Overview of YEAR 12 AUTUMN 2

Week	Statements	Teaching activities	Notes
1	1.06h Be able to use logarithmic graphs to estimate parameters in relationships of the form $y = ax^n$ and $y = kb^x$, given data for x and x. *Learners should be able to reduce equations of these forms to a linear form and hence estimate values of a and n, or k and b by drawing graphs using given experimental data and using appropriate calculator functions.*		CHAPTER 8 SECTION 4 FITTING MODELS TO DATA Page 141-145

Week	Statements	Teaching activities	Notes
2	1.06h Be able to use logarithmic graphs to estimate parameters in relationships of the form $y = ax^n$ and $y = kb^x$, given data for x and x. *Learners should be able to reduce equations of these forms to a linear form and hence estimate values of a and n, or k and b by drawing graphs*		CHAPTER 8 SECTION 4 FITTING MODELS TO DATA Page 141-145 MIXED PRACTICE 8 Page 146-148

	using given experimental data and using appropriate calculator functions.		
	1.06i Understand and be able to use exponential growth and decay and use the exponential function in modelling. *Examples may include the use of e in continuous compound interest, radioactive decay, drug concentration decay and exponential growth as a model for population growth. Includes consideration of limitations and refinements of exponential models.*		

Week	Statements	Teaching activities	Notes
3	1.04a Understand and be able to use the binomial expansion of $(a + bx)^n$ for positive integer n and the notations $n!$ and ${}^nC_r$, ${}_nC_r$ or $\binom{n}{r}$, with ${}^nC_0 = {}^nC_n = 1$. e.g. Find the coefficient of the x^3 term in the expansion of $(2 - 3x)^7$. *Learners should be able to calculate binomial coefficients. They should also*		CHAPTER 9 SECTION 1 THE BINOMIAL THEOREM Page 149-153

	know the relationship of the binomial coefficients to Pascal's triangle and their use in a binomial expansion. *They should also know that* $0! = 1$*.*		

Week	Statements	Teaching activities	Notes
4	1.02c Be able to solve simultaneous equations in two variables by elimination and by substitution, including one linear and one quadratic equation. *The equations may contain brackets and/or fractions.* *e.g.* $y = 4 - 3x$ and $y = x^2 + 2x - 2$ $2xy + y^2 = 4$ and $2x + 3y = 9$		CHAPTER 9 SECTION 2 CALCULATING THE BINOMIAL COEFFICIENTS Page 154-156
	1.04b Understand and know the link to binomial probabilities.		

Week	Statements	Teaching activities	Notes
5	1.04a Understand and be able to use the binomial expansion of $(a + bx)^n$ for positive integer n and the notations $n!$ and ${}^nC_r$, ${}_nC_r$ or $\binom{n}{r}$, with ${}^nC_0 = {}^nC_n = 1$. e.g. Find the coefficient of the x^3 term in the expansion of $(2 - 3x)^7$. *Learners should be able to calculate binomial coefficients. They should also know the relationship of the binomial coefficients to Pascal's triangle and their use in a binomial expansion.* *They should also know that* $0! = 1$.		CHAPTER 9 SECTION 3 APPLICATIONS OF THE BINOMIAL THEOREM Page 157-159 MIXED PRACTICE 9 Page 160
	1.04b Understand and know the link to binomial probabilities.		

Week	Statements	Teaching activities	Notes
6	1.05a Understand and be able to use the definitions of sine, cosine and tangent for all arguments.		CHAPTER 10

			SECTION 1 DEFINITIONS AND GRAPHS OF THE SINE AND COSINE FUNCTIONS Page 170-175 SECTION 2 DEFINITION AND GRAPH OF THE TANGENT FUNCTION Page 176-177

Week	Statements	Teaching activities	Notes
7	1.05f Understand and be able to use the sine, cosine and tangent functions, their graphs, symmetries and periodicities. *Includes knowing and being able to use exact values of* $sin\ \theta$ *and* $cos\ \theta$ *for* $\theta = 0°, 30°, 45°, 60°, 90°, 180°$ *and multiples thereof and exact values of* $tan\ \theta$ *for* $\theta = 0°, 30°, 45°, 60°, 90°, 180°$ *and multiples thereof.*		CHAPTER 10 SECTION 3 EXACT VALUES OF TRIGONOMETRIC GRAPHS Page 177-179

Week	Statements	Teaching activities	Notes
8	1.05j Understand and be able to use $\tan\theta \equiv \frac{\sin\theta}{\cos\theta}$ and $\sin^2\theta + \cos^2\theta \equiv 1$.		CHAPTER 10

	In particular, these identities may be used in solving trigonometric equations and simple trigonometric proofs.		SECTION 4 TRIGONOMETRIC IDENTITIES Page 179-183

Week	Statements	Teaching activities	Notes
9	1.05o Be able to solve simple trigonometric equations in a given interval, including quadratic equations in $\sin\theta$, $\cos\theta$ and $\tan\theta$ and equations involving multiples of the unknown angle. *e.g.* $sin\,\theta = 0.5$ *for* $0 \leq \theta < 360°$ $6\sin^2\theta + \cos\theta - 4 = 0$ *for* $0 \leq \theta < 360°$ $tan\,3\theta = -1$ *for* $-180° < \theta < 180°$ *Extend their knowledge of trigonometric equations to include radians and the trigonometric identities in Stage 2.*		CHAPTER 10 SECTION 5 INTRODUCING TRIGONOMETRIC EQUATIONS Page 184-188

Week	Statements	Teaching activities	Notes
10	1.05f Understand and be able to use the sine, cosine and tangent functions, their graphs, symmetries and periodicities. *Includes knowing and being able to use exact values of* $sin\,\theta$ *and* $cos\,\theta$ *for* $\theta = 0°, 30°, 45°, 60°, 90°, 180°$ *and multiples thereof and exact values of* $tan\,\theta$ *for* $\theta = 0°, 30°, 45°, 60°, 90°, 180°$ *and multiples thereof.*		CHAPTER 10 SECTION 6 TRANSFORMATIONS OF TRIGONOMETRIC GRAPHS Page 189-192

Week	Statements	Teaching activities	Notes
11	1.05o Be able to solve simple trigonometric equations in a given interval, including quadratic equations in $\sin\theta$, $\cos\theta$ and $\tan\theta$ and equations involving multiples of the unknown angle. *e.g.* $sin\,\theta = 0.5$ *for* $0 \leq \theta < 360°$ $6\sin^2\theta + \cos\theta - 4 = 0$ *for* $0 \leq \theta < 360°$ $tan\,3\theta = -1$ *for* $-180° < \theta < 180°$ *Extend their knowledge of*		CHAPTER 10 SECTION 7 MORE COMPLEX TRIGONOMETRIC EQUATIONS Page 193-196

	trigonometric equations to include radians and the trigonometric identities in Stage 2.		

Week	Statements	Teaching activities	Notes
12	1.05j Understand and be able to use $\tan\theta \equiv \frac{\sin\theta}{\cos\theta}$ and $\sin^2\theta + \cos^2\theta \equiv 1$. *In particular, these identities may be used in solving trigonometric equations and simple trigonometric proofs.*		CHAPTER 10 SECTION 7 USING IDENTITIES TO SOLVE EQUATIONS Page 196-199 MIXED PRACTICE 10 Page 201-202

Week	Statements	Teaching activities	Notes
13	1.05b Understand and be able to use the sine and cosine rules. *Questions may include the use of bearings and require the use of the ambiguous case of the sine rule.*		CHAPTER 11 SECTION 1 SINE RULE Page 204-208 SECTION 2 COSINE RULE Page 209-213

Week	Statements	Teaching activities	Notes
14	1.05c Understand and be able to use the area of a triangle in the form $\frac{1}{2}ab\sin C$.		CHAPTER 11 SECTION 3 AREA OF A TRIANGLE Page 214-217 MIXED PRACTICE 11 Page 218-219

Week	Statements	Teaching activities	Notes
15	1.10a Be able to use vectors in two dimensions. *i.e. Learners should be able to use vectors expressed as* $x\mathbf{i} + y\mathbf{j}$ *or as a column vector* $\begin{pmatrix} x \\ y \end{pmatrix}$ *to use vector notation appropriately either as* $\vec{AB}$ *or* $\boldsymbol{a}$*.* *Learners should know the difference between a scalar and a vector, and should distinguish between them carefully when writing by hand.*		CHAPTER 12 SECTION 1 DESCRIBING VECTORS Page 221-226

Week	Statements	Teaching activities	Notes
16	1.10c Be able to calculate the magnitude and direction of a vector and convert between component form and magnitude/direction form. *Learners should know that the modulus of a vector is its magnitude and the direction of a vector is given by the angle the vector makes with a horizontal line parallel to the positive x-axis. The direction of a vector will be taken to be in the interval* $[0°, 360°)$. *Includes use of the notation* $\lvert\boldsymbol{a}\rvert$ *for the magnitude of* $\boldsymbol{a}$ *and* $\left\lvert\vec{OA}\right\rvert$ *for the magnitude of* $\vec{OA}$. *Learners should be able to calculate the magnitude of vector* $\begin{pmatrix}x\\y\end{pmatrix}$ *as* $\sqrt{x^2+y^2}$ *and its direction by* $tan^{-1}\begin{pmatrix}x\\y\end{pmatrix}$.		CHAPTER 12 SECTION 2 OPERATIONS ON VECTORS Page 226-231
	1.10d Be able to add vectors diagrammatically and perform the algebraic operations of vector addition and multiplication by scalars, and understand their geometrical interpretations.		

	i.e. Either a scaling of a single vector or a displacement from one position to another by adding one or more vectors, often in the form of a triangle of vectors.		

Week	Statements	Teaching activities	Notes
17	1.10e Understand and be able to use position vectors. *Learners should understand the meaning of displacement vector, component vector, resultant vector, parallel vector, equal vector and unit vector.*		CHAPTER 12 SECTION 3 POSITION AND DISPLACEMENT VECTORS Page 232-237
	1.10f Be able to calculate the distance between two points represented by position vectors. *i.e. The distance between the points* $a\mathbf{i} + b\mathbf{j}$ *and* $c\mathbf{i} + d\mathbf{j}$ *is* $\sqrt{(c-a)^2 + (d-b)^2}$.		

Week	Statements	Teaching activities	Notes
18	1.10g Be able to use vectors to solve problems in pure mathematics and in context, including forces.		CHAPTER 12 SECTION 4 USING VECTORS TO SOLVE GEOMETRICAL PROBLEMS Page 238-244 MIXED PRACTICE 12 Page 245-246

Week	Statements	Teaching activities	Notes
19	1.07a Understand and be able to use the derivative of $\mathrm{f}(x)$ as the gradient of the tangent to the graph of $y = \mathrm{f}(x)$ at a general point (x, y).		CHAPTER 13 SECTION 1 SKETCHING DERIVATIVES Page 247-251
	1.07o Be able to identify where functions are increasing or decreasing. *i.e. To be able to use the sign of $\frac{dy}{\mathrm{d}x}$ to determine whether the function is increasing or decreasing.*		

Week	Statements	Teaching activities	Notes
20	1.07g Be able to show differentiation from first principles for small positive integer powers of x. *In particular, learners should be able to use the definition* $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ *including the notation.* [*Integer powers greater than 4 are excluded.*]		CHAPTER 13 SECTION 2 DIFFERENTIATION FROM FIRST PRINCIPLES Page 251-253
	1.07b Understand and be able to use the gradient of the tangent at a point where $x = a$ as: 1. the limit of the gradient of a chord as x tends to a 2. a rate of change of y with respect to x. *Learners should be able to use the notation* $\frac{dy}{dx}$ *to denote the rate of* y *change of* x. *Learners should be able to use the notations* $f'(x)$ *and* $\frac{dy}{dx}$ *and recognise their equivalence.*		

Week	Statements	Teaching activities	Notes
21	1.07i Be able to differentiate x^n for rational values of n and related constant multiples, sums and differences.		CHAPTER 13 SECTION 3 RULES OF DIFFERENTIATION Page 254-257 SECTION 4 Page 258-260

Week	Statements	Teaching activities	Notes
22	1.07b Understand and be able to use the gradient of the tangent at a point where $x = a$ as: 1. the limit of the gradient of a chord as x tends to a 2. a rate of change of y with respect to x. *Learners should be able to use the notation $\frac{dy}{dx}$ to denote the rate of y change of x.* *Learners should be able to use the notations $f'(x)$ and $\frac{dy}{dx}$ and recognise their equivalence.*		CHAPTER 13 SECTION 5 INTERPRETING DERIVATIVES AND SECOND DERIVATIVES Page 261-266 MIXED PRACTICE 13 Page 268-269

	1.07d Understand and be able to find second derivatives. *Learners should be able to use the notations* $f''(x)$ *and* $\frac{d^2y}{dx^2}$ *and recognise their equivalence.*		
	1.07e Understand and be able to use the second derivative as the rate of change of gradient. *e.g. For distinguishing between maximum and minimum points.* *For the application to points of inflection, see 1.07f.*		

Week	Statements	Teaching activities	Notes
23	1.07m Be able to apply differentiation to find the gradient at a point on a curve and the equations of tangents and normals to a curve.		CHAPTER 14 SECTION 1 TANGENTS AND NORMALS Page 270-274

Week	Statements	Teaching activities	Notes
24	1.07e Understand and be able to use the second derivative as the rate of change of gradient. *e.g. For distinguishing between maximum and minimum points.* *For the application to points of inflection, see 1.07f.*		CHAPTER 14 SECTION 2 STATIONARY POINTS Page 275-279
	1.07d Understand and be able to find second derivatives. *Learners should be able to use the notations* $f''(x)$ *and* $\frac{d^2y}{dx^2}$ *and recognise their equivalence.*		

Week	Statements	Teaching activities	Notes
25	1.07e Understand and be able to use the second derivative as the rate of change of gradient. *e.g. For distinguishing between maximum and minimum points.*		CHAPTER 14 SECTION 3 OPTIMISATION Page 279-286 MIXED PRACTICE 14 Page 288-289

	For the application to points of inflection, see 1.07f.		

Week	Statements	Teaching activities	Notes
26	1.08a Know and be able to use the fundamental theorem of calculus. *i.e. Learners should know that integration may be defined as the reverse of differentiation and be able to apply the result that* $\int \mathrm{f}(x)\,\mathrm{d}x = \mathrm{F}(x) + \mathrm{c} \Leftrightarrow \mathrm{f}(x) = \frac{\mathrm{d}}{\mathrm{d}x}\left(\mathrm{F}(x)\right)$ *for sufficiently well-behaved functions.* *Includes understanding and being able to use the terms indefinite and definite when applied to integrals.*		CHAPTER 15 SECTION 1 RULES FOR INTEGRATION Page 291-294

Week	Statements	Teaching activities	Notes
27	1.08b Be able to integrate x^n where $n \neq -1$ and related sums, differences and constant multiples. *Learners should also be able to solve*		CHAPTER 15 SECTION 2 SIMPLIFYING THE INTEGRATION RULES Page 294-296

	problems involving the evaluation of a constant of integration e.g. to find the equation of the curve through $(-1, 2)$ *for which* $\frac{dy}{dx} = 2x + 1$.		

Week	Statements	Teaching activities	Notes
28	1.08b Be able to integrate x^n where $n \neq -1$ and related sums, differences and constant multiples. *Learners should also be able to solve problems involving the evaluation of a constant of integration e.g. to find the equation of the curve through* $(-1, 2)$ *for which* $\frac{dy}{dx} = 2x + 1$.		CHAPTER 15 SECTION 3 FINDING THE EQUATION OF A CURVE Page 297-300

Week	Statements	Teaching activities	Notes
29	1.08d Be able to evaluate definite integrals.		CHAPTER 15 SECTION 4 DEFINITE INTEGRATION Page 300-302 SECTION 5 GEOMETRICAL SIGNIFICANCE Page 302-310

			MIXED PRACTICE 15 Page 311-314
	1.08e Be able to use a definite integral to find the area between a curve and the *x*-axis. *This area is defined to be that enclosed by a curve, the x-axis and two ordinates. Areas may be included which are partly below and partly above the x-axis, or entirely below the x-axis.*		

Week	Statements	Teaching activities	Notes
30			

Week	Statements	Teaching activities	Notes
31			