Park House School - Year 12 June Assessment

Maths Assessment Manifest

- You will have 2 Maths papers, paper 1 is pure only, paper 2 is statistics and mechanics
- Paper 1 is 100 marks and 2 hours
- Paper 2 is 60 marks and 1 hour and 15 mins
- You are expected to spend 1 minute on each mark and then have time to check your answers.

Pure

Topics	Red	Amber	Green
I can understand and use the structure of mathematical proof, proceeding from given assumptions through a series of logical steps to a conclusion; use methods of proof including: • Proof by deduction • Proof by exhaustion • Disproof by counter example			
I can understand and use the laws of indices for all rational exponents			
I can use and manipulate surds including rationalising the denominator			
I can work with quadratic functions and their graphs			
I can find the discriminant of a quadratic function, including the conditions for real and repeated roots			
I can complete the square			
I can find solutions of quadratic equations			
I can solve quadratic equations in a function of the unknown			
I can solve simultaneous equations in two variables by elimination and by substitution, including one linear and one quadratic equation			
I can solve linear and quadratic inequalities in a single variable and interpret such inequalities graphically, including inequalities with brackets and fractions			
I can express solutions through correct us of 'and' and 'or' or through set notation			
I can represent linear and quadratic inequalities graphically			
I can manipulate polynomial algebraically, including expanding brackets and collecting like terms, factorisation and simple algebraic division; use of the factor theorem			
I can simplify rational expressions, including by factorising and cancelling, and algebraic division			
I can understand and use graphs of functions; sketch curves defined by simple equations including polynomials			
I can understand and use the modulus of a linear function			
I can interpret algebraic solutions of equations graphically; use intersection points of graphs to solve equations			
I can understand and use proportional relationships and their graphs			
I can understand and use composite functions, inverse functions and their graphs			
I can understand the effect of simple transformations on the graph y=f(x), including sketching associated graphs			

I can decompose rational functions into partial fractions			
I can use functions in modelling including consideration of limitations and refinements of the model			
I can understand and use the equation of a straight line, including the forms $y-y_1=m(x-x_1)$ and $ax + by + c = 0$			
I can understand the gradient conditions for two straight lines to be parallel or perpendicular			
I can use straight line models in a variety of contexts			
I can understand and use the coordinate geometry of the circle including using the equation of a circle in the form $(x-a)^2+(y-b)^2=r^2$			
I can complete the square to find the centre and radius of a circle and then use the following properties: • The angle in a semicircle is a right angle • The perpendicular from the centre to a chord bisects the chord • The radius of a circle at a given point on its circumference is perpendicular to the tangent to the circle at that point			
I can understand and use the parametric equations of curves and convert between Cartesian and parametric forms			
I can use parametric equations in modelling in a variety of contexts			
I can understand and use the binomial expansion of $(a+bx)^n$ for positive integer n and extend to any rational n, including its use for approximation			
I can understand and use the definitions of sine, cosine and tangent for all arguments			
I can understand and use the sine and cosine rules and the area of a triangle formula			
I can work with radian measure, including use for arc length and area of a sector			
I can understand and use the standard small angle approximations of sine, cosine and tangent			
I can understand and use the sine, cosine and tangent functions, their graphs, symmetries and periodicity			
I can understand and use trigonometric identities			
I can solve simple trigonometric equations in a given interval, including quadratic equations in sin, cos and tan and equations involving multiples of the unknown angle			
I can construct proofs involving trigonometric functions and identities			
I can use trigonometric functions to solve problems in context, including problems involving vectors, kinematics and forces			
I can use the function a^x and its graph, where a is positive			
I can use the function e^x and its graph			
I know that the gradient of e^{kx} is equal to ke^{kx} and hence understand why the exponential model is suitable in many applications			
I know and use the definition of $\log_a x$ as the inverse of a^x, where a is positive and $x>0$			
I know and use the function ln x and its graph			
I know and use ln x as the inverse function of e^x			
I can understand and use the laws of logarithms			
I can solve equations of the form $a^x=b$			

I can use logarithmic graphs to estimate parameters in relationships of the form $y=ax^n$ and $y=kb^x$			
I can understand and use exponential growth and decay; use in modelling; with consideration of limitations and refinements of exponential models			
I can understand the derivate of f(x) as the gradient of the tangent to the graph of y=f(x) at a general point (x,y); the gradient of the tangent as a limit; interpretation as a rate of change			
I can sketch the gradient function for a given curve			
I can calculate second derivatives			
I can use differentiation from first principles for small positive integer powers of x			
I can understand and use the second derivative as the rate of change of a gradient and connect this to convex and concave sections of curves along with points of inflection			
I can differentiate x^n, for rational values of n, and related constant multiples, sums and differences			
I can differentiate e^{kx} and a^{kx}, sinkx, coskx, tankx and related sums, differences and constant multiples			
I can understand and use the derivative of ln x			
I can apply differentiation to find gradients, tangents and normals			
I can calculate maxima and minima and stationary points			
I can identify where functions are increasing or decreasing			
I can differentiate using the product rule, the quotient rule and the chain rule, including problems involving connected rates of change and inverse functions			
I can differentiate simple functions and relations defined implicitly or parametrically, for first derivative only			
I can construct simple differential equations in pure mathematics and in context			
I know and use the fundamental theorem of calculus			
I can integrate x^n and related sums, differences and constant multiples			
I can integrate e^{kx}, 1/x, sinkx, coskx and related sums, differences and constant multiples			
I can evaluate definite integrals, use a definite integral to find the area under a curve and the area between two curves			
I can understand and use integration as the limit of a sum			
I can carry out simple cases of integration by substitution and integration by parts and I understand that these methods are the inverse processes of the chain and product rules			
I can integrate using partial fractions that are linear in the denominator			
I can evaluate the analytical solution of simple first order differential equations with separable variables, including finding particular solutions			
I interpret the solution of a differential equation in the context of solving a problem, including identifying limitations of the solution, including links to kinematics			
I can locate roots of f(x)=0 by considering changes of sign of f(x) in an interval of x on which f(x) is sufficiently well behaved			
I can understand how change of sign methods can fail			

I can solve equations approximately using simple iterative methods and be able to draw associated cobweb and staircase diagrams			
I can solve equations using the Newton-Raphson method and other recurrence relations of the form $x_{n+1}=g(x_n)$			
I can understand how such methods can fail			
I can understand and use numerical integration of functions, including the use of the trapezium rule and estimating the approximate area under a curve and limits that it must lie between			
I can use numerical methods to solve problems in context			
I can use vectors in two dimensions and in three dimensions			
I can calculate the magnitude and direction of a vector and convert between component form and magnitude/direction form			
I can add vectors diagrammatically and perform the algebraic operations of vector addition and multiplication by scalars, and understand their geometrical interpretations			
I can understand and use position vectors, calculate the distance between two points represented by position vectors			
I can use vectors to solve problems in pure mathematics and in context			

Statistics

Topics	Red	Amber	Green
I can understand and use the terms 'population' and 'sample'			
I can use samples to make informal inferences about the population			
I can understand and use sampling techniques, including simple random sampling and opportunity sampling			
I can select or critique sampling techniques in the context of solving a statistical problem, including understanding that different samples can lead to different conclusions about the population			
I can interpret diagrams for single-variable data, including understanding that area in a histogram represents frequency and can connect this to probability distributions			
I can interpret scatter diagrams and regression lines for bivariate data including recognition of scatter diagrams which include distinct sections of the population			
I can understand the informal interpretation of correlation			
I can understand that correlation does not imply causation			
I can interpret measures of central tendency and variation, extending to standard deviation			
I can calculate standard deviation, including from summary statistics			
I can recognise and interpret possible outliers in data sets and statistical diagrams			
I can select or critique data presentation techniques in the context of a statistical problem			
I can clean data including dealing with missing data, errors and outliers			
I can understand and use mutually exclusive and independent events when calculating probabilities			
I can link this to discrete and continuous distributions			

I can understand and use conditional probability, including the use of tree diagrams, Venn diagrams and two-way tables			
I can understand and use the conditional probability formula			
I can model with probability including critiquing assumptions made and the likely effect of more realistic assumptions			
I can understand and use simple, discrete probability distributions including binomial distribution, as a model and calculate probabilities using the binomial distribution			
I can understand and use the Normal distribution as a model and find probabilities using the Normal distribution			
I can link this to histograms, mean, standard deviation and points of inflection			
I can link Normal distribution and the binomial distribution			
I can select an appropriate probability distribution for a context, with appropriate reasoning, including recognising when the binomial or Normal model may not be appropriate			
I can understand and apply the language of statistical hypothesis testing, developed through a binomial model: null hypothesis, alternative hypothesis, significance level, 2-tail test, critical value, critical region, acceptance region, p-value			
I can extend this to correlation coefficients as measures of how close data points lie to a straight line			
I can interpret a given correlation coefficient using a given p-value or critical value			
I can conduct a statistical hypothesis test for the proportion in the binomial distribution and interpret the results in context			
I can understand that a sample is being used to make an inference about the population			
I can appreciate that the significance level is the probability of incorrectly rejecting the null hypothesis			
I can conduct a statistical hypothesis test for the mean of a Normal distribution with known, given or assumed variance and interpret the results in context			

Mechanics

Topics	Red	Amber	Green
I can understand and use fundamental quantities and units in the S.I. system: length, time and mass			
I can understand and use derived quantities and units: velocity, acceleration, force, weight, moment			
I can understand and use the language of kinematics, position, displacement, distance travelled, velocity, speed and acceleration			
I can understand, use and interpret graphs in kinematics for motion in a straight line: displacement against time and interpretation of gradient, velocity against time and interpretation of gradient and area under the graph			
I can understand, use and derive the formulae for constant acceleration for the motion in a straight line			

I can extend the formulae for constant acceleration to 2 dimensions using vectors			
I can use calculus in kinematics for motion in a straight line and can extend this to 2 dimensions using vectors			
I can model motion under gravity in a vertical plane using vectors			
I can derive formulae for time of flight, range and greatest height through the path of a projectile			
I can understand the concept of a force and can understand and use Newton's first law			
I can understand and use Newton's second law for motion in a straight line and extend to situations where forces need to be resolved			
I can understand and use weight and motion in a straight line under gravity; gravitational acceleration, and its value in S.I. units to varying degrees of accuracy			
I can understand and use Newton's third law, equilibrium of forces on a particle and motion in a straight line			
I can apply this to problems involving smooth pulleys and connected particles			
I can understand and use the addition of forces, resultant forces and dynamics for motion in a plane			
I can understand and use the model for friction, coefficient of friction, motion of a body on a rough surface, limiting friction and statics			
I can understand and use moments in simple static contexts			