HSC Mathematics (Extension 1)

Exam Planner

Your guide for exam goal-setting, preparation and success.

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Subject: Mathematics (Extension 1)

EXAM DATE ....

GOAL ....

Topic: Proof	Do I have it in my notes?	Note-making deadline	Memorising deadline
Understand the nature of inductive proof, including the 'initial statement' and the inductive step (ACMSM064)			
Prove results using mathematical induction			
– Prove results for sums, for example $1+4+9+\cdots n^2 = \frac{n(n+1)(2n+1)}{6}$ for any positive integer n (ACMSM065)			
– Prove divisibility results, for example $3^{2n}-1$ is divisible by 8 for any positive integer n (ACMSM066)			
Identify errors in false 'proofs by induction', such as cases where only one of the required two steps of a proof by induction is true, and understand that this means that the statement has not been proved			
Recognise situations where proof by mathematical induction is not appropriate			

Topic: Vectors	Do I have it in my notes?	Note-making deadline	Memorising deadline
Define a vector as a quantity having both magnitude and direction, and examine examples of vectors, including displacement and velocity (ACMSM010)			
– Explain the distinction between a position vector and a displacement (relative) vector			
Define and use a variety of notations and representations for vectors in two dimensions (ACMSM014)			
– Use standard notations for vectorsfor example: $\underset{\sim}{a}$, $\overrightarrow{AB}$, $\boldsymbol{a}$			
– Represent vectors graphically in two dimensions as directed line segments			

– Define unit vectors as vectors of magnitude 1, and the standard two-dimensional perpendicular unit vectors $\underset{\sim}{i}$ and $\underset{\sim}{j}$			
– Express and use vectors in two dimensions in a variety of forms, including component form, ordered pairs and column vector notation			
Perform addition and subtraction of vectors and multiplication of a vector by a scalar algebraically and geometrically, and interpret these operations in geometric terms			
– Graphically represent a scalar multiple of a vector (ACMSM012)			
– Use the triangle law and the parallelogram law to find the sum and difference of two vectors			
– Define and use addition and subtraction of vectors in component form (ACMSM017)			
– Define and use multiplication by a scalar of a vector in component form (ACMSM018)			
Define, calculate and use the magnitude of a vector in two dimensions and use the notation |u| for the magnitude of a vector u=xi + yj			
– Prove that the magnitude of a vector, $\underset{\sim}{u} = x\underset{\sim}{i} + y\underset{\sim}{j}$, can be found using: $\|\underset{\sim}{u}\| = \left\|x\underset{\sim}{i} + y\underset{\sim}{j}\right\| = \sqrt{x^2 + y^2}$			
– Identify the magnitude of a displacement vector $\underset{AB}{\rightarrow}$ as being the distance between the points A and B			
– Convert a non-zero vector $\underset{\sim}{u}$ into a unit vector $\hat{u}$ by dividing by its length: $\hat{u} = \frac{\underset{\sim}{u}}{\|\underset{\sim}{u}\|}$			
Define and use the direction of a vector in two dimensions			
Define, calculate and use the scalar (dot) product of two vectors u = x1.i + y1.j and v + x2i + y2j			
– Apply the scalar (dot) product, $\underset{\sim}{u} \cdot \underset{\sim}{v}$, to vectors expressed in component form, where ,u.v = x1 x2 + y1 y2			
– Use the expression for the scalar (dot) product, $\underset{\sim}{u} \cdot \underset{\sim}{v} = \|\underset{\sim}{u}\|\|\underset{\sim}{v}\| cos\theta$ where θ is the angle between vectors $\underset{\sim}{u}$ and $\underset{\sim}{v}$ to solve problems			

– Demonstrate the equivalence, $\underset{\sim}{u} \cdot \underset{\sim}{v} = \lvert\underset{\sim}{u}\rvert\lvert\underset{\sim}{v}\rvert cos\theta = x_1x_2 + y_1y_2$ and use this relationship to solve problems			
– Establish and use the formula $\underset{\sim}{v} \cdot \underset{\sim}{v} = \lvert v\rvert^2$			
– Calculate the angle between two vectors using the scalar (dot) product of two vectors in two dimensions			
Examine properties of parallel and perpendicular vectors and determine if two vectors are parallel or perpendicular (ACMSM021)			
Define and use the projection of one vector onto another (ACMSM022)			
Solve problems involving displacement, force and velocity involving vector concepts in two dimensions (ACMSM023)			
Prove geometric results and construct proofs involving vectors in two dimensions including to proving that:			
– The diagonals of a parallelogram meet at right angles if and only if it is a rhombus (ACMSM039)			
– The midpoints of the sides of a quadrilateral join to form a parallelogram (ACMSM040)			
– The sum of the squares of the lengths of the diagonals of a parallelogram is equal to the sum of the squares of the lengths of the sides (ACMSM041)			
Understand the concept of projectile motion, and model and analyse a projectile's path assuming that:			
– The projectile is a point			
– The force due to air resistance is negligible			
– The only force acting on the projectile is the constant force due to gravity, assuming that the projectile is moving close to the Earth's surface			
Model the motion of a projectile as a particle moving with constant acceleration due to gravity and derive the equations of motion of a projectile			

– Represent the motion of a projectile using vectors			
– Recognise that the horizontal and vertical components of the motion of a projectile can be represented by horizontal and vertical vectors			
– Derive the horizontal and vertical equations of motion of a projectile			
– Understand and explain the limitations of this projectile model			
Use equations for horizontal and vertical components of velocity and displacement to solve problems on projectiles			
Apply calculus to the equations of motion to solve problems involving projectiles (ACMSM115)			

Topic: Trigonometric Functions	**Do I have it in my notes?**	**Note-making deadline**	**Memorising deadline**
Convert expressions of the form $a\ cos\ x\ + b\ sin\ x$ to $R\ cos(x\ \pm\ \alpha)$ or i j and apply these to solve equations of the form a cos x + b sin x = c, sketch graphs and solve related problems			
Solve trigonometric equations requiring factorising and/or the application of compound angle, double angle formulae or the t-formulae			
Prove and apply other trigonometric identities, for example $cos\ 3x = 4\ cos^3\ x - 3\ cos\ x$(ACMSM049)			
Solve trigonometric equations and interpret solutions in context using technology or otherwise			

Topic: Calculus	**Do I have it in my notes?**	**Note-making deadline**	**Memorising deadline**
Find and evaluate indefinite and definite integrals using the method of integration by substitution, using a given substitution			
– Change an integrand into an appropriate form using algebra			
Prove and use the identities $sin^2\ nx = \frac{1}{2}(1 - cos\ 2nx)$ and $cos^2\ nx = \frac{1}{2}(1 + cos\ 2nx)$ to solve problems			

Solve problems involving $\int sin^2 nxdx$ and $\int cos^2 nxdx$			
Find derivatives of inverse functions by using the relationship $\frac{dy}{dx} = \frac{1}{\frac{dx}{dy}}$			
Solve problems involving the derivatives of inverse trigonometric functions			
Integrate expressions of the form $\frac{1}{\sqrt{a^2-x^2}}$ or $\frac{a}{a^2+x^2}$ (ACMSM121)			
Calculate area of regions between curves determined by functions (ACMSM124)			
Sketch, with and without the use of technology, the graph of a solid of revolution whose boundary is formed by rotating an arc of a function about the x-axis or y-axis			
Calculate the volume of a solid of revolution formed by rotating a region in the plane about the x-axis or y-axis, with and without the use of technology (ACMSM125)			
Determine the volumes of solids of revolution that are formed by rotating the region between two curves about either the x-axis or y-axis in both real-life and abstract contexts			
Recognise that an equation involving a derivative is called a differential equation			
Recognise that solutions to differential equations are functions and that these solutions may not be unique			
Sketch the graph of a particular solution given a direction field and initial conditions			
– Form a direction field (slope field) from simple first-order differential equations			
– Recognise the shape of a direction field from several alternatives given the form of a differential equation, and vice versa			
– Sketch several possible solution curves on a given direction field			
Solve simple first-order differential equations (ACMSM130)			
– Solve differential equations of the form $\frac{dy}{dx} = f(x)$			
– Solve differential equations of the form $\frac{dy}{dx} = g(y)$			

– The interaction of charged particles with electric fields			
– Other examples of uniform circular motion (ACSPH108)			
Investigate qualitatively and quantitatively the interaction between a current-carrying conductor and a uniform magnetic field $F = lI \perp B = lIBsin\theta$ to establish: (ACSPH080, ACSPH081)			
– Conditions under which the maximum force is produced			
– The relationship between the directions of the force, magnetic field strength and current			
– Conditions under which no force is produced on the conductor			
Conduct a quantitative investigation to demonstrate the interaction between two parallel current-carrying wires			
Analyse the interaction between two parallel current-carrying wires $\frac{F}{l} = \frac{\mu_0}{2\pi}\frac{I_1 I_2}{r}$and determine the relationship between the International System of Units (SI) definition of an ampere and Newton's Third Law of Motion (ACSPH081, ACSPH106)			
Describe how magnetic flux can change, with reference to the relationship $\Phi = B_{\|\|}A = BAcos\theta$ (ACSPH083, ACSPH107, ACSPH109)			
Analyse qualitatively and quantitatively, with reference to energy transfers and transformations, examples of Faraday's Law and Lenz's Law $\varepsilon = -N\frac{\Delta\phi}{\Delta t}$, including but not limited to: (ACSPH081, ACSPH110)			
– The generation of an electromotive force (emf) and evidence for Lenz's Law produced by the relative movement between a magnet, straight conductors, metal plates and solenoids			
– The generation of an emf produced by the relative movement or changes in current in one solenoid in the vicinity of another solenoid			
Analyse quantitatively the operation of ideal transformers through the application of: (ACSPH110)			
– $\frac{V_p}{V_s} = \frac{N_p}{N_s}$			

– Solve differential equations of the form $\frac{dy}{dx} = f(x)g(y)$using separation of variables			
Recognise the features of a first-order linear differential equation and that exponential growth and decay models are first-order linear differential equations, with known solutions			
Model and solve differential equations including to the logistic equation that will arise in situations where rates are involved, for example in chemistry, biology and economics (ACMSM132)			
Topic: Statistical Analysis	**Do I have it in my notes?**	**Note-making deadline**	**Memorising deadline**
Use a Bernoulli random variable as a model for two-outcome situations (ACMMM143)			
– Identify contexts suitable for modelling by Bernoulli random variables (ACMMM144)			
Use Bernoulli random variables and their associated probabilities to solve practical problems (ACMMM146)			
– Understand and apply the formulae for the mean, $E(X) = \bar{x} = p$, and variance, $\mathrm{Var}(X) = p(1 - p)$, of the Bernoulli distribution with parameter p, and X defined as the number of successes (ACMMM145)			
Understand the concepts of Bernoulli trials and the concept of a binomial random variable as the number of 'successes' in n independent Bernoulli trials, with the same probability of success p in each trial (ACMMM147)			
– Calculate the expected frequencies of the various possible outcomes from a series of Bernoulli trials			
Use binomial distributions and their associated probabilities to solve practical problems (ACMMM150)			
– Identify contexts suitable for modelling by binomial random variables (ACMMM148)			
– Identify the binomial parameter p as the probability of success			
– Understand and use the notation $X \sim \mathrm{Bin}(n, p)$ to indicate that the random variable X is distributed binomially with parameters n and p			

– Apply the formulae for probabilities $P(X = r) = n_{C_r p^r (1-p)^{n}-1}$ associated with the binomial distribution with parameters n and p and understand the meaning of ^nC_r as the number of ways in which an outcome with r successes can occur			
– Understand and apply the formulae for the mean, $E(X) = \bar{x} = np$, and the variance, $\mathrm{Var}(X) = np(1 - p)$, of a binomial distribution with parameters n and p			
Use appropriate graphs to explore the behaviour of the sample proportion on collected or supplied data			
– Understand the concept of the sample proportion $\hat{p}$ as a random variable whose value varies between samples			
Explore the behaviour of the sample proportion using simulated data			
– Examine the approximate normality of the distribution of $\hat{p}$ for large samples (ACMMM175)			
Understand and use the normal approximation to the distribution of the sample proportion and its limitations			

Practice Schedule

PRACTICE EXAM	DEADLINE
Practice Exam 1	
Practice Exam 2	
Practice Exam 3	
Practice Exam 4	
Practice Exam 5	
EXAM DATE:	

Congratulations!

You're ready! Now relax and think about how good it will feel leaving the exam room knowing the hard work has paid off. Congratulations and good luck (not that you need it)!

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