SVKM International School, Mumbai
– SCHEME OF WORK
A1 Level: Pure Mathematics 1 & Statistics 1
Batch:2019-20

Teacher: Nagesh Nayak **Subject: Pure Mathematics 1 & Statistics 1**

Week and Month	Topic and Subtopic	Learning Outcomes	Teaching activities	Assessment Summative / formative	Resources
July (2 Weeks)	**Quadratics** • Quadratic expressions • Completing the square • Solving quadratic equations • The discriminant $b^2 - 4ac$ • Simultaneous equations • Equations which reduce to quadratic equations.	At the end of this unit students will be able to: • carry out the process of completing the square • for a quadratic polynomial $ax^2 + bx + c$ and use • a completed square form • find the discriminant of a quadratic polynomial • $ax^2 + bx + c$ and use the discriminant. • solve quadratic equations, and quadratic inequalities,	Use of ppts & videos, Smartboard • revise the basic method of completing the square is on the TES website • Sketching quadratic graphs' by Salters • A video covering the three cases – 'Using the quadratic formula: number of solutions' • An interactive activity 'Solving Linear Inequalities. • Problems on quadratics in a function of *x*, 'C1 quadratics in disguise',	1. Worksheet 2. Tests after completion of the topic	Textbook resources: Pure Mathematics 1 by Hugh Neill, Douglas Quadling, Julian Gilbey Pure Mathematics 1 Hodder by Education www.tes.com/teaching-resource/completing-the-square-6409449 www.tes.com/teaching-resource/sketching-quadratic-graphs-6442934 www.khanacademy.org www.geogebra.org/m/p3xmmJV7 www.mathshelper.co.uk.

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		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.			
July (1 week) August (1Week)	**Coordinate Geometry** • find the equation of a straight line given sufficient information e.g. given two points, or one point and the gradient • interpret and use any of the forms y = mx + c, y – y1 = m(x – x1),in solving problems; including calculations of	Learners will be able to • find the equation of a straight line given sufficient information • interpret and use any of the forms $y = mx + c$, $y – y1 = m(x – x1)$, $ax + by + c = 0$ in solving problems.	• Teacher draws few straight lines on the board and learners will be asked to identify which line is more steep and which is less? • Teacher introduces the concept of gradient along with it's formula.Learners practice few questions on finding gradient of a line. • Teacher discusses different forms of equation of lines and their application with suitable examples.	1. Worksheet 2. Tests after completion of the topic	Textbook resources: Pure Mathematics 1 by Hugh Neill, Douglas Quadling, Julian Gilbey Pure Mathematics 1 Hodder by Education www.mathsisfun.com/equation_of_line.html https://undergroundmathematics.org

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	distances, gradients, midpoints, points of intersection and use of the relationship between the gradients of parallel and perpendicular lines • understand that the equation $(x - a)^2 + (y - b)^2 = r^2$ represents the circle with centre (a, b) and radius r ; including use of the expanded form • use algebraic methods to solve problems involving lines and circles; including use of elementary geometrical properties of circles, e.g. tangent	• understand that the equation $(x - a)^2 + (y - b)^2 = r^2$ represents the circle with centre (a, b) and radius r including use of the expanded form $x^2 + y^2 + 2gx + 2fy + c = 0$. • use algebraic methods to solve problems.	• Teacher derives Distance formula and Midpoint formula and shows application of the same with suitable examples. • Teacher explains the relationship between gradients of parallel and perpendicular lines with suitable examples.Learners practice few questions on the concept. • Teacher asks learners to practice past/specimen paper questions for practice. • Teacher asks the learners to define a circle and then introduces different forms of equation of circle. • Teacher solves few problems on finding equation of circle using appropriate formula. • Teacher asks learners to practice problems from past papers. • Teacher explains equations of tangents to circles with suitable examples.		www.tes.com/teaching-resource/a-level-maths-c1-coordinate-geometry-worksheet-6135231. www.mathsisfun.com/algebra/circle-equations.html www.tes.com/teaching-resource/equations-of-circles-6422649 www.tes.com/teaching-resource/equations-of-tangents-to-circles-11080079

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	perpendicular to radius, angle in a semicircle, symmetry; implicit differentiation is not included • 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, e.g. to determine the set of values of *k* for which the line $y = x + k$ intersects, touches or does not meet a quadratic curve	• 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.	• Learners revisit the concept intersection of two lines • Investigation of the intersection of a quadratic graph and a line. **(I)** • Past/specimen papers for practice **(I)(F)**:		www.mathopenref.com/coordintersection.html www.geogebra.org/m/uJ2j9pBq
August (2Weeks)	**Functions** • understand the terms function, domain,	• understand the terms function, domain, range, one-one function, inverse function and composition of functions • identify the range of a given	• Teacher will start by defining the terms 'function', 'domain' and 'range'.	1. Worksheet 2. Tests after	Textbook resources: Pure Mathematics 1Coursebook by Hugh

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	range, one-one function, inverse function and composition of functions • identify the range of a given function in simple cases, and find the composition of two given functions, e.g. range of f: $x \rightarrow 1/x$ for $x \geq 1$ and range of g: x^2+1, $x \in R$ including the condition that a composite function gf can only be formed when the range of f is within the domain of g. • determine whether or not a given function is one-one, and find the inverse of a one-one function in simple cases, e.g. finding the inverse of	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 • 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.	• Teacher will cover definitions of the terms 'one-one function', 'inverse function' and 'composition of functions' together with the appropriate notation. • Exploration of transforming the sine graph. specimen paper for practice: 2020 Specimen Paper 1 Q5 A card sort with single step transformations for a range of graphs. **(I)(F)**	completion of the topic	Neill, Douglas Quadling, Julian Gilbey Pure Mathematics 1 by Hodder Education www.coolmath.com/algebra/15-functions/01-whats-a-function-domain-range-01. www.geogebra.org/m/Hknxbnjb TES website – search for 'Transformation of Graphs by ianmckenzie'.

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	$h: x \mapsto (2x+3)^2 - 4$ for $x < -\frac{3}{2}$ • illustrate in graphical terms the relation between a one-one function and its inverse; sketches should include an indication of the mirror line $y = x$ • 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; including use of the terms 'translation', 'reflection' and 'stretch' in describing transformations; questions may				

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	involve algebraic or trigonometric functions, or other graphs with given features.				
August (1 weeks) 3rd week	**Circular measure** • understand the definition of a radian, and use the relationship between radians and degrees • use the formulae $s = r\theta$ and $A = \frac{1}{2}r^2\theta$ in solving problems concerning the arc length and sector area of a circle; including calculation of lengths and angles in triangles and areas of triangles	• understand the definition of a radian, and use the relationship between radians and degrees • use the formulae s=rΘ and A=1/2r²Θ in solving problems concerning the arc length and sector area of a circle.	Teacher will ask the learners to calculate the angle, in degrees, subtended by an arc, of length 1 unit, of a circle which has radius 1 unit. This will illustrate the definition of a radian and give learners an idea of the approximate size of a radian in degrees. Learners will practise converting degrees to radians. Teacher will ask learners to find the length of the arc using the ratio of the angles, $\frac{\theta}{2\pi}$, and to derive the formula for the sector area of a circle using a similar method. Practice questions on arc lengths and areas of sector. Past/specimen papers for practice:	1. Worksheet 2. Tests after completion of the topic	www.khanacademy.org/math/algebra2/trig-functions/intro-to-radians-alg2/v/we-converting-degrees-to-radians www.mathsisfun.com/geometry/circle-sector-segment.html

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August (1 week) 4th week	**Representation of data** • 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; including back-to-back stem-and-leaf diagrams • understand and use different measures of	Learners will be able to • 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	• Teacher will give a general introduction to measures of central tendency: • Comparing different measures of central tendency with a discussion of which may be the best to use in certain situation.	1. Worksheet 2. Tests after completion of the topic	Textbook resources: Statistics 1 and 2 (S1 & 2) by Hodder education Statistics 1 by Steve Dobbs and Jane Miller www.khanacademy.org/math/probability/descriptive-statistics/central_tendency/v/statistics-intro-mean-median-and-mode www.khanacademy.org/math/probability/descriptive-statistics/central_tendency/v/exploring-mean-and-median-module www.youtube.com/watch?v=E4HAYd0QnRc

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	central tendency (mean, median, mode) and variation (range, interquartile range, standard deviation), e.g. in comparing and contrasting sets of data • use a cumulative frequency graph, e.g. to estimate medians, quartiles, percentiles, the proportion of a distribution above (or below) a given value, or between two values • calculate and use the mean and standard deviation of a set of data (including grouped data) either from the data itself or from given	• 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 the two data sets.	• General introduction to measures of dispersion: Past/specimen papers for practice include **(I)(F)**:		

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	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				
September (1 week) 1st week	**Permutations and combinations** • 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	Learners will be able to : • 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).	To help learners understand the terms permutation and combination, teacher will use following two videos **(F)** The video on permutations, including notations used and the formula: The video that explains combinations and includes an explanation of the difference between permutations and combinations: Teacher will solve the problems on permutations and combinations' using Past/specimen papers for practice **(I)(F)**:		Textbook resources: Statistics 1 and 2 (S1 & 2) by Hodder education Statistics 1 by Steve Dobbs and Jane Miller www.youtube.com/watch?v=XqQTXW7XfYA www.youtube.com/watch?v=bCxMhncR7PU www.mathsisfun.com/combinatorics/combinations-permutations.html

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	line if two particular people must, or must not, stand next to each other); • questions may include cases such as people sitting in two (or more) rows; questions about objects arranged in a circle will not be included				
October (2 weeks) 1st and 2nd week	**Trigonometry** • sketch and use graphs of the sine, cosine and tangent functions (for angles of any size, and using either degrees or	Leaners will be able to: • sketch and use graphs of the sine, cosine and tangent functions (for angles of any size, and using either degrees or radians) • use the exact values of the sine, cosine and tangent of 30°, 45°, 60°, and related angles.	• Teacher will use an interactive graph plotter to show different trigonometric curves. Teacher will use an equilateral triangle of side 2 units to find the exact values of sin, cos and tan of 30° and 60°, and a right-angled isosceles triangle of sides 1, 1, √2	1. Worksheet 2. Tests after completion of the topic	Textbook resources: Pure Mathematics 1 by Hugh Neill, Douglas Quadling, Julian Gilbey www.desmos.com/calculator

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	radians); including e.g. $y = 3\sin x$, $y = 1 - \cos 2x$, $y = \tan\left(x + \frac{1}{4}\pi\right)$ • use the exact values of the sine, cosine and tangent of 30°, 45°, 60°, and related angles, e.g. $\cos 150° = -\frac{1}{2}\sqrt{3}$ $\sin\frac{3}{4}\pi = \frac{1}{\sqrt{2}}$ • use the notations $\sin^{-1}x$, $\cos^{-1}x$, • $\tan^{-1}x$ to denote the principal values of the inverse trigonometric relations; no specialised knowledge of these functions is required, but	• 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 $\sin\Theta/\cos\Theta=\tan\Theta$ $\sin^2\Theta + \cos^2\Theta = 1$	to find the exact values of sin, cos and tan of 45°. 'Trigonometric ratios of an angle of any size' Past/specimen papers for practice Teacher will reinforce the principal values for each trigonometric ratio. Past/specimen papers for practice Teacher will introduce the identities using a right-angled triangle. A structured worksheet and matching activity. Past/specimen papers for practice and/or formative assessment include **(I)(F)**: Teacher will ask learners to sketch the sine graph from -360° to +360°		www.mathcentre.ac.uk/resources/uploaded/mc-ty-trigratiosanysize-2009-1.pdf. www.tes.com/teaching-resource/a-level-maths-trigonometry-identities-worksheets-6146808.

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	understanding of them as examples of inverse functions is expected • use the identities and , e.g. in proving identities, simplifying expressions and solving equations • find all the solutions of simple trigonometrical equations lying in a specified interval (general forms of solution are not included), e.g. solve $3 \sin 2x + 1 = 0$ for $-\pi < x < \pi$, $3 \sin 2\theta - 5 \cos\theta - 1 = 0$ for $0 \leq \Theta \leq 360^0$	• find all the solutions of simple trigonometrical equations lying in a specified interval (general forms of solution are not included).	and ask them to mark all of the points where $\sin \theta = 0.7$ and then to try to identify the corresponding angles. This can be extended to other trigonometric graphs with other ranges. **(I)** 'Trigonometric equations' resource takes learners through examples of these types of question and provides some practice questions. 'CAST diagram for solving trigonometric equations' has a series of worked examples and some practice questions. **(I)** Past/specimen papers for practice **(I)(F)**:		www.mathcentre.ac.uk/resources/uploaded/mc-ty-trigeqn-2009-1.pdfwww.tes.com/teaching-resource/cast-diagram-for-solving-trigonometric-equations- 6332281www.tes.com/teaching-resource/core-2-trigonometry-powerpoint-lesson-6030080

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November 1st week (1 week)	**Series** • use the expansion of $(a + b)^n$, where n is a positive integer; including the notations $\binom{n}{r}$ and n!; knowledge of the greatest term and properties of the coefficients are not required • 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; including knowledge that	Learners will be able to: • use the expansion of $(a + b)^n$, where n is a positive integer	Use of ppts, videos & smartboard Teacher will use the resource on 'Binomial theorem' Teacher shows a PowerPoint demonstration of Pascal's triangle and the formula for the binomial expansion using combinations. Teacher wll introduce learners to the formula and explain the notation: $(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \binom{n}{3}a^{n-3}b^3 + \ldots b^n$ where $\binom{n}{r} = \frac{n!}{(n-r)!r!}$. Teacher will solve the problems such as: Find the term in x^2 in the expansion of $(2+x)(3+4x)^5$ Find the term independent of x in	1. Worksheet 2. Tests after completion of the topic	Textbook resources: Pure Mathematics 1 Coursebook by Hugh Neill, Douglas Quadling, Julian Gilbey Pure Mathematics 1 by Hodder Education www.mathsisfun.com/algebra/binomial-theorem.html. www.tes.com/teaching-resource/binomial-expansion-powerpoint-6071493.

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	numbers a, b, c are 'in arithmetic progression' if $2b = a + c$ (or equivalent) and are 'in geometric progression' if $b^2 = ac$ (or equivalent); questions may involve more than one progression • use the condition for the convergence of a geometric progression, and the formula for the sum to infinity of a convergent geometric progression	• recognise arithmetic and geometric progressions • use the formulae for the *n*th 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	the expansion of $\left(2x^3 - \frac{1}{x}\right)^8$. Suitable past/specimen papers for practice **(I)(F)**: Teacher will use the resource 'Arithmetic Sequences and Sums' and encourage learners to work out the formula for the *n*th term and then to derive the formula for the sum of *n* terms. **(I)** **Extension activity:** On the website select 'Sequences' and then the task 'Change one thing' or 'Connect three?' for interesting tasks relating to arithmetic progressions. **(I)** 'Geometric Sequences and Sums' **(I)** **Extension activity:** On the website select 'Sequences'. The 'Common terms' problem gets learners to consider the properties of arithmetic and geometric progressions. **(I)** To encourage independent		worksheets at www.tes.com/teaching-resource/a-level-maths-c2-binomial-expansion-worksheets-6146793 www.mathsisfun.com/algebra/sequences-sums-arithmetic.html https://undergroundmathematics.org

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			learning, learners be asked to search for 'Summing Geometric Progressions'. **(I)** Word problems related to geometric series. **(I)** Past/specimen papers for practice **(I)(F)**: Teacher starts by considering a simple convergent geometric progression e.g. $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+.....$ Find the sum of *n* terms using the formula, i.e. $S_n = \frac{1-\left(\frac{1}{2}\right)^n}{1-\frac{1}{2}}$ which leads to $S_n = 2\left(1-\left(\frac{1}{2}\right)^n\right)$. learners can see that the sum can never be greater than 2. Teacher then point out the similarity to $n \to \infty$ and hence the sum to infinity. **Extension activity:** Video on summing an infinite Geometric series on **(I)**		www.mathsisfun.com/algebra/sequences-sums-geometric.html https://undergroundmathematics.org https://nrich.maths.org 'Finite geometric series word problems'on www.khanacademy.org/math https://undergroundmathematics.org

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			Past/specimen papers for practice **(I)(F)**:		
November (1 week) 2nd week December (2 weeks) 1st and 2nd week	**Differentiation** • 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), $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for first and second derivatives; only an informal understanding of the idea of a limit is expected; e.g. includes consideration of the gradient of	Candidates should be able to: • 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*), $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for 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	Introduction to the topic with activities Teacher will explain 'Chain rule' **(I)** Past/specimen papers for practice and/or formative assessment include **(I)(F)**:		Textbook resources: Pure Mathematics 1 by Hugh Neill, Douglas Quadling, Julian GilbeyPure Mathematics 1 by Hodder Education https://undergroundmathematics.org Worksheets on basic differentiation on www.tes.com/teaching-resource/a-level-maths-c1-differentiation-worksheets-6146718. www.tes.com/teaching-resource/chain-rule-6146849

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	the chord joining the points with x coordinates 2 and $(2 + h)$ on the curve $y = x^3$; formal use of the general method of differentiation from first principles is not required • 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, e.g. find $\frac{dy}{dx}$ given $y = \sqrt{2x^3 + 5}$ • apply differentiation to gradients, tangents and normals,	• apply differentiation to gradients, tangents and normals, increasing and decreasing functions and rates of change	Teacher will remind learners that the gradient function will give the gradient of a **tangent** to the curve at a particular point, so differentiation will be the first step in finding the equation of the tangent. Work through a straightforward example on the board or give it out as a group exercise, e.g. Find the equation of the tangent to curve $y = 2x^3 - 4x^2 + 5x - 7$ at the point where $x = 1$. The activity could be extended to finding the equation of the normal at that point and some more examples of increasing difficulty. The website www.tes.com has two resources that can be used to support this: worksheets including structured questions (from www.tes.com search for 'A level Maths C1: Tangents and Normals. **(I)(F)** An interactive activity 'Tangents		• www.tes.com/teaching-resource/find-the-

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	increasing and decreasing functions and rates of change; including connected rates of change, e.g. given the rate of increase of the radius of a circle, find the rate of increase of the area for a specific value of one of the variables • locate stationary points and determine their nature, and use information about stationary points in sketching graphs; including use of the second derivative for identifying maxima and	• locate stationary points and determine their and use information about stationary	and normal line challenge' to practise the tangents and normals aspect with multiple choice, self-marking questions, **(I)(F)** Remind learners of the chain rule from the previous section and show how they can form equations with it, e.g. $\frac{dA}{dt} = \frac{dA}{dr} \times \frac{dr}{dt}$. Introduce the idea that *A* could represent the area of a circle of radius *r* (you could give the example of a circular ink stain) so, if they know the rate of change of the radius with respect to time, they can calculate the corresponding rate of change of the area. Increasing and decreasing functions Past/specimen papers for practice **(I)(F)** Teacher explains the concept of maxima and minima with few examples.		tangent-normal-matching-cards-commentary-6162092 • www.tes.com/teaching-resource/a-level-maths-c1-tangents-and-normals-worksheet-6146716 www.khanacademy.org/math. Worksheet on increasing and decreasing functions on www.tes.com/teaching-resource/a-level-maths-c1-worksheet-function-turning-point-6146765 (or from www.tes.com **(I)** Worksheet on maxima and minima at www.nuffieldfoundation.org/fsmqs/level-3-calculus **(I)**

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	minima; alternatives may be used in questions where no method is specified; knowledge of points of inflexion is not included	points in sketching graphs.	Past/specimen papers **(I)(F)**:		
December (1 week) (3rd week) January (2 weeks) 1st and 2nd week	**Integration** • 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, e.g. $\int (2x^3 - 5x + 1)\,dx$, $\int \frac{1}{(2x+3)^2}\,dx$ • solve problems involving the evaluation of a constant of integration, e.g. to find the equation of the curve through (1, –2) for which	Learners will be able to • 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	The first lesson provides a good approach to the introduction of integration, the terminology and notation, and to the use of a constant of integration. The teacher gives a short exercise for learners on basic Integration problems. **(I)(F)** Suitable past/specimen papers for practice **(I)(F)**: Introduction to definite integration and demonstrate how to evaluate an integral using limits and square brackets.		Textbook resources: Pure Mathematics 1 by Hugh Neill, Douglas Quadling, Julian Gilbey Pure Mathematics 1 by Hodder Education www.tes.com/teaching-resource/integration-powerpoint-6402321 www.tes.com/teaching-resource/indefinite-integration-6146782

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	$\frac{dy}{dx} = \sqrt{2x+1}$ • evaluate definite integrals; including simple cases of 'improper' integrals, such as $\int_0^1 x^{-\frac{1}{2}}\,dx$ and $\int_1^\infty x^{-2}\,dx$ • 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; a volume of revolution may involve a region not	• 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	**Extension activity:** The activity 'Stretch the function' uses the idea of stretching a function to allow learners to practise evaluating definite integrals. Introduction to area under a curve. . The files 'Using Integration to Find Areas' and 'Definite Integration to find Areas' provide a good approach to the introduction of the topic together with examples which may be used as practice. **(I)** 'Area between curves'. **Extension activity:** The task 'Meaningful areas' at gets learners to think in more depth about finding the area between two curves. **(I)**		www.tes.com/teaching-resource/integration-powerpoint-6402321 Worksheet on definite integration www.tes.com/teaching-resource/a-level-maths-c2-definite-integration-worksheet-6146778 https://undergroundmathematics.org www.mathsisfun.com/calculus/integration-definite.html. Definite Integration worksheet' by

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	bounded by the axis of rotation, e.g. the region between $y = 9 - x^2$ and $y = 5$ rotated about the *x*-axis	— a volume of revolution about one of the axes.	Volume of solid of revolution.		SRWhitehouse at www.tes.com/teaching-resource/a-level-maths-c2-definite-integration-worksheet-6146778 www.khanacademy.org/math. https://undergroundmathematics.org 'disk method around x axis' from www.khanacademy.org/math
January (2 weeks) 3rd and 4th week	**Probability** • evaluate probabilities in simple cases by means of enumeration of equiprobable elementary events or by calculation using permutations or combinations, e.g. the total score when two fair dice are thrown, or drawing balls at random from a bag containing balls of different	Learners will be able to: • evaluate probabilities in simple cases by means of enumeration of equiprobable elementary events, or by calculation using permutations or combinations	A useful activity to test recall of the notation (once introduced) is available at: www.tes.com. Some examples of practical activities and examples of evaluating probabilities in simple cases are at **Extension activity**: Balls in a box, involving probabilities and tree diagrams is at: Basic probability, equally probable events, and experimental		Textbook resources: Statistics 1 and 2 (S1 & 2) by Hodder education Statistics 1 by Steve Dobbs and Jane Miller www.cimt.org.uk/projects/mepres/alevel/stats_ch1.pdf www.s253053503.websitehome.co.uk/msv/msv-23.html

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	colours(Knowledge of the following probability notation may also be required: P(A), $P(A \cup B)$, $P(A \cap B)$ $P(A \mid B)$ and the use of A' to denote the complement of A) • use addition and multiplication of probabilities, as appropriate, in simple cases; explicit use of the general formula $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ is not required • 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) × P(B) • calculate and use conditional	• 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∩B) and P(A)×P(B) • calculate and use conditional probabilities in simple cases.	probability are explained at: Examples of calculating probabilities using combinations are at: 'Probability trees' Tarsia jigsaws. An explanation of the addition rule for probability. An explanation of how to use tree diagrams to work out probabilities is at: The formula for conditional probabilities is explained, using both Venn diagrams and tree diagrams. **Extension activity**: An interesting problem involving independent events and real data is at Past/specimen papers for practice and/or formative assessment include **(I)(F)**: Nov 2013 Paper 62 Q2, Q7(iii)(iv)		www.youtube.com/watch?v=uzkc-qNVoOk www.youtube.com/watch?v=Xqfcy1rqMbI www.mrbartonmaths.com/jigsaw.htm www.youtube.com/watch?v=QE2uR6Z-NcU www.youtube.com/watch?v=6E_NVnboMB8 www.youtube.com/watch?v=h05VK1XjVEY http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/950/original/illustrative_mathematics_950.pdf?1390751089

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	probabilities in simple cases, e.g. situations that can be represented by a sample space of equiprobable elementary events, or a tree diagram; the use of $P(A \mid B) = \frac{P(A \cap B)}{P(B)}$ may be required in simple cases				
February (2 weeks) 1st and 2nd week	**Discrete random variables** • draw up a probability distribution table relating to a given situation involving a discrete random variable X, and calculate E(X) and Var(X) • use formulae for probabilities for the binomial and geometric distributions, and recognise practical situations where these distributions	Learners will be able to: • draw up a probability distribution table relating to a given situation involving a discrete random variable X, and calculate E(X) and Var(X) • use formulae for probabilities for the binomial and geometric distributions, and recognize practical situations where these distributions are suitable models	Teacher makes a matching card activity consisting of a set of cards showing probability distribution tables for learners to match with the corresponding E(X) and Var(X). **(F)** Past/specimen papers for practice **(I)(F)**: Use of Binostat for calculating binomial probabilities and deriving the formula. An explanation of the properties of a binomial distribution and the notation used is at: The formula is explained from a tree diagram at: • Introduction to the geometric		Textbook resources: Statistics 1 and 2 (S1 & 2) by Hodder education Statistics 1 by Steve Dobbs and Jane Miller www.youtube.com/watch?v=ZQZy5834l2s www.youtube.com/watch?v=NaDZ0zVTyXQ

Week and Month	Topic and Subtopic	Learning Outcomes	Teaching activities	Assessment Summative / formative	Resources
	are suitable models, including the notations B(n, p) and Geo(p) ; Geo(p) denotes the distribution in which $p_r = p(1 – p)^{r–1}$ for r = 1, 2, 3, … • use formulae for the expectation and variance of the binomial distribution and for the expectation of the geometric distribution; proofs of formulae are not required	• use formulae for the expectation and variance of the binomial distribution and for the expectation of the	distribution with two example calculations using a geometric distribution. This could be set as preparatory work for a lesson or could be used to support learners who need simple examples. • PowerPoint presentation that provides a step-by-step introduction to the geometric distribution and includes example calculations. Past/specimen papers for practice and/or formative assessment include **(I)(F)**: The formulae for the binomial distribution. **Extension activity**: For challenge, learners consider the proof of the formulae for the binomial distribution.**(I)** The formula for the expectation of the geometric distribution is given and explained, as well as examples using it.		www.youtube.com/watch?v=-U2cR-ErRVc www.tes.com. ‘Geometric distributions’ by CK-12 www.tes.com ‘Geometric distribution’ by stewarty www.youtube.com/watch?v=zEyLaS2t8FI www.s253053503.website

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		geometric distribution.	**Extension activity**: For challenge, learners consider the proof of the formula for the expectation of geometric distribution. **(I)**		home.co.uk/msv/msv-40.html https://www.youtube.com/watch?v=1cO5KwIFQpI www.youtube.com/watch?v=AiQuXEsZCyU.
February (2 weeks) 3rd and 4th week	**Normal distribution** • understand the use of a normal distribution to model a continuous random variable, and use normal distribution tables; sketches of normal curves to illustrate distributions or probabilities may be required • solve problems concerning a variable *X*, where *X*	Learners will be able to: • understand the use of a normal distribution to model a continuous random variable, and use normal distribution tables.	The 'Standard Normal Distribution'. Past/specimen papers for practice **(I)(F)**: solving a problem involving finding the mean and standard deviation: Past/specimen papers for practice **(I)(F)**:		Textbook resources: Statistics 1 and 2 (S1 & 2) by Hodder education Statistics 1 by Steve Dobbs and Jane Miller www.youtube.com/watch?v=xgQhefFOXrM This video explains how to find probabilities using tables: www.youtube.com/watch?v=uxwkx4s7U18

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	~ N(μ,σ^2) 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 x1, μ, and σ given the value of P($X > x_1$) or a related probability for calculations involving standardisation, full details of the working should be shown, e.g. $Z = \frac{(X-\mu)}{\sigma}$ • recall conditions under which the normal distribution can be used as an approximation to the binomial distribution, and use this approximation,	• solve problems concerning a variable X, where $X \sim N(\mu,\sigma^2)$, including — finding the value of $P(X > x1)$, or a related probability, given the values of x_1, μ, σ. — finding a relationship between x_1, μ, σ given the value of $P(X > x1)$ 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.	An introduction to the normal approximation to the binomial Conditions for this approximation and the use of a continuity correction.		www.youtube.com/watch?v=CsuNZIQ-fsU http://onlinestatbook.com/2/normal_distribution/normal_approxM.html www.youtube.com/watch?v=SmjepW2Mb28

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	with a continuity correction, in solving problems; *n* sufficiently large to ensure that both $np > 5$ and $nq > 5$				
March (1st and 2nd week) 3rd week	• **Revisiting the topics** • **Past paper solving** **Mock exam starts**				