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| IGCSE EXTENDED - SELF ASSESSMENT SHEET |
| **Question Type** | **NUMBER: You should be able to:**  | R | A | G |
| Number | Identify and use: | TT  |
| Natural numbers |  |  |  |
| Integers (positive, negative and zero) |  |  |  |
| Prime numbers |  |  |  |
| Write a number as a product of its prime factors |  |  |  |
| Square and cube numbers |  |  |  |
| Common factors and highest common factor of two or more numbers |  |  |  |
| Common multiples and lowest common multiple of two or more numbers |  |  |  |
| Rational numbers |  |  |  |
| Irrational numbers (e.g., π, √2 ) |  |  |  |
| Real numbers |  |  |  |
| Reciprocals |  |  |  |
|  |
| Set notation and language | Use language, notation and Venn diagrams to describe sets and represent relationships between sets as follows: |  |  |  |
| Definition of sets, e.g. |  |
| A = {x: x is a natural number} |  |  |  |
| B = {(x,y): y = mx + c} |  |  |  |
| C = {x: a င x င b} D = {a, b, c, …}  |  |  |  |
| D = {a, b, c, …} |  |  |  |
| Notation, e.g. |  |
| number of elements in set n(A) |  |  |  |
| “... is an element of ...” ∈ |  |  |  |
| “ ...is not an element of ...” ∉ |  |  |  |
| Complement of set A’ |  |  |  |
| The empty set Ø |  |  |  |
| Universal set ξ |  |  |  |
| A is a subset of B (A ⊆ B) |  |  |  |
| A is a proper subset of B (A ⊂ B) |  |  |  |
| A is not a subset of B (A $⊈$ B) |  |  |  |
| A is not a proper subset of B (A ⊄ B) |  |  |  |
| Union of A and B (A ∪ B) |  |  |  |
| Intersection of A and B (A ∩ B) |  |  |  |

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| **Question Type** | **NUMBER: You should be able to:** | R | A | G |
| Squares, square roots, cubes and cube roots | Calculate: | TT  |
| squares of numbers |  |  |  |
| square roots of numbers |  |  |  |
| cubes of numbers |  |  |  |
| cube roots of numbers |  |  |  |
| other powers and roots of numbers |  |  |  |
|  |
| Directed Numbers | Use directed numbers in practical situations, for example temperature changes |  |  |  |
|  |
| Fractions, decimals and percentages | Use the language and notation of simple vulgar and decimal fractions and percentages in appropriate contexts |  |  |  |
| Recognise equivalent fractions, decimals and percentages |  |  |  |
| Convert between fractions, decimals and percentages |  |  |  |
| Convert recurring decimals to fractions |  |  |  |
|  |
| Ordering | Order quantities by magnitude and demonstrate familiarity with the symbols =, ≠, >, <, ≥, ≤ |  |  |  |
|  |
| Indices and standard form (links to Algebraic manipulation) | Evaluate indices, including fractional negative and zero |  |  |  |
| e.g. $5^{-2},144^{\frac{1}{2}}, 8^{-\frac{2}{3}}, 100^{0}$ |  |  |  |
| Use the rules of indices for: |  |
| multiplication of indices, e.g. $2^{-3}× 2^{4}$ |  |  |  |
| division of indices, e.g. $2^{-3}÷2^{4}$ |  |  |  |
| index numbers raised to an index, e.g. $(2^{3})^{2}$ |  |  |  |
| Use the standard form $A × 10^{n}$ where n is a positive or negative integer, and 1 ≤ A < 10 |  |
| convert into and out of standard form |  |  |  |
| calculate with numbers in standard form |  |  |  |
|  |
| Four rules( + - x ÷ ) | Use the four rules for calculations with: |  |
| whole numbers |  |  |  |
| decimals |  |  |  |
| vulgar and mixed fractions |  |  |  |
| correct ordering of operations (BIDMAS) and use of brackets |  |  |  |
|  |
| Estimates | Make estimates of numbers, quantities and lengths |  |  |  |
| Give approximations to a specified number of: |  |
| significant figures |  |  |  |
| decimal places |  |  |  |
| Round off answers to reasonable accuracy in the context of a given problem |  |  |  |

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| **Question Type** | **NUMBER: You should be able to:** | R | A | G |
| Bounds | Give upper and lower bounds for data given to a specified accuracy, e.g. measured lengths |  |  |  |
| Obtain appropriate upper and lower bounds to solutions of simple problems given to a specified accuracy, e.g. the lower and upper bounds for the area of a rectangle |  |  |  |
|  |
| Ratio, proportion, rate(links to Direct and inverse proportion) | Understand ratio |  |  |  |
| Divide quantities in a given ratio |  |  |  |
| Increase and decrease a quantity by a given ratio |  |  |  |
| Understand numerical problems involving direct and inverse proportion |  |  |  |
| Use ratio and scales in practical situations |  |  |  |
| Use common measures of rate (formulae for other rates, e.g. density and pressure will be given in the question) |  |  |  |
| Calculate average speed |  |  |  |
|  |
| Percentages | Calculate a percentage of a quantity |  |  |  |
| Express one quantity as a percentage of another quantity Calculate percentage increase or decrease |  |  |  |
| Calculate reverse percentages, e.g. finding the cost price given the selling price and the percentage profit |  |  |  |
| Calculate a percentage of a quantity |  |  |  |
|  |
| Use of an electronic calculator | Use a calculator efficiently |  |  |  |
| Check accuracy of calculations |  |  |  |
|  |
| Time | Calculate times in terms of the 24-hour and 12-hour clock |  |  |  |
| Read clocks, dials and timetables |  |  |  |
|  |
| Money | Calculate using money |  |  |  |
| Convert from one currency to another |  |  |  |
|  |
| Personal and small business finance | Use given data to solve problems on: |  |
| earnings |  |  |  |
| simple interest |  |  |  |
| compound interest (you must know the compound interest formula) |  |  |  |
| discount |  |  |  |
| profit and loss |  |  |  |
| Extract data from tables and charts |  |
|  |
| Exponential growth and decay | Use exponential growth and decay in population and finance, e.g. depreciation, bacteria growth |  |  |  |

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| **Question Type** | **ALGEBRA & GRAPHS: You should be able to:** | R | A | G |
| Basic algebra | Use letters to express generalised numbers |  |  |  |
| Express basic arithmetic processes algebraically |  |  |  |
| Substitute numbers in complicated formulae |  |  |  |
| Construct and rearrange complicated formulae, e.g. where the subject appears twice |  |  |  |
|  |
| Algebraic manipulation | Manipulate directed numbers |  |  |  |
| Use brackets: |  |
| expand a single bracket e.g. $2x (3x – 5y)$ |  |  |  |
| expand a pair of brackets e.g. $(x-4)(x+7)$ |  |  |  |
| expand products of more than two brackets, e.g. $(x-4)(x+7)(x+2)$ |  |  |  |
| Extract common factors, e.g. factorise $9x^{2}+15xy$ |  |  |  |
| Factorise expressions of the form: |  |
| $$ax+bx+kay+kby$$ |  |  |  |
| $$a^{2}x^{2}+b^{2}y^{2}$$ |  |  |  |
| $$a^{2}+2ab+b^{2}$$ |  |  |  |
| $$ax^{2}+bx+c$$ |  |  |  |
|  |
| Algebraic fractions | Manipulate algebraic fractions, e.g. |  |
| $$\frac{x}{3}+\frac{x-4}{2}$$ |  |  |  |
| $$\frac{2x}{3}-\frac{3(x-7)}{4}$$ |  |  |  |
| $$\frac{3a}{4}+\frac{5ab}{3}$$ |  |  |  |
| $$\frac{3a}{4}÷\frac{9a}{10}$$ |  |  |  |
| $$\frac{1}{x-2}+\frac{2}{x-3}$$ |  |  |  |
| Factorise and simplify algebraic fractions such as $\frac{x^{2}-2x}{x^{2}-5x+6}$ |  |  |  |
|  |
| Rules of indices | Use and interpret positive, negative and zero indices |  |  |  |
| Use and interpret fractional indices, e.g. solve $32^{x}=2$ |  |  |  |
| Use the rules of indices to simplify algebra, e.g. |  |
| $$3x^{-4} × \frac{2}{3}x^{\frac{1}{2}} $$ |  |  |  |
| $$\frac{2}{5}x^{\frac{1}{5}}÷2x^{-2} $$ |  |  |  |
| $$\left(\frac{2x^{5}}{3}\right)^{3}$$ |  |  |  |

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| **Question Type** | **ALGEBRA & GRAPHS: You should be able to:** | R | A | G |
| Equations and inequalities | Derive and solve simple linear equations in one unknown |  |  |  |
| Derive and solve simultaneous linear equations in two unknowns |  |  |  |
| Derive and solve simultaneous equations involving one linear and one quadratic |  |  |  |
| Solve quadratic equations by: |  |
| factorisation |  |  |  |
| completing the square |  |  |  |
| using the formula |  |  |  |
| Derive and solve simple linear inequalities, including representing solutions on a number line |  |  |  |
|  |
| Linear programming | Represent inequalities graphically, including using the conventions of: |  |
| broken lines for strict inequalities |  |  |  |
| shading unwanted regions |  |  |  |
| Solve simple linear programming problems using graphical representations of inequalities |  |  |  |
|  |
| Number sequences (links to Squares, square roots, cubes and cube roots) | Continue a number sequence |  |  |  |
| Recognise patterns in sequences |  |  |  |
| Recognise relationships between different sequences |  |  |  |
| Find the *nth* term of sequences of: |  |
| linear sequences |  |  |  |
| quadratic sequences |  |  |  |
| cubic sequences |  |  |  |
| exponential sequences |  |  |  |
| and simple combinations of these |  |  |  |
|  |
| Direct and inverse proportion (links to Ratio, proportion, rate) | Express direct proportion algebraically |  |  |  |
| Express inverse proportion algebraically |  |  |  |
| Use algebraic expressions of direct and inverse proportion to find unknown quantities |  |  |  |
|  |
| Practical graphs(links toCoordinate geometry) | Interpret and use graphs in practical situations including: |  |
| travel graphs |  |  |  |
| conversion graphs |  |  |  |
| Draw graphs from given data |  |  |  |
| Apply the idea of rate of change to simple kinematics involving: |  |
| distance–time graphs |  |  |  |
| speed–time graphs |  |  |  |
| acceleration and deceleration |  |  |  |
| This may involve estimation and interpretation of the gradient of a tangent at a point |  |
| Calculate distance travelled as an area under a linear speed– time graph |  |  |  |

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| **Question Type** | **ALGEBRA & GRAPHS: You should be able to:** | R | A | G |
| Graphs of functions (links to Coordinate geometry) | Construct tables of values and draw graphs for functions of the form: |  |
| $ax^{n}$ where a is a rational constant and n = -2, -1, 0, 1, 2, 3 and simple sums of not more than three of these |  |  |  |
| $ab^{x}+c $where a and c are rational constants and b is a positive integer |  |  |  |
| Solve associated equations approximately by graphical methods, including finding and interpreting roots and finding turning points of quadratics by completing the square |  |  |  |
| Draw and interpret graphs representing exponential growth and decay problems |  |  |  |
| Recognise, sketch and interpret graphs of:  |  |
| linear |  |  |  |
| quadratic |  |  |  |
| cubic |  |  |  |
| reciprocal |  |  |  |
| exponential |  |  |  |
| (knowledge of turning points and asymptotes is required) |  |
|  |
| Tangents | Estimate gradients of curves by drawing tangents |  |  |  |
|  |
| Functions | Use function notation, e.g. |  |
| $f\left(x\right)=3x-5, f:x\rightarrow 3x-5$ to describe simple functions |  |  |  |
| Find inverse functions $f^{-1}\left(x\right)$ |  |  |  |
| Form composite functions as defined by $gf\left(x\right)=g(f\left(x\right))$ |  |  |  |
|  |
| Derivatives | Understand the idea of a derived function |  |  |  |
| Use derivatives of the form $ax^{n}$ and simple sums of not more than three of these (a is a rational constant and n is a positive integer or 0) |  |  |  |
| Apply differentiation to gradients and turning points (stationary points) |  |  |  |
| Use any method to explain whether the turning point is a maximum or a minimum, e.g. second derivative or gradient of function on either side of turning point |  |  |  |
|  |
| Straight line graphs | Work with co-ordinates in two dimensions |  |  |  |
|  |
| Gradient | Find the gradient of a straight line graph |  |  |  |
| Calculate the gradient of a straight line from the co-ordinates of two points on it |  |  |  |
|  |
| Length and midpoint | Calculate the length and the co-ordinates of the midpoint of a straight line segment from the co-ordinates of its end points |  |  |  |
|  |
| Equation of line | Interpret and obtain the equation of a straight line graph |  |  |  |
|  |
| Parallel lines | Determine the equation of a straight line parallel to a given line, e.g. find the equation of a line parallel to $y=3x-5 $that passes through (2,-3) |  |  |  |
|  |
| Perpendicular lines | Find the gradient of parallel and perpendicular lines, e.g. |  |
| find the gradient of a line perpendicular to $y=2x+5$ |  |  |  |
| find the equation of a line perpendicular to one passing through the co-ordinates (1,-2) and (4,6) |  |  |  |

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| **Question Type** | **GEOMETRY: You should be able to:** | R | A | G |
| Geometrical language | Use and interpret the geometrical terms: |  |
| point |  |  |  |
| line |  |  |  |
| parallel |  |  |  |
| perpendicular |  |  |  |
| bearing |  |  |  |
| right angle, acute, obtuse and reflex angles |  |  |  |
| similar |  |  |  |
| congruent |  |  |  |
| Use and interpret the vocabulary of: |  |
| triangles; right-angled, scalene, isosceles, equilateral |  |  |  |
| quadrilaterals |  |  |  |
| circles |  |  |  |
| polygons |  |  |  |
| simple solid figures including nets |  |  |  |
|  |
| Geometrical constructions | Measure and draw lines and angles |  |  |  |
| Construct a triangle given the three sides, using a ruler and a pair of compasses only |  |  |  |
|  |
| Scale drawings | Read and make scale drawings |  |  |  |
|  |
| Similar figures | Calculate lengths of similar figures |  |  |  |
| Use relationships between areas of similar triangles and in similar figures |  |  |  |
| Use relationships between volumes and surface areas of similar solids |  |  |  |
|  |
| Congruent triangles | Use the congruence criteria for triangles (SSS, ASA, SAS, RHS) |  |  |  |
|  |
| Symmetry | Recognise symmetry properties for triangles, quadrilaterals and circles |  |  |  |
| Recognise line symmetry in two dimensions |  |  |  |
| Recognise and find the order of rotational symmetry in two dimensions |  |  |  |
| Use the following symmetry properties of circles: |  |
| equal chords are equidistant from the centre |  |  |  |
| perpendicular bisector of a chord passes through the centre |  |  |  |
| tangents from an external point are equal in length |  |  |  |
| Recognise and use symmetry properties of: |  |
| prism, cylinder, cone and pyramid |  |  |  |

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| **Question Type** | **GEOMETRY: You should be able to:** | R | A | G |
| Angle properties | Calculate unknown angles, explaining the properties that you are using in geometrical language, for the following geometrical properties: |  |
| angles at a point  |  |  |  |
| angles at a point on a straight line and intersecting straight lines  |  |  |  |
| angles formed within parallel lines  |  |  |  |
| angle properties of triangles and quadrilaterals  |  |  |  |
| angle properties of regular polygons  |  |  |  |
| angle in a semi-circle  |  |  |  |
| angle between tangent and radius of a circle  |  |  |  |
| angle properties of irregular polygons  |  |  |  |
| angle at the centre of a circle is twice the angle at the circumference  |  |  |  |
| angles in the same segment are equal  |  |  |  |
| angles in opposite segments are supplementary; cyclic quadrilaterals  |  |  |  |
| alternate segment theorem |  |  |  |
| **Question Type** | **MENSURATION: You should be able to:** | R | A | G |
| Measures | Use current units of: |  |
| mass |  |  |  |
| length |  |  |  |
| area |  |  |  |
| volume |  |  |  |
| capacity |  |  |  |
| Express quantities in terms of smaller or larger units, including units of area and volume |  |  |  |
|  |
| Perimeter | Carry out calculations involving: |  |
| perimeter and area of a rectangle |  |  |  |
| perimeter and area of a triangle |  |  |  |
| perimeter and area of parallelogram |  |  |  |
| perimeter and area of a trapezium |  |  |  |
| perimeter and area of compound shapes made by combining rectangles, triangles, parallelograms and/or trapeziums |  |  |  |
|  |
| Circles | Carry out calculations involving circumference and area of a circle |  |  |  |
| Solve problems involving arc length and sector area of a circle |  |  |  |
|  |
| Surface area and volume | Carry out calculations involving: |  |
| surface area and volume of a cuboid, prism and cylinder (no formulae will be given for these shapes) |  |  |  |
| surface area and volume of a sphere, pyramid and cone (formulae will be given for these shapes) |  |  |  |
|  |
| Compound shapes | Carry out calculations involving: |  |
| area of a shape made by combining cuboids, prisms and/or cylinders |  |  |  |
| volume of a shape made by combining cuboids, prisms and/ or cylinders |  |  |  |

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| **Question Type** | **TRIGONOMETRY: You should be able to:** | R | A | G |
| Bearings | Use and interpret three-figure bearings measured clockwise from the North, i.e. 000°– 360° |  |  |  |
|  |
| Trigonometry | Find unknown sides and/or angles in RA triangles by applying: |  |  |  |
| Pythagoras’ theorem |  |  |  |
| sine, cosine and tangent ratios for acute angles in right- angled triangles |  |  |  |
| Solve problems in two dimensions involving angles of elevation and depression |  |  |  |
| Know that the perpendicular distance from a point to a line is the shortest distance to the line |  |  |  |
|  |
| Trig graphs and equations | Recognise, sketch and interpret graphs of simple trigonometric functions |  |  |  |
| Graph and know the properties of trigonometric functions |  |  |  |
| Solve simple trigonometric equations for values between 0° - 360°, e.g. Solve $sinx=\frac{\sqrt{3}}{2}$ for values of x between 0° - 360° |  |  |  |
|  |
| General trig | Solve problems using sine and cosine rules for any triangle  |  |  |  |
| Find the area of any triangle using $\frac{1}{2}absinc$ |  |  |  |
|  |
| Trig in 3D | Solve simple trigonometric problems in three dimensions including angle between a line and a plane |  |  |  |
| **Question Type** | **VECTORS & TRANSFORMATIONS: You should be able to:** | R | A | G |
| Vectors in two dimensions (links to Trigonometry) | Describe a translation by using a vector represented by: |  |
| $$\left(\begin{matrix}x\\y\end{matrix}\right) , \vec{AB}, or a$$ |  |  |  |
| Add and subtract vectors |  |  |  |
| Multiply a vector by a scalar |  |  |  |
|  |
| Transformations | Reflect simple shapes in horizontal or vertical lines |  |  |  |
| Rotate simple shapes through multiples of 90° about any point |  |  |  |
| Construct translations of simple shapes |  |  |  |
| Construct enlargements of simple shapes (positive, fractional and negative scale factors) |  |  |  |
| Recognise and describe: |  |
| reflections |  |  |  |
| rotations |  |  |  |
| translations |  |  |  |
| enlargements (positive, fractional and negative scale factors) |  |  |  |
|  |
| Harder vectors | Calculate the magnitude of a vector $\left(\begin{matrix}x\\y\end{matrix}\right)$ as $\sqrt{x^{2}+y^{2}}$  |  |  |  |
| understand that magnitude is denoted by modulus signs $\vec{\left|AB\right|}$ or$ \left|a\right|$ |  |  |  |
| Represent vectors by directed line segments |  |  |  |
| Use the sum and difference of two vectors |  |  |  |
| Use position vectors |  |  |  |

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| **Question Type** | **PROBABILITY: You should be able to:** | R | A | G |
| Probability (links to Four rules) | Calculate the probability of a single event as a fraction, decimal or percentage (not a ratio) |  |  |  |
|  |
| Probability scale | Understand and use the probability scale from 0 to 1 |  |  |  |
|  |
| Sum to 1 | Understand that the probability of an event occurring = 1 – the probability of the event not occurring |  |  |  |
|  |
| Relative frequency | Understand relative frequency as an estimate of probability Work out expected frequencies using relative frequency |  |  |  |
| Understand relative frequency as an estimate of probability Work out expected frequencies using relative frequency |  |  |  |
|  |
| Combined events | Calculate the probability of combined events using: |  |
| tree diagrams |  |  |  |
| possibility diagrams  |  |  |  |
| tables |  |  |  |
| **Question Type** | **STATISTICS: You should be able to:** | R | A | G |
| Classify | Collect, classify and tabulate data |  |  |  |
|  |
| Interpret and compare | Read, interpret and draw simple inferences from tables and statistical diagrams |  |  |  |
| Compare sets of data using |  |  |  |
| tables |  |  |  |
| graphs |  |  |  |
| statistical measures |  |  |  |
| Be aware of restrictions when making conclusions from data |  |  |  |
|  |
| Charts | Construct and use |  |  |  |
| bar charts |  |  |  |
| pie charts |  |  |  |
| pictograms |  |  |  |
| stem – and – leaf diagrams |  |  |  |
| frequency distributions |  |  |  |
| histograms with equal and unequal intervals |  |  |  |
| scatter diagrams |  |  |  |
|  |
| Averages | Calculate, for individual and discrete data |  |  |  |
| mean |  |  |  |
| median |  |  |  |
| mode |  |  |  |
| range |  |  |  |
| and distinguish between their use |  |  |  |

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| **Question Type** | **STATISTICS: You should be able to:** | R | A | G |
| Estimated mean | Calculate an estimate of the mean for grouped and continuous data |  |  |  |
| Identify the modal class from a grouped frequency distribution |  |  |  |
|  |
| Cumulative frequency | Construct and use cumulative frequency diagrams to estimate and interpret |  |  |  |
| the median |  |  |  |
| percentiles |  |  |  |
| quartiles |  |  |  |
| inter-quartile range |  |  |  |
| Construct and interpret box-and-whisker plots |  |  |  |
|  |
| Correlation | Understand what is meant by positive, negative and zero correlation with reference to a scatter diagram |  |  |  |
|  |
| Lines of best fit | Draw, interpret and use a ruled line of best fit by eye |  |  |  |