LPS4B Shield-maroon aw

**LPSB | Mathematics A level | Checklist**

* You should audit yourself against this checklist to get an overview of which year 12 topics you are confident in – grade yourself red amber or green.
* You should base your judgment upon if you are able to complete the relevant topic assessment that is on teams.
* If you are weak on a given checklist point, you should use the resources available on teams/websites/alevel drop in/ teacher support to ensure that you have revised the topic thoroughly – relevant websites are included at the end of this documents.
* Once this work is complete, you can regrade yourself.

## Pure Mathematics: Proof

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| Learning Outcome | R|A|G |
| Understand and use the structure of mathematical proof. |  |
| Use methods of proof, including proof by deduction and proof by exhaustion. |  |
| Disprove a conjecture by the use of a counterexample. |  |

## Pure Mathematics: Algebra

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| Learning Outcome | R|A|G |
| Use algebraic vocabulary and notation. |  |
| Solve linear equations in one unknown. |  |
| Change the subject of a formula. |  |
| Solve quadratic equations by factorising, completing the square, using the quadratic formula, and graphically. |  |
| Find and interpret the discriminant of a quadratic equation. |  |
| Solve simultaneous equations (linear-linear and linear-quadratic). |  |
| Understand points of intersection of graphs. |  |
| Solve linear and quadratic inequalities and express solutions correctly. |  |
| Use and manipulate surds. |  |
| Rationalise the denominator of a surd expression. |  |
| Use the laws of indices for rational exponents. |  |
| Understand and use proportional relationships and their graphs. |  |

## Pure Mathematics: Functions

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| Learning Outcome | R|A|G |
| Add, subtract, multiply, and divide polynomials. |  |
| Use the factor theorem to factorise polynomials and find zeros. |  |

## Pure Mathematics: Graphs

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| Learning Outcome | R|A|G |
| Understand and use graphs of functions. |  |
| Find intersections with coordinate axes. |  |
| Complete the square and find turning points of quadratics. |  |
| Sketch graphs of simple functions including polynomials. |  |
| Use stationary points when sketching curves. |  |
| Sketch and interpret reciprocal and square root graphs. |  |
| Apply transformations to graphs. |  |

## Pure Mathematics: Coordinate Geometry

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| Learning Outcome | R|A|G |
| Use the equation of a straight line in various forms. |  |
| Understand gradient conditions for parallel and perpendicular lines. |  |
| Calculate distance between points and midpoint of a line segment. |  |
| Form equations of straight lines and find points of intersection. |  |
| Apply straight line models in context. |  |
| Find points of intersection of lines and curves, including circles. |  |
| Understand and use the equation of a circle. |  |
| Apply geometrical properties of circles. |  |

## Pure Mathematics: Sequences and Series

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| Learning Outcome | R|A|G |
| Understand and use the binomial expansion of (a + bx)^n for positive integer n. |  |
| Understand factorial notation and combinations. |  |

## Pure Mathematics: Trigonometry

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| Learning Outcome | R|A|G |
| Use trigonometric functions and unit circle definitions. |  |
| Know and use trigonometric graphs and symmetries. |  |
| Know exact trigonometric values for standard angles. |  |
| Use sine and cosine rules and area of a triangle. |  |
| Use trigonometric identities (tan = sin/cos and sin² + cos² = 1). |  |
| Solve simple trigonometric equations in given intervals. |  |

## Pure Mathematics: Exponentials and Logarithms

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| Learning Outcome | R|A|G |
| Understand and use exponential functions and their graphs. |  |
| Convert between index and logarithmic forms. |  |
| Understand logarithms as inverse functions. |  |
| Use laws of logarithms, including solving equations and inequalities. |  |
| Understand natural logarithms and exponential models of growth and decay. |  |

## Pure Mathematics: Calculus

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| Learning Outcome | R|A|G |
| Understand the concept of a derivative as the gradient of a curve. |  |
| Differentiate simple functions using the power rule. |  |
| Interpret first and second derivatives. |  |
| Find stationary points and determine maxima or minima. |  |
| Find equations of tangents and normals. |  |
| Integrate functions of the form kx^n (n ≠ -1). |  |
| Find constants of integration using boundary conditions. |  |
| Evaluate definite integrals and understand areas under curves. |  |

## Pure Mathematics: Vectors

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| Learning Outcome | R|A|G |
| Understand vector notation and basic operations. |  |
| Add, subtract, and scale vectors. |  |
| Find magnitude and direction of vectors. |  |
| Use position vectors and solve problems involving vectors. |  |

## Mechanics

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| Learning Outcome | R|A|G |
| Understand the concept of a particle model in mechanics. |  |
| Define and interpret displacement, distance, velocity, speed, acceleration. |  |
| Differentiate between scalar and vector quantities in mechanics. |  |
| Use and derive the constant acceleration equations (suvat) for motion in one dimension. |  |
| Apply constant acceleration equations to problems including those with initial and final velocities. |  |
| Sketch and interpret displacement-time graphs and their gradients. |  |
| Sketch and interpret velocity-time graphs and calculate gradients and areas under curves. |  |
| Understand Newton’s First Law of Motion and identify forces acting on a particle in equilibrium. |  |
| Apply Newton’s Second Law of Motion (F = ma) to particles in motion with constant force. |  |
| Apply Newton’s Third Law of Motion and recognise action-reaction force pairs. |  |
| Understand the concept of weight as a force and calculate weight using W = mg. |  |
| Analyse problems involving resultant forces and equilibrium in one dimension. |  |
| Solve problems involving connected particles in motion or equilibrium. |  |
| Model motion using simple assumptions such as neglecting air resistance and treating objects as particles. |  |
| Interpret real-world contexts using constant force models including tension and normal reaction. |  |

## Statistics

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| Learning Outcome | R|A|G |
| Understand key terms: population, sample, parameter, statistic, sampling frame, sampling unit. |  |
| Differentiate between types of sampling: simple random, systematic, stratified, opportunity, quota. |  |
| Understand advantages and disadvantages of different sampling methods. |  |
| Describe and interpret measures of location: mean, median, mode. |  |
| Describe and interpret measures of spread: range, interquartile range, variance, standard deviation. |  |
| Interpret and construct box plots and cumulative frequency diagrams. |  |
| Interpret and construct histograms, including unequal class widths. |  |
| Interpret scatter diagrams and describe correlation (positive, negative, none). |  |
| Understand that correlation does not imply causation. |  |
| Understand and apply the binomial distribution for discrete probability situations. |  |
| Use binomial probabilities to model discrete events. |  |
| Calculate and interpret cumulative binomial probabilities using formulae and calculators. |  |
| Formulate null and alternative hypotheses for binomial tests. |  |
| Conduct hypothesis tests using critical regions and p-values for binomial distributions. |  |
| Interpret the outcome of hypothesis tests within the context of the problem. |  |
| Understand assumptions and limitations of binomial models and hypothesis testing. |  |

**Resources**

* All course resources are on teams. Use of these resources to prepare for assessments is paramount. The resources section for maths should be your home away from home: LPSB-Year 13 > Maths Channel > Files.
* <https://alevelmathsrevision.com/> - Exam questions by topic
* <https://www.physicsandmathstutor.com/maths-revision/> - Exam questions by topic, worksheets, cheat sheets etc.
* [MADAS maths papers](https://www.madasmaths.com/archive_iygb_practice_papers_mp1_practice_papers.html) - excellent pure maths practice, the MP1 papers are AS content and the MP2 papers are A level content.
* MP1: <https://madasmaths.com/archive_iygb_practice_papers_mp1_practice_papers.html>
* MP2: <https://madasmaths.com/archive_iygb_practice_papers_mp2_practice_papers.html>