**Y13 Pure Maths Self-Assessment Sheets**

Chapter 1 – Algebraic Methods

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| **Sub-topic** | **Progress Descriptor** | **☺** | **☹** |
| Contradiction | Complete proofs using proof by contradiction |  |  |
| Algebraic fractions | Add, subtract, multiply and divide algebraic fractions |  |  |
| Algebraic fractions | Simplify algebraic fractions |  |  |
| Algebraic fractions | Decompose algebraic fractions into partial fractions - two linear factors |  |  |
| Algebraic fractions | Decompose algebraic fractions into partial fractions - three linear factors |  |  |
| What I need to do to improve… | | | |

Chapter 2 – Functions and graphs

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| **Sub-topic** | **Progress Descriptor** | **☺** | **☹** |
| Functions | Define mapping and function |  |  |
| Functions | Understand the concepts of domain and range |  |  |
| Functions | Understand, find and use composite functions |  |  |
| Functions | Find inverse functions |  |  |
| Functions | Work with the domain and find the range of a variety of familiar functions |  |  |
| Functions | Find the domain and range for composite functions |  |  |
| Functions | Find the domain and range for inverse functions |  |  |
| Functions | Work with the domain and find the range of unfamiliar functions |  |  |
| Functions | Understand and use the relationship of the graph of an inverse function to the graph of y = x |  |  |
| Modulus function | Understand the modulus function |  |  |
| Modulus function | Solve equations involving the modulus function |  |  |
| Modulus function | Solve inequalities involving the modulus function |  |  |
| Sketching graphs | Sketch the graph of the modulus of a linear function |  |  |
| Sketching graphs | Sketch the graphs of the modulus of familiar non-linear functions |  |  |
| Sketching graphs | Sketch the graphs of the modulus of unfamiliar non-linear functions |  |  |
| Transformations | Combine two or more transformations |  |  |
| Transformations | Combine two or more transformations including modulus graphs |  |  |
| What I need to do to improve… | | | |

Chapter 3 – Sequences and series

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| **Sub-topic** | **Progress Descriptor** | **☺** | **☹** |
| Sequences | Understand general sequences defined by an nth-term rule |  |  |
| Arithmetic sequences | Understand simple arithmetic sequences |  |  |
| Arithmetic sequences | Understand simple arithmetic series |  |  |
| Arithmetic sequences | Use arithmetic sequences and series in context and as models |  |  |
| Arithmetic sequences | Use Sn notation and the formula for the sum of n terms of an arithmetic series |  |  |
| Arithmetic sequences | Understand the proof of the Sn formula for arithmetic series |  |  |
| Geometric sequences | Understand simple geometric sequences |  |  |
| Geometric sequences | Work with the nth-term formula for geometric sequences |  |  |
| Geometric sequences | Understand simple geometric series |  |  |
| Geometric sequences | Use Sn notation and the formula for the sum of n terms of a geometric series |  |  |
| Geometric sequences | Understand the proof of the Sn formula for geometric series |  |  |
| Geometric sequences | Use geometric sequences and series in context and as models |  |  |
| Geometric sequences | Understand convergent geometric series and the sum to infinity, including notation and proof |  |  |
| Sigma notation | Understand sigma notation |  |  |
| Sigma notation | Use sigma notation in context for a range of series types (including constant series) |  |  |
| Recurrence relations | Work with sequences generated by simple recurrence relations |  |  |
| Recurrence relations | Understand the terms increasing, decreasing and periodic |  |  |
| Recurrence relations | Use sequences and series in modelling in familiar and unfamiliar contexts |  |  |
| What I need to do to improve… | | | |

Chapter 4 – Binomial Expansion

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| **Sub-topic** | **Progress Descriptor** | **☺** | **☹** |
| Binomial expansion | Understand the binomial theorem for any rational n |  |  |
| Binomial expansion | Understand the conditions for validity of the binomial theorem for rational n |  |  |
| Binomial expansion | Expand rational functions using partial fraction decomposition |  |  |
| Binomial expansion | Solve problems using the general binomial expansion in unfamiliar contexts |  |  |
| What I need to do to improve… | | | |

Chapter 5 – Radians

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| **Sub-topic** | **Progress Descriptor** | **☺** | **☹** |
| Radian measure | Understand radian measure |  |  |
| Radian measure | Recall exact values for trigonometric functions (radians) |  |  |
| Mensuration | Understand the formula for arc length using radian measure |  |  |
| Mensuration | Understand the formula for sector area using radian measure |  |  |
| Mensuration | Solve problems involving arc length and sector area in context |  |  |
| Trigonometric functions | Sketch the graphs of simple trigonometric functions using radians |  |  |
| Trigonometric functions | Understand small-angle approximations for sin, cos and tan (angle in radians) |  |  |
| Trigonometric functions | Use small-angle approximations to solve problems |  |  |
| Equations and identities | Solve simple trigonometric equations in a given interval (radians) |  |  |
| Equations and identities | Solve more complicated trigonometric equations in a given interval such as ones requiring use of the tan identity (radians) |  |  |
| Equations and identities | Solve trigonometric equations that produce quadratics (radians) |  |  |
| Equations and identities | Solve trigonometric equations that derive from unfamiliar or applied contexts (radians) |  |  |
| What I need to do to improve… | | | |

Chapter 6 – Trigonometric functions

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| **Sub-topic** | **Progress Descriptor** | **☺** | **☹** |
| Trig functions | Understand the functions sec, cosec and cot |  |  |
| Trig functions | Understand the graphs of sec, cosec and cot |  |  |
| Trig functions | Understand the arccos, arcsin and arctan functions |  |  |
| Trig functions | Use the functions sec, cosec and cot to solve simple trigonometric problems |  |  |
| Trig functions | Understand the domain and range of arccos, arcsin and arctan |  |  |
| Trig functions | Understand the graphs of arccos, arcsin and arctan |  |  |
| Trig functions | Use arccos, arcsin and arctan to solve problems |  |  |
| Equations and identities | Use sec, cosec and cot to simplify expressions and prove simple identities |  |  |
| Equations and identities | Prove sec^2(x) = 1 + tan^2(x) and cosec^2(x) = 1 + cot^2(x) |  |  |
| Equations and identities | Use sec^2(x) and cosec^2(x) identities in proofs and to solve equations |  |  |
| What I need to do to improve… | | | |

Chapter 7 – Trigonometry and modelling

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| **Sub-topic** | **Progress Descriptor** | **☺** | **☹** |
| Modelling | Use functions in modelling (including critiquing) |  |  |
| Equations & identities | Understand the addition formulae for sin, cos and tan |  |  |
| Equations & identities | Use the addition formulae for sin, cos and tan |  |  |
| Equations & identities | Understand the double angle formulae for sin, cos and tan |  |  |
| Equations & identities | Use the double angle formulae for sin, cos and tan |  |  |
| Equations & identities | Understand how to use identities to rewrite acosx + bsinx |  |  |
| Equations & identities | Understand the proofs of the addition formulae |  |  |
| Equations & identities | Understand the proofs of the double angle formulae |  |  |
| Equations & identities | Use addition formulae and/or double angle formulae to solve equations |  |  |
| Equations & identities | Extend the use of double angle formulae to half angle formulae for sin and cos |  |  |
| Equations & identities | Solve problems involving acosx + bsinx |  |  |
| Equations & identities | Use addition formulae, double angle formulae and other identities to prove unfamiliar trigonometric identities |  |  |
| Equations & identities | Use trigonometric functions and identities to solve problems in a range of unfamiliar contexts |  |  |
| What I need to do to improve… | | | |

Chapter 8 – Parametric Equations

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| **Sub-topic** | **Progress Descriptor** | **☺** | **☹** |
| Parametric equations | Understand parametric equations of curves |  |  |
| Parametric equations | Convert between parametric and Cartesian forms using substitution |  |  |
| Parametric equations | Convert between parametric and Cartesian forms using trigonometry |  |  |
| Parametric equations | Sketch graphs of parametric functions |  |  |
| Parametric equations | Solve coordinate geometry problems involving parametric equations |  |  |
| Parametric equations | Use parametric equations in modelling in a variety of contexts |  |  |
| What I need to do to improve… | | | |

Chapter 9 – Differentiation

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| **Sub-topic** | **Progress Descriptor** | **☺** | **☹** |
| Differentiation | Carry out differentiation from first principles rigorously to find the derivative of a given function (for small positive powers of x) |  |  |
| Differentiation | Differentiate simple trigonometric functions |  |  |
| Differentiation | Differentiate simple logarithmic and exponential functions (including a^x) |  |  |
| Differentiation | Differentiate sums and differences of functions involving trigonometric, logarithmic and exponential functions |  |  |
| Differentiation | Differentiate using the chain rule |  |  |
| Differentiation | Differentiate using partial fractions |  |  |
| Differentiation | Differentiate using the product rule |  |  |
| Differentiation | Differentiate using the quotient rule |  |  |
| Differentiation | Differentiate reciprocal and inverse trigonometric functions |  |  |
| Differentiation | Differentiate simple functions defined parametrically including application to tangents and normals |  |  |
| Differentiation | Understand and use the rule for differentiating general inverse functions |  |  |
| Differentiation | Differentiate simple functions defined implicitly |  |  |
| Differentiation | Use second derivatives to solve problems of concavity, convexity and points of inflection |  |  |
| Differentiation | Solve problems involving connected rates of change |  |  |
| Differentiation | Construct simple differential equations |  |  |
| Differentiation | Solve problems involving the differentiation of a wide range of functions |  |  |
| Differentiation | Construct differential equations in a range of contexts |  |  |
| What I need to do to improve… | | | |

Chapter 10 – Numerical methods

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| **Sub-topic** | **Progress Descriptor** | **☺** | **☹** |
| Locating roots | Understand the concept of roots of equations |  |  |
| Locating roots | Use a change of sign to locate roots |  |  |
| Iteration | Solve equations approximately using the method of iteration |  |  |
| Iteration | Understand the associated graphs of iterative processes |  |  |
| Newton-Raphson | Understand the geometric basis of the Newton-Raphson method |  |  |
| Newton-Raphson | Solve equations approximately using the Newton-Raphson method |  |  |
| Applications | Appreciate why numerical methods are often necessary to find solutions of equations |  |  |
| Applications | Use numerical methods to solve problems in context |  |  |
| Applications | Understand how various methods for finding roots can fail |  |  |
| What I need to do to improve… | | | |

Chapter 11 – Integration

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| **Sub-topic** | **Progress Descriptor** | **☺** | **☹** |
| Integration | Integrate a range of standard functions including trigonometric and exponential functions |  |  |
| Integration | Integrate 1/x |  |  |
| Integration | Integrate functions of the form f(ax + b) |  |  |
| Integration | Integrate functions using trigonometric identities |  |  |
| Integration | Integrate functions of the form f'(x)/f(x) by recognition |  |  |
| Integration | Integrate functions using the reverse chain rule |  |  |
| Integration | Integrate functions using a given substitution and understand the connection with the chain rule |  |  |
| Integration | Integrate functions by parts (single application) and understand the connection with the product rule |  |  |
| Integration | Integrate functions using partial fractions |  |  |
| Integration | Use definite integration to find areas between curves (or a curve and a line) |  |  |
| Integration | Solve differential equations using standard methods |  |  |
| Integration | Understand the role of constants of integration and particular integrals in the solutions of differential equations |  |  |
| Integration | Understand how to sketch a family of solution curves of differential equations |  |  |
| Integration | Integrate functions using a substitution which is not given |  |  |
| Integration | Integrate functions by parts (repeated application) |  |  |
| Integration | Integrate functions using a range of methods in familiar contexts |  |  |
| Integration | Use definite integration to find areas between curves (or a curve and a line) in context |  |  |
| Integration | Solve differential equations using separation of variables |  |  |
| Integration | Integrate functions using a range of methods in unfamiliar contexts |  |  |
| Integration | Understand and use integration as the limit of a sum |  |  |
| Integration | Solve differential equations in a range of contexts |  |  |
| Integration | Interpret solutions to differential equations in a range of contexts and identify limitations, including consideration of validity for large values |  |  |
| Integration | Understand and use the trapezium rule |  |  |
| Integration | Use a sketch to determine whether the trapezium rule gives an over- or underestimate |  |  |
| Integration | Estimate the approximate area under a curve and the limits it must lie between |  |  |
| Integration | Integrate a range of standard functions including trigonometric and exponential functions |  |  |
| What I need to do to improve… | | | |

Chapter 12 – Vectors

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| **Sub-topic** | **Progress Descriptor** | **☺** | **☹** |
| Representing vectors | Understand 3D coordinates |  |  |
| Representing vectors | Use vectors in 3 dimensions |  |  |
| Representing vectors | Find the magnitude of a vector in 3 dimensions |  |  |
| Representing vectors | Solve contextualised problems in mechanics using 3D vectors |  |  |
| Vector geometry | Solve geometric problems using vectors in 3 dimensions |  |  |
| What I need to do to improve… | | | |