Cambridge A-level Mathematics (9709)

EP Curriculum Map

Pure Mathematics 1 (for Paper 1)

1.1 Quadratics

Candidates should be able to:	Lessons
• carry out the process of completing the square for a quadratic polynomial $ax^2 + bx + c$ and use a completed square form	• Completing the Square • The Quadratic Formula • Introduction to the Discriminant • Using the Discriminant to find Coefficients • Nature of Roots • Solving Non-Monic Quadratic Equations • Solving Quadratic Equations: The Quadratic Formula • The Quadratic Formula • The Quadratic Formula • Solving Quadratic Inequalities • Solving Non-Linear Simultaneous Equations • Introduction to Non-Linear Simultaneous Equations
• find the discriminant of a quadratic polynomial $ax^2 + bx + c$ and use the discriminant	
• solve quadratic equations, and quadratic inequalities, in one unknown	
• solve by substitution a pair of simultaneous equations of which one is linear and one is quadratic	
• recognise and solve equations in x which are quadratic in some function of x.	

1.2 Functions

Candidates should be able to:	Lessons
• understand the terms function, domain, range, one-one function, inverse function and composition of functions	• Function Notation • Inverse Functions • Composite Functions • Find the Range of a Function • Inverse Functions • Inverse Functions and Transformations
• identify the range of a given function in simple cases, and find the composition of two given functions	
• determine whether or not a given function is one-one, and find the inverse of a one-one function in simple cases	
• illustrate in graphical terms the relation between a one-one function and its inverse	
• understand and use the transformations of the graph of $y = f(x)$ given by $y = f(x) + a$, $y = f(x + a)$, $y = af(x)$, $y = f(ax)$ and simple combinations of these.	

1.3 Coordinate geometry

Candidates should be able to:	Lessons
• find the equation of a straight line given sufficient information	• [Circle Graphs]
• interpret and use any of the forms $y = mx + c$, $y - y1 = m(x - x1)$, $ax + by + c = 0$ in solving problems	
• understand that the equation $(x - a)^2 + (y - b)^2 = r^2$ represents the circle with centre (a, b) and radius r	
• use algebraic methods to solve problems involving lines and circles	
• understand the relationship between a graph and its associated algebraic equation, and use the relationship between points of intersection of graphs and solutions of equations.	

1.4 Circular measure

Candidates should be able to:	Lessons
• understand the definition of a radian, and use the relationship between radians and degrees	• The Unit Circle and Radians • Finding an Arc Length • Area of Sectors and Segments
• use the formulae $s = r\theta$ and $A = 1/2r^2\theta$ in solving problems concerning the arc length and sector area of a circle.	

1.5 Trigonometry

Candidates should be able to:	Lessons
• sketch and use graphs of the sine, cosine and tangent functions (for angles of any size, and using either degrees or radians)	• Understanding and Graphing Sine • Understanding and Graphing Cosine • Comparing Trigonometric Functions • Sketching Transformed Trigonometric Graphs • Special Triangles: 30-60-90 • Special Triangles: 45-45-90 • Finding Angles Using Trigonometry • The Pythagorean Identity • Solving equations involving trigonometric functions
• use the exact values of the sine, cosine and tangent of 30°, 45°, 60°, and related angles	
• use the notations $\sin^{-1}x$, $\cos^{-1}x$, $\tan^{-1}x$ to denote the principal values of the inverse trigonometric relations	
• use the identities $\frac{sin}{cos} \equiv tan$ and $sin^2\theta + cos^2\theta \equiv 1$	
• find all the solutions of simple trigonometrical equations lying in a specified interval (general forms of solution are not included)	

1.6 Series

Candidates should be able to:	Lessons
• use the expansion of $(a + b)^n$, where n is a positive integer • recognise arithmetic and geometric progressions • use the formulae for the nth term and for the sum of the first n terms to solve problems involving arithmetic or geometric progressions • use the condition for the convergence of a geometric progression, and the formula for the sum to infinity of a convergent geometric progression.	• Pascal's Triangle and n Choose r • Binomial Expansion • Introduction to Arithmetic Sequences • Summing Geometric Sequences • Review: Arithmetic Sequences • Summing Geometric Sequences • Sums to Infinity

1.7 Differentiation

Candidates should be able to:	Lessons
• understand the gradient of a curve at a point as the limit of the gradients of a suitable sequence of chords, and use the notations $f'(x)$, $f''(x)$, $\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$ for first and second derivatives • use the derivative of x^n (for any rational n), together with constant multiples, sums and differences of functions, and of composite functions using the chain rule • apply differentiation to gradients, tangents and normals, increasing and decreasing functions and rates of change • locate stationary points and determine their nature, and use information about stationary points in sketching graphs.	• Introduction to Derivatives • Sketching the Gradient Function from the Original Function • Understanding The Second Derivative • Differentiating Polynomials • The Chain Rule • Review Lesson: Tangents and Normals • Finding Stationary Points • Sketching Graphs

1.8 Integration

Candidates should be able to:	Lessons
• understand integration as the reverse process of differentiation, and integrate $(ax + b)^n$ (for any rational n except -1), together with constant multiples, sums and differences • solve problems involving the evaluation of a constant of integration • evaluate definite integrals • use definite integration to find: • – the area of a region bounded by a curve and lines parallel to the axes, or between a curve and a line or between two curves • – a volume of revolution about one of the axes.	• Integrating Polynomials • Anti-Differentiating Polynomials • Equation of the Original Function

Pure Mathematics 2 (for Paper 2)

2.1 Algebra

Candidates should be able to:	Lessons
• understand the meaning of $\|x\|$, sketch the graph of $y = \|ax + b\|$ and use relations such as $\|a\| = \|b\| \Leftrightarrow a^2 = b^2$ and $\|x - a\| < b \Leftrightarrow a - b < x < a + b$ when solving equations and inequalities	• Dividing Polynomials • The Remainder Theorem • The Factor Theorem • Factorising Cubic Polynomials • Factorising Quartic Polynomials • Solving Polynomials
• divide a polynomial, of degree not exceeding 4, by a linear or quadratic polynomial, and identify the quotient and remainder (which may be zero)	
• use the factor theorem and the remainder theorem.	

2.2 Logarithmic and exponential functions

Candidates should be able to:	Lessons
• understand the relationship between logarithms and indices, and use the laws of logarithms (excluding change of base)	• Deriving the Laws of Logarithms • Features of Logarithmic Graphs • Exponential Graphs • Defining the Exponential Function • The Natural Logarithm and Inverse Relations • Solving Equations Involving Logarithmic Functions
• understand the definition and properties of e^x and $\ln x$, including their relationship as inverse functions and their graphs	
• use logarithms to solve equations and inequalities in which the unknown appears in indices	
• use logarithms to transform a given relationship to linear form, and hence determine unknown constants by considering the gradient and/or intercept	

2.3 Trigonometry

Candidates should be able to:	Lessons
• understand the relationship of the secant, cosecant and cotangent functions to cosine, sine and tangent, and use properties and graphs of all six trigonometric functions for angles of any magnitude	*Not currently covered in the EP platform*
• use trigonometrical identities for the simplification and exact evaluation of expressions, and in the course of solving equations, and select an identity or identities appropriate to the context, showing familiarity in particular with the use of – $\sec^2\theta \equiv 1 + \tan^2\theta$ and $\operatorname{cosec}^2\theta \equiv 1 + \cot^2\theta$ – the expansions of $\sin(A \pm B)$, $\cos(A \pm B)$ and $\tan(A \pm B)$ – the formulae for $\sin 2A$, $\cos 2A$ and $\tan 2A$ – the expression of $a \sin\theta + b\cos\theta$ in the forms $R\sin(\theta \pm \alpha)$ and $R\cos(\theta \pm \alpha)$	

2.4 Differentiation

<table>
<tr><th>Candidates should be able to:</th><th>Lessons</th></tr>
<tr><td>• use the derivatives of e^x , ln x, sin x, cos x, tan x, together with constant multiples, sums, differences and composites</td><td rowspan="3">• Exponential Functions
• Natural Logarithms
• Trigonometric Functions
• Mixed Differentiation Techniques
• Differentiating Exponential Functions
• Differentiating the Natural Logarithm
• The Product and Quotient Rule
• The Quotient Rule
• Combining Multiple Rules
• Parametric Equations
• Tangents and Normals of Parametric Curves
• Implicit Differentiation</td></tr>
<tr><td>• differentiate products and quotients</td></tr>
<tr><td>• find and use the first derivative of a function which is defined parametrically or implicitly.</td></tr>
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2.5 Integration

<table>
<tr><th>Candidates should be able to:</th><th>Lessons</th></tr>
<tr><td>• extend the idea of ‘reverse differentiation’ to include the integration of e^{ax+b}, $\frac{1}{ax+b}$, sin($ax + b$), cos($ax + b$) and $\sec^2(ax + b)$</td><td rowspan="3">• Integrating Exponential Functions
• Integrating Trigonometric Functions
• Trigonometric Functions: Finding the Constant
• Integrating Products: Reverse Chain Rule
• Integrating the Reciprocal Function
• Integrating Quotients: Splitting Fractions
• Integrating Quotients: Factorising and Cancelling
• Definite Integrals: Further Questions
• Integrating Trigonometric Functions</td></tr>
<tr><td>• use trigonometrical relationships in carrying out integration</td></tr>
<tr><td>• understand and use the trapezium rule to estimate the value of a definite integral.</td></tr>
</table>

2.6 Numerical solution of equations

<table>
<tr><th>Candidates should be able to:</th><th>Lessons</th></tr>
<tr><td>• locate approximately a root of an equation, by means of graphical considerations and/or searching for a sign change</td><td rowspan="2">Not currently covered in the EP platform</td></tr>
<tr><td>• understand the idea of, and use the notation for, a sequence</td></tr>
</table>

of approximations which converges to a root of an equation	
• understand how a given simple iterative formula of the form $x_{n+1} = \mathrm{F}(x_n)$ relates to the equation being solved, and use a given iteration, or an iteration based on a given rearrangement of an equation, to determine a root to a prescribed degree of accuracy.	

Pure Mathematics 3 (for Paper 3)

3.1 Algebra

Candidates should be able to:	Lessons
• understand the meaning of $\lvert x\rvert$, sketch the graph of $y = \lvert ax + b\rvert$ and use relations such as $\lvert a\rvert = \lvert b\rvert \Leftrightarrow a^2 = b^2$ and $\lvert x - a\rvert < b \Leftrightarrow a - b < x < a + b$ when solving equations and inequalities	• Dividing Polynomials • The Remainder Theorem • The Factor Theorem • Factorising Cubic Polynomials • Factorising Quartic Polynomials • Solving Polynomials
• divide a polynomial, of degree not exceeding 4, by a linear or quadratic polynomial, and identify the quotient and remainder (which may be zero)	
• use the factor theorem and the remainder theorem.	
• recall an appropriate form for expressing rational functions in partial fractions, and carry out the decomposition, in cases where the denominator is no more complicated than • – $(ax + b)(cx + d)(ex + f)$ • – $(ax + b)(cx + d)^2$ • – $(ax + b)(cx^2 + d)$	
• use the expansion of $(1 + x)^n$, where n is a rational number and $\lvert x\rvert < 1$.	

3.2 Logarithmic and Exponential Functions

Candidates should be able to:	Lessons
• understand the relationship between logarithms and indices, and use the laws of logarithms (excluding change of base)	• Features of Logarithmic Graphs • Exponential Graphs • Defining the Exponential Function • Solving Equations Involving Logarithmic Functions • Using Logarithms to Solve Equations Involving Indices
• understand the definition and properties of e^x and $\ln x$, including their relationship as inverse functions and their graphs	
• use logarithms to solve equations and inequalities in which the unknown appears in indices	
• use logarithms to transform a given relationship to linear form, and hence determine unknown constants by considering the gradient and/or intercept	

3.3 Trigonometry

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<tr><td>• use trigonometrical identities for the simplification and exact evaluation of expressions, and in the course of solving equations, and select an identity or identities appropriate to the context, showing familiarity in particular with the use of
– $\sec^2\theta \equiv 1 + \tan^2\theta$ and $\operatorname{cosec}^2\theta \equiv 1 + \cot^2\theta$
– the expansions of $\sin(A \pm B)$, $\cos(A \pm B)$ and $\tan(A \pm B)$
– the formulae for $\sin 2A$, $\cos 2A$ and $\tan 2A$
– the expression of $a \sin\theta + b\cos\theta$ in the forms $R\sin(\theta \pm \alpha)$ and $R\cos(\theta \pm \alpha)$</td></tr>
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3.4 Differentiation

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• Natural Logarithms
• Differentiation Techniques
• Differentiating Exponentials
• The Natural Logarithm and Inverse Relations
• The Product and Quotient Rule
• The Quotient Rule
• Combining Multiple Rules
• Parametric Equations
• Tangents and Normals of Parametric Curves
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3.5 Integration

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• Integrating Trigonometric Functions
• Trigonometric Functions: Finding the Constant
• Integrating Products: Reverse Chain Rule
• Integrating the Reciprocal Function</td></tr>
<tr><td>• use trigonometrical relationships in carrying out integration</td></tr>
<tr><td>• integrate rational functions by means of decomposition into partial fractions</td></tr>
<tr><td>• recognise an integrand of the form $\frac{kf'(x)}{f(x)}$ and integrate such</td></tr>
</table>

functions	• [Integrating Quotients: Splitting Fractions] • [Integrating Quotients: Factorising and Cancelling] • [Definite Integrals: Further Questions] • [Integrating Trigonometric Functions] • [Integrating Quotients: Generalised Logarithms] • [Integration by Substitution]
• recognise when an integrand can usefully be regarded as a product, and use integration by parts	
• use a given substitution to simplify and evaluate either a definite or an indefinite integral	

3.6 Numerical solution of equations

Candidates should be able to:	Lessons
• locate approximately a root of an equation, by means of graphical considerations and/or searching for a sign change	*Not currently covered in the EP platform*
• understand the idea of, and use the notation for, a sequence of approximations which converges to a root of an equation	
• understand how a given simple iterative formula of the form $x_{n+1} = \mathrm{F}(x_n)$ relates to the equation being solved, and use a given iteration, or an iteration based on a given rearrangement of an equation, to determine a root to a prescribed degree of accuracy.	

3.7 Vectors

Candidates should be able to:	Lessons
• use standard notations for vectors	*Not currently covered in the EP platform*
• carry out addition and subtraction of vectors and multiplication of a vector by a scalar, and interpret these operations in geometrical terms	
• calculate the magnitude of a vector, and use unit vectors, displacement vectors and position vectors	
• understand the significance of all the symbols used when the equation of a straight line is expressed in the form $\mathbf{r} = \mathbf{a} + t\mathbf{b}$, and find the equation of a line, given sufficient information	
• determine whether two lines are parallel, intersect or are skew, and find the point of intersection of two lines when it exists	
• use formulae to calculate the scalar product of two vectors, and use scalar products in problems involving lines and points.	

3.8 Differential Equations

Candidates should be able to:	Lessons
• formulate a simple statement involving a rate of change as a differential equation	• Introduction to Differential Equations • Solving Differential Equations • Introduction to Differential Equations • Separated Variables • Calculating Particular Solutions • Separated Variables: Particular Solutions
• find by integration a general form of solution for a first order differential equation in which the variables are separable	
• use an initial condition to find a particular solution	
• interpret the solution of a differential equation in the context of a problem being modelled by the equation.	

3.9 Complex Numbers

Candidates should be able to:	Lessons
• understand the idea of a complex number, recall the meaning of the terms real part, imaginary part, modulus, argument, conjugate, and use the fact that two complex numbers are equal if and only if both real and imaginary parts are equal	• Complex Numbers • Complex Conjugates • Rationalising the Denominator • Multiplying and Dividing Complex Numbers • Quadratic Equations with Complex Roots • Cubic Equations with Complex Roots • Loci
• carry out operations of addition, subtraction, multiplication and division of two complex numbers expressed in Cartesian form $x + \mathrm{i}y$	
• use the result that, for a polynomial equation with real coefficients, any non-real roots occur in conjugate pairs	
• represent complex numbers geometrically by means of an Argand diagram	
• carry out operations of multiplication and division of two complex numbers expressed in polar form $r(\cos\theta + \mathrm{i}\sin\theta) \equiv re^{\mathrm{i}\theta}$	
• find the two square roots of a complex number	
• understand in simple terms the geometrical effects of conjugating a complex number and of adding, subtracting, multiplying and dividing two complex numbers	
• illustrate simple equations and inequalities involving complex numbers by means of loci in an Argand diagram	

Mechanics (for Paper 4)

4.1 Forces and equilibrium

Candidates should be able to:	Lessons
• identify the forces acting in a given situation	• Introduction to Forces • Forces in One Dimension • Forces in Two Dimensions • Inclined Planes with Applied Force • Newton's Third Law
• understand the vector nature of force, and find and use components and resultants	
• use the principle that, when a particle is in equilibrium, the vector sum of the forces acting is zero, or equivalently, that the sum of the components in any direction is zero	
• understand that a contact force between two surfaces can be represented by two components, the normal component and the frictional component	
• use the model of a 'smooth' contact, and understand the limitations of this model	
• understand the concepts of limiting friction and limiting equilibrium, recall the definition of coefficient of friction, and use the relationship $F = \mu R$ or $F \geq \mu R$, as appropriate.	
• use Newton's third law.	

4.2 Kinematics of motion in a straight line

Candidates should be able to:	Lessons
• understand the concepts of distance and speed as scalar quantities, and of displacement, velocity and acceleration as vector quantities	• Motion, Speed and Velocity • Acceleration • Distance-Time Graphs • Displacement-Time Graphs • Velocity-Time Graphs • Acceleration-Time Graphs • Summary of Motion Graphs • Kinematic Equations • Using the Acceleration Formula to Calculate Final Velocity • Using the Acceleration Formula to Calculate Initial Velocity • Using the Acceleration Formula to Calculate Time • Motion under Gravity
• sketch and interpret displacement–time graphs and velocity–time graphs, and in particular appreciate that: – the area under a velocity–time graph represents displacement, – the gradient of a displacement–time graph represents velocity, – the gradient of a velocity–time graph represents acceleration	
• use differentiation and integration with respect to time to solve simple problems concerning displacement, velocity and acceleration	
• use appropriate formulae for motion with constant acceleration in a straight line.	

4.3 Momentum

Candidates should be able to:	Lessons
• use the definition of linear momentum and show understanding of its vector nature	• Momentum • Conservation of Momentum
• use conservation of linear momentum to solve problems that may be modelled as the direct impact of two bodies.	

4.4 Newton's laws of motion

Candidates should be able to:	Lessons
• apply Newton's laws of motion to the linear motion of a particle of constant mass moving under the action of constant forces, which may include friction, tension in an inextensible string and thrust in a connecting rod	• Newton's First Law
• use the relationship between mass and weight	
• solve simple problems which may be modelled as the motion of a particle moving vertically or on an inclined plane with constant acceleration	
• solve simple problems which may be modelled as the motion of connected particles.	

4.5 Energy, work and power

Candidates should be able to:	Lessons
• understand the concept of the work done by a force, and calculate the work done by a constant force when its point of application undergoes a displacement not necessarily parallel to the force	• Work • Power • Kinetic Energy • Gravitational Potential Energy • Work Done by Gravitational Fields
• understand the concepts of gravitational potential energy and kinetic energy, and use appropriate formulae	
• understand and use the relationship between the change in energy of a system and the work done by the external forces, and use in appropriate cases the principle of conservation of energy	
• use the definition of power as the rate at which a force does work, and use the relationship between power, force and velocity for a force acting in the direction of motion	
• solve problems involving, for example, the instantaneous acceleration of a car moving on a hill against a resistance.	

Probability and Statistics 1 (for Paper 5)

5.1 Representations of data

Candidates should be able to:	Lessons
• select a suitable way of presenting raw statistical data, and discuss advantages and/or disadvantages that particular representations may have • draw and interpret stem-and-leaf diagrams, box-and-whisker plots, histograms and cumulative frequency graphs • understand and use different measures of central tendency (mean, median, mode) and variation (range, interquartile range, standard deviation) • use a cumulative frequency graph • calculate and use the mean and standard deviation of a set of data (including grouped data) either from the data itself or from given totals Σx and Σx^2, or coded totals $\Sigma(x-a)$ and $\Sigma(x-a)^2$ and use such totals in solving problems which may involve up to two data sets.	• Types of Data • Dot Plots, Stem and Leaf Plots and Histograms • Cumulative Frequency • Range • Median, Quartiles and Percentiles • Interquartile Range • Box and Whisker Plots and Interquartile Range • Box and Whisker Plots, Histograms and Dot Plots • Five Point Summary • Back-to-Back Stem and Leaf Plots • Calculating Measures of Centre and Spread • Measures of Centre in Grouped Data • Cumulative Frequency • Median, Quartiles and Percentiles • Interquartile Range • Calculating Standard Deviation

5.2 Permutations and combinations

Candidates should be able to:	Lessons
• understand the terms permutation and combination, and solve simple problems involving selections • solve problems about arrangements of objects in a line, including those involving – repetition (e.g. the number of ways of arranging the letters of the word 'NEEDLESS') – restriction (e.g. the number of ways several people can stand in a line if two particular people must, or must not, stand next to each other).	• Combinations and Permutations

5.3 Probability

Candidates should be able to:	Lessons
• evaluate probabilities in simple cases by means of enumeration of equiprobable elementary events, or by calculation using permutations or combinations	• Probability Concepts • Intersections and Unions • Expected Value • Conditional Probability • Further Questions • Introducing Venn Diagrams • Using Venn Diagrams • Triple Venn Diagrams • Venn Diagrams: Further Questions • Introducing Two-Way Tables • Using Two-Way Tables • Two-Way Tables: Further Questions • Introducing Probability Trees • Using Probability Trees • Probability Trees: Further Questions • Multiplication & Addition Rules • Introduction to Independence • Investigating Independent Events using Chance Diagrams
• use addition and multiplication of probabilities, as appropriate, in simple cases	
• understand the meaning of exclusive and independent events, including determination of whether events A and B are independent by comparing the values of $P(A \cap B)$ and $P(A) \times P(B)$	
• calculate and use conditional probabilities in simple cases.	

5.4 Discrete random variables

Candidates should be able to:	Lessons
• draw up a probability distribution table relating to a given situation involving a discrete random variable X, and calculate $E(X)$ and $Var(X)$	• Introduction to Discrete Random Variables • Using Variance and Standard Deviation of Discrete Random Variables • Discrete Random Variables to Solve Practical Problems • Calculating the Mean and Variance of a Binomial Distribution • Using Binomial Distributions to Model and Solve Practical Problems
• use formulae for probabilities for the binomial and geometric distributions, and recognise practical situations where these distributions are suitable models	
• use formulae for the expectation and variance of the binomial distribution and for the expectation of the geometric distribution.	

5.5 The normal distribution

Candidates should be able to:	Lessons
• understand the use of a normal distribution to model a continuous random variable, and use normal distribution tables	• Introducing the Normal Distribution • The Standard Normal Distribution • Calculating Probabilities with the Normal Distribution • Applications of the Normal Distribution • Applications of the Normal Distribution • Working Backwards: Calculating Bounds • Working Backwards: Mean and Standard Deviation • The Normal Distribution: Further Questions
• solve problems concerning a variable X, where $X \sim N(\mu \sigma^2)$i, including – finding the value of P ($X > x_1$), or a related probability, given the values of x_1, μ,σ. – finding a relationship between x_1 , μ,σ given the value of P ($X > x_1$) or a related probability	
• recall conditions under which the normal distribution can be used as an approximation to the binomial distribution, and use this approximation, with a continuity correction, in solving problems.	

Probability and Statistics 2 (for Paper 6)

6.1 The Poisson distribution

Candidates should be able to:	Lessons
• use formulae to calculate probabilities for the distribution Poλ	• Introducing the Poisson Distribution • Poisson Distribution: Combined Events
• use the fact that if X ~ Poλ then the mean and variance of X are each equal to λ	
• understand the relevance of the Poisson distribution to the distribution of random events, and use the Poisson distribution as a model	
• use the Poisson distribution as an approximation to the binomial distribution where appropriate	
• use the normal distribution, with continuity correction, as an approximation to the Poisson distribution where appropriate.	

6.2 Linear combinations of random variables

Candidates should be able to:	Lessons
• use, when solving problems, the results that – $E(aX + b) = aE(X) + b$ and $\mathrm{Var}(aX + b) = a^2\mathrm{Var}(X)$ – $E(aX + bY) = aE(X) + bE(Y)$ – $\mathrm{Var}(aX + bY) = a^2\mathrm{Var}(X) + b^2\mathrm{Var}(Y)$ for independent X and Y – if X has a normal distribution then so does $aX + b$ – if X and Y have independent normal distributions then $aX + bY$ has a normal distribution – if X and Y have independent Poisson distributions then $X + Y$ has a Poisson distribution.	*Not currently covered in the EP platform*

6.3 Continuous random variables

Candidates should be able to:	Lessons
• understand the concept of a continuous random variable, and recall and use properties of a probability density function	• Continuous Random Variables • General Continuous Random Variables • Expected Value, Standard Deviation and Variance of Continuous Random Variables
• use a probability density function to solve problems involving probabilities, and to calculate the mean and variance of a distribution.	

6.4 Sampling and estimation

Candidates should be able to:	Lessons
• understand the distinction between a sample and a population, and appreciate the necessity for randomness in choosing samples	• What is Sampling? • Types of Sampling: Probability Sampling • Sampling Errors • Analysing Sampling in Reports • Introduction to Random Sampling and Bias • Sample proportions, means and standard deviation • Question Bank - Topic 5: Interval Estimates for Proportions
• explain in simple terms why a given sampling method may be unsatisfactory	
• recognise that a sample mean can be regarded as a random variable, and use the facts that E_X i = n and that X n Var 2	
• use the fact that _X i has a normal distribution if X has a normal distribution	
• use the Central Limit Theorem where appropriate	
• calculate unbiased estimates of the population mean and variance from a sample, using either raw or summarised data	
• determine and interpret a confidence interval for a population mean in cases where the population is normally distributed with known variance or where a large sample is used	
• determine, from a large sample, an approximate confidence interval for a population proportion.	

6.5 Hypothesis tests

Candidates should be able to:	Lessons
• understand the nature of a hypothesis test, the difference between one-tailed and two-tailed tests, and the terms null hypothesis, alternative hypothesis, significance level, rejection region (or critical region), acceptance region and test statistic	*Not currently covered in the EP platform*
• formulate hypotheses and carry out a hypothesis test in the context of a single observation from a population which has a binomial or Poisson distribution, using – direct evaluation of probabilities – a normal approximation to the binomial or the Poisson distribution, where appropriate	
• formulate hypotheses and carry out a hypothesis test concerning the population mean in cases where the population is normally distributed with known variance or where a large sample is used	
• understand the terms Type I error and Type II error in relation to hypothesis tests	
• calculate the probabilities of making Type I and Type II errors in specific situations involving tests based on a normal distribution or direct evaluation of binomial or Poisson probabilities.	