 is not confident and 4 is very confident).

**Mathematical Processes and Applications**

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| **How confident are you that you know what it means to:** | 1 | 2 | 3 | 4 |
| Conjecture? |  |  |  |  |
| Generalise? |  |  |  |  |
| Find a counter example? |  |  |  |  |
| Identify a special case? |  |  |  |  |
| Use mathematical reasoning? |  |  |  |  |
| Investigate a problem systematically? |  |  |  |  |
| Distinguish between verification and proof? |  |  |  |  |
| State constraints and assumptions when deducing results? |  |  |  |  |

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| **How confident are you that you know what it means to:** | 1 | 2 | 3 | 4 |
| Solve a multi-step word problem? |  |  |  |  |
| Check a solution to a problem using inverse operations? |  |  |  |  |

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| **How confident are you in using:** | 1 | 2 | 3 | 4 |
| The data handling cycle? |  |  |  |  |

**Numbers and the Number System**

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| **How confident are you that you understand:** | 1 | 2 | 3 | 4 |
| the place value of decimals using expanded notation and decimals or fractions? |  |  |  |  |
| the meaning of ‘significant figures’? |  |  |  |  |
| how to represent a number in standard form? |  |  |  |  |
| how to calculate using numbers in standard form using real-life examples? |  |  |  |  |
| how to use a fraction to model a division problem? |  |  |  |  |
| the distinction between natural number, integer, directed number, rational number, irrational number and real number? |  |  |  |  |
| why sometimes only a fraction, surd or irrational number can express an exact answer? |  |  |  |  |
| the meaning of multiple, common multiple and least (lowest) common multiple? |  |  |  |  |
| the meaning of factor, common factor and highest common factor? |  |  |  |  |
| the meaning of prime? |  |  |  |  |
| the meaning of prime factor decomposition? |  |  |  |  |
| the meaning of square, square root (including negative square roots), and their index notation? |  |  |  |  |
| cubes and cube roots, and their index notation? |  |  |  |  |
| negative and fractional index notation? |  |  |  |  |
| index laws for multiplication and division of integer powers? |  |  |  |  |
| the special case of index 0? |  |  |  |  |

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| **How confident are you that you understand:** | 1 | 2 | 3 | 4 |
| the commutative laws of addition and multiplication? |  |  |  |  |
| the associative laws of addition and multiplication? |  |  |  |  |
| the distributive law of multiplication over addition and subtraction, and of division over addition and subtraction? |  |  |  |  |
| the order of operations? |  |  |  |  |
| written methods for the addition of positive integers and decimals? |  |  |  |  |
| written methods for the subtraction of positive integers and decimals? |  |  |  |  |

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| **How confident are you that you can:** | 1 | 2 | 3 | 4 |
| derive multiplication and division facts involving decimals from facts to 10 × 10? |  |  |  |  |
| use factors to simplify a mental multiplication or division calculation? |  |  |  |  |

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| **How confident are you that you understand written multiplication methods:** | 1 | 2 | 3 | 4 |
| for multiplying whole numbers using an efficient method such as ‘long multiplication’? |  |  |  |  |
| for multiplying a decimal by a decimal? |  |  |  |  |

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| **How confident are you that you understand written division methods:** | 1 | 2 | 3 | 4 |
| for dividing by a one-digit whole number using an efficient method such as ‘short division’? |  |  |  |  |
| for dividing a decimal by a whole number or a decimal? |  |  |  |  |
| for dividing by two-digit whole numbers using an efficient method such as ‘long division’? |  |  |  |  |

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| **How confident are you that you can:** | 1 | 2 | 3 | 4 |
| make the distinction between the number that still needs to be divided after a division has resulted in a number which does not result in a whole number answer and, the actual numbers after the decimal point in the calculator answer or, the equivalent fraction? |  |  |  |  |
| use a calculator to find a remainder after division? |  |  |  |  |
| interpret a range of ‘real−life’ word problems based on numbers, money or measures in which numbers must be multiplied or divided, including examples with numbers left over that are still to be divided? |  |  |  |  |
| add, subtract, multiply or divide fractions? |  |  |  |  |
| find the product and quotient of a pair of directed numbers? |  |  |  |  |
| use the memory of a calculator to carry out calculations with more than one step? |  |  |  |  |
| use a basic calculator to find an approximate value for a square root using trial and improvement? |  |  |  |  |

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| **How confident are you in understanding:** | 1 | 2 | 3 | 4 |
| the relationship between fractions and recurring and terminating decimals? |  |  |  |  |
| which fractions produce terminating decimals? |  |  |  |  |
| how to convert a recurring decimal into a rational fraction? |  |  |  |  |

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| **How confident are you that you understand:** | 1 | 2 | 3 | 4 |
| truncation on a calculator? |  |  |  |  |
| a recurring decimal when it appears in a calculator display and use algebraic methods to change a recurring decimal to a fraction? |  |  |  |  |

**Algebra**

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| **How confident are you that you understand how to:** | 1 | 2 | 3 | 4 |
| use and interpret algebraic notation? |  |  |  |  |
| simplify and manipulate algebraic expressions? |  |  |  |  |

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| **How confident are you that you understand the distinction between:** | 1 | 2 | 3 | 4 |
| an expression, formula, equation and identity? |  |  |  |  |

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| **How confident are you that you can explain how to find:** | 1 | 2 | 3 | 4 |
| the nth term of an arithmetic or geometric sequence? |  |  |  |  |

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| **How confident are you that you know:** | 1 | 2 | 3 | 4 |
| different ways of factorising algebraic expressions? |  |  |  |  |
| how to solve a linear equation with fractional coefficients? |  |  |  |  |
| how to identify and cancel common algebraic factors in rational expressions? |  |  |  |  |
| how to change the subject of a formula where the subject appears twice or where a power of the subject appears? |  |  |  |  |

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| **How confident are you that you can:** | 1 | 2 | 3 | 4 |
| find the gradient of lines given by equations of the form y = mx + c? |  |  |  |  |
| find the gradients of parallel lines and lines perpendicular to them? |  |  |  |  |
| know how to deduce and graph inverse functions? |  |  |  |  |

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| **How confident are you that you know how to:** | 1 | 2 | 3 | 4 |
| find the exact solution of a pair of linear simultaneous equations by eliminating one variable? |  |  |  |  |
| find an approximate solution of a pair of linear simultaneous equations by graphical methods? |  |  |  |  |

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| **How confident are you that you know how to:** | 1 | 2 | 3 | 4 |
| generate points and plot graphs of quadratic functions? |  |  |  |  |
| find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function? |  |  |  |  |
| solve exactly, by elimination, one linear and one quadratic equation? |  |  |  |  |
| solve quadratic equations by factorisation? |  |  |  |  |
| solve quadratic equations by completing the square? |  |  |  |  |
| solve quadratic equations using the quadratic formula? |  |  |  |  |
| how to check the answers to questions that involve solving quadratic equations? |  |  |  |  |

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| **How confident are you that you can:** | 1 | 2 | 3 | 4 |
| use a range of graphs to model real situations and can interpret them? |  |  |  |  |
| understand relationships that are directly proportional and can relate these relationships to graphical representations? |  |  |  |  |
| understand relationships that are in inverse proportion and can relate these relationships to graphical representations? |  |  |  |  |

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| **How confident are you that you know how to:** | 1 | 2 | 3 | 4 |
| find the length of the line segment AB, given the coordinates of A and B? |  |  |  |  |
| find points that divide a line in a given ratio, using the properties of similar triangles? |  |  |  |  |

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| **How confidently can you:** | 1 | 2 | 3 | 4 |
| explain and exemplify the use of the inequality symbols? |  |  |  |  |
| solve simple linear inequalities in one variable? |  |  |  |  |
| solve simple linear inequalities in two variables? |  |  |  |  |
| solve several linear inequalities in two variables and find the solution set? |  |  |  |  |

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| **How confidently are you able to:** | 1 | 2 | 3 | 4 |
| recognise and understand the key features of cubic graphs, the reciprocal graph and simple exponential graphs? |  |  |  |  |
| recognise and understand the key features of the basic trigonometric functions y = sin x, y = cos x and y = tan x? |  |  |  |  |
| apply simple transformations to graphs of y = f(x)? |  |  |  |  |

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| **How confident are you in knowing:** | 1 | 2 | 3 | 4 |
| why the quadratic relation x² + y² = r² represents a circle with radius r, centred on the origin? |  |  |  |  |
| why two simultaneous equations representing a straight line and a circle can have 0, 1 or 2 points of solution? |  |  |  |  |

**Ratio, Proportion and Rates of Change**

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| **How confident are you that you are able to:** | 1 | 2 | 3 | 4 |
| solve problems involving direct proportion, including by using the unitary method? |  |  |  |  |
| express a proportion as a percentage, both without and with a calculator? |  |  |  |  |
| calculate a percentage of a quantity, both without and with a calculator? |  |  |  |  |
| calculate percentage increases and decreases? |  |  |  |  |
| calculate compound interest? |  |  |  |  |
| calculate reverse percentages, choosing the correct numbers to take as 100%? |  |  |  |  |
| divide a quantity into two or more parts in a given ratio? |  |  |  |  |

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| **How confident are you that you can understand:** | 1 | 2 | 3 | 4 |
| a fraction as a ratio to compare the size of one number or quantity with another? |  |  |  |  |

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| **How confident are you that you understand:** | 1 | 2 | 3 | 4 |
| compound measures? |  |  |  |  |

**Geometry and Measures**

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| **How confident are you that you understand:** | 1 | 2 | 3 | 4 |
| properties and transformations of shapes? |  |  |  |  |
| translation? |  |  |  |  |
| reflection? |  |  |  |  |
| rotation? |  |  |  |  |
| enlargement? |  |  |  |  |
| the implications of enlargement for area and volume? |  |  |  |  |

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| **How confident are you that you can construct similar shapes by:** | 1 | 2 | 3 | 4 |
| enlargement? |  |  |  |  |

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| **How confident are you that you understand how to:** | 1 | 2 | 3 | 4 |
| combine vectors on a plane? |  |  |  |  |

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| **How confident are you that you understand and can use:** | 1 | 2 | 3 | 4 |
| the relationship between parallel lines and alternate angles and corresponding angles, supplementary angles, complementary angles? |  |  |  |  |

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| **How confident are you that you can reason deductively to:** | 1 | 2 | 3 | 4 |
| derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons? |  |  |  |  |
| prove that the opposite angles of a parallelogram are equal? |  |  |  |  |
| establish through geometrical reasoning the side, angle and diagonal properties of quadrilaterals? |  |  |  |  |
| the exterior angle of a triangle is equal to the sum of the two interior opposite angles, and the sum of the exterior angles of any polygon is 360°? |  |  |  |  |

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| **How confident are you that you know and can use:** | 1 | 2 | 3 | 4 |
| the conditions for congruent triangles and can prove that the base angles of an isosceles triangle are equal? |  |  |  |  |
| the standard ruler and compass constructions? |  |  |  |  |
| how to establish through geometrical reasoning the side, angle and diagonal properties of quadrilaterals? |  |  |  |  |
| how to describe simple loci? |  |  |  |  |
| and can prove important circle theorems? |  |  |  |  |

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| **How confident are you that you understand:** | 1 | 2 | 3 | 4 |
| Pythagoras’ theorem and its application to solving mathematical problems? |  |  |  |  |
| Pythagoras’ theorem to solve problems in three dimensions? |  |  |  |  |
| the conditions for similar triangles and other similar plane figures? |  |  |  |  |
| how to calculate the volume of prisms? |  |  |  |  |
| how to use trigonometric ratios to solve problems in right-angled triangles? |  |  |  |  |
| how to interpret mathematical relationships both algebraically and geometrically? |  |  |  |  |
| trigonometrical relationships to solve problems in three dimensions? |  |  |  |  |

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| **How confident are you that you can apply:** | 1 | 2 | 3 | 4 |
| similarity to derive results about angles and sides to obtain simple proofs? |  |  |  |  |

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| **How confident are you that you know how to:** | 1 | 2 | 3 | 4 |
| find the midpoint of the line segment AB, given the coordinates of A and B? |  |  |  |  |
| find the length of the line segment AB, given the coordinates of A and B? |  |  |  |  |

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| **How confident are you that you understand:** | 1 | 2 | 3 | 4 |
| perimeter, area and volume? |  |  |  |  |

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| **How confident are you that you understand how to find the areas of shapes other than squares and rectangles, including:** | 1 | 2 | 3 | 4 |
| irregular shapes? |  |  |  |  |
| triangles? |  |  |  |  |
| parallelograms? |  |  |  |  |
| circles? |  |  |  |  |

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| **How confident are you that you understand:** | 1 | 2 | 3 | 4 |
| the distinction between mass and weight? |  |  |  |  |
| the distinction between volume and capacity? |  |  |  |  |
| the accuracy of measurements? |  |  |  |  |
| compound measures? |  |  |  |  |
| bearings and their use? |  |  |  |  |

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| **How confident are you that you know how to find:** | 1 | 2 | 3 | 4 |
| the area and perimeter of sectors and segments of a circle? |  |  |  |  |

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| **How confident are you that you know how to use:** | 1 | 2 | 3 | 4 |
| the properties of simple solids to solve problems involving surface area and volume? |  |  |  |  |
| how to calculate the surface area and volume of a cylinder? |  |  |  |  |

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| **How confident are you that you understand:** | 1 | 2 | 3 | 4 |
| The trigonometric ratios sine, cosine and tangent and know how to use them to solve relevant problems? |  |  |  |  |
| the equivalences of the trigonometric functions beyond the range –180° to 180°? |  |  |  |  |
| the use of the sine rule and cosine rule? |  |  |  |  |
| why caution is sometimes needed in interpreting results from the sine rule? |  |  |  |  |

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| **How confident are you that you understand and can use** | 1 | 2 | 3 | 4 |
| the formula for the area of a triangle: A = ½ ab sin C ? |  |  |  |  |

**Probability and Statistics**

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| **How confident are you that you understand:** | 1 | 2 | 3 | 4 |
| discrete data, categorical data, grouped discrete data, continuous data? |  |  |  |  |

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| **Given a set of data, how confident are you that you understand:** | 1 | 2 | 3 | 4 |
| the range, the median, the quartile value, the interquartile range, a box plot and a stem-and-leaf diagram? |  |  |  |  |
| the mode, modal class interval, the mean and the estimated mean of grouped data? |  |  |  |  |

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| **How confident are you that you know what:** | 1 | 2 | 3 | 4 |
| a tally chart is? |  |  |  |  |
| a grouped frequency table is? |  |  |  |  |
| a pictogram is? |  |  |  |  |
| a pie chart is? |  |  |  |  |
| a bar chart is? |  |  |  |  |
| a bar-line graph is? |  |  |  |  |
| a frequency diagram is? |  |  |  |  |
| a histogram is? |  |  |  |  |
| a frequency polygon is? |  |  |  |  |

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| **How confident are you that you understand and can use:** | 1 | 2 | 3 | 4 |
| different kinds of line graph, such as a time-series graph, a distance-time graph and a conversion graph? |  |  |  |  |
| frequency density? |  |  |  |  |
| cumulative frequency? |  |  |  |  |
| a scatter graph, a line of best fit and correlation |  |  |  |  |
| moving averages? |  |  |  |  |

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| **How confident are you that you understand how to calculate or estimate probability:** | 1 | 2 | 3 | 4 |
| based on theory and equally likely outcomes, or from a set of experimental data? |  |  |  |  |
| based on the relative frequency of data in a two-way table? |  |  |  |  |
| involving mutually exclusive outcomes? |  |  |  |  |
| involving independent events? |  |  |  |  |
| using conditional probability? |  |  |  |  |

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| **How confidently do you understand:** | 1 | 2 | 3 | 4 |
| sample spaces? |  |  |  |  |
| probability tree diagrams? |  |  |  |  |

**A Level Content**

Please go to the Edexcel website here

<https://qualifications.pearson.com/en/qualifications/edexcel-a-levels/mathematics-2017.html>

look at pages 11 to 38 of the specification and rate your understanding of each of the topics by writing a number (1 = little or no knowledge up to 4 for very secure knowledge) for each of the statements.

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| **Paper 1 & 2: Pure Mathematics** | 1 | 2 | 3 | 4 |
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| **Paper 3: Statistics and Mechanics** | 1 | 2 | 3 | 4 |
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