Overview of YEAR 13 AUTUMN 1

Week	Statements	Teaching activities	Notes
1	1.02j Be able to manipulate polynomials algebraically. *Includes expanding brackets, collecting like terms, factorising, simple algebraic division and use of the factor theorem.* *Learners should be familiar with the terms "quadratic", "cubic" and "parabola".* *Learners should be familiar with the factor theorem as:* *1.* $f(a)=0 \Leftrightarrow (x-a)$ *is a factor of* $f(x)$*;* *2.* $f(\frac{b}{a})=0 \Leftrightarrow (ax-b)$ *is a factor of* $f(x)$*.* *They should be able to use the factor theorem to find a linear factor of a polynomial normally of degree* ≤ 3*. They may also be required to find factors of a polynomial, using any valid method, e.g. by inspection.*		CHAPTER 5 RATIONAL FUNCTIONS AND PARTIAL FRACTIONS Page 93 SECTION 1 REVIEW OF FACTOR THEOREM Page 93 EXERCISE 5A Page 95

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Week	Statements	Teaching activities	Notes
2	1.02k Be able to simplify rational expressions. *Includes factorising and cancelling, and algebraic division by linear expressions.* *e.g. Rational expressions may be of the form* $\frac{x^3-x-2}{2x+1}$ *or* $\frac{(x^2-x-6)(x^2+4x+3)}{(x^2-9)(x+3)}$. *Learners should be able to divide a polynomial of degree* ≥ 2 *by a linear polynomial of the form* $(ax-b)$, *identify the quotient and remainder and solve equations of degree* ≤ 4. *The use of the factor theorem and algebraic division may be required.*		SECTION 2 SIMPLIFYING RATIONAL EXPRESSIONS Page 96 EXERCISE 5B Page 97-99

Week	Statements	Teaching activities	Notes
3	1.02y Be able to decompose rational functions into partial fractions (denominators not more complicated than squared linear terms and with no more than 3 terms, numerators constant or linear). *i.e. The denominator is no more*		SECTION 3 PARTIAL FRACTIONS WITH DISTINCT FACTORS Page 99 EXERCISE 5C Page 101

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	complicated than $(ax+b)(c+d)^2$ *or* $(ax+b)(c+d)(ex+f)$ *and the numerator is either a constant or linear term.* *Learners should be able to use partial fractions with the binomial expansion to find the power series for an algebraic fraction or as part of solving an integration problem.*		

Week	**Statements**	**Teaching activities**	**Notes**
4	1.02y Be able to decompose rational functions into partial fractions (denominators not more complicated than squared linear terms and with no more than 3 terms, numerators constant or linear). *i.e. The denominator is no more complicated than* $(ax+b)(c+d)^2$ *or* $(ax+b)(c+d)(ex+f)$ *and the numerator is either a constant or linear term.* *Learners should be able to use partial fractions with the binomial expansion to find the power series for an algebraic fraction or as part of solving an integration problem.*		SECTION 4 PARTIAL FRACTIONS WITH A REPEATED FACTORS Page 102 EXERCISE 5D Page 103

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Week	Statements	Teaching activities	Notes
5			MIXED PRACTICE 5 Page 105-106

Week	Statements	Teaching activities	Notes
6	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 6 GENERAL BINOMIAL EXPANSION Page 107 SECTION 1 GENERAL BINOMIAL EXPANSION Page 107 EXERCISE 6A Page 111-112

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Week	Statements	Teaching activities	Notes
7	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 $0! = 1$.*		SECTION 2 BINOMIAL EXPANSIONS OF COMPOUND EXPRESSIONS Page 112 EXERCISE 6B Page 114-115

Week	Statements	Teaching activities	Notes
8	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 $(2 - 3x)^7$.		MIXED PRACTICE 6 Page 116-117

	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* $0! = 1$*.*		

Week	Statements	Teaching activities	Notes
9	1.05a Understand and be able to use the definitions of sine, cosine and tangent for all arguments.		SECTION 1 INTRODUCING RADIAN MEASURE Page 128 EXERCISE 7A Page 133-134
	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.*		

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	1.05g Know and be able to use exact values of $\sin\theta$ and $\cos\theta$ for $\theta = 0, \frac{1}{6}\pi, \frac{1}{4}\pi, \frac{1}{3}\pi, \frac{1}{2}\pi, \pi$ and multiples thereof, and exact values of $\tan\theta$ for $\theta = 0, \frac{1}{6}\pi, \frac{1}{4}\pi, \frac{1}{3}\pi, \pi$ and multiples thereof.		

Week	Statements	Teaching activities	Notes
10	1.05h Understand and be able to use the definitions of secant ($\sec\theta$), cosecant ($\operatorname{cosec}\theta$) and cotangent ($\cot\theta$) and of $\arcsin\theta$, $\arccos\theta$ and $\arctan\theta$ and their relationships to $\sin\theta$, $\cos\theta$ and $\tan\theta$ respectively.		SECTION 2 INVERSE TRIGONOMETRIC FUNCTIONS AND SOLVING TRIGONOMETRIC EQUATIONS Page 134 EXERCISE 7B Page 138-139
	1.05i Understand the graphs of the functions given in 1.05h, their ranges and domains. *In particular, learners should know that the principal values of the inverse trigonometric relations may be denoted by $arcsin\,\theta$ or $sin^{-1}\,\theta$, $arccos\,\theta$ or $cos^{-1}\,\theta$, $arctan\,\theta$ or $tan^{-1}\,\theta$ and relate their graphs (for the appropriate domain) to the graphs of $sin\,\theta$, $cos\,\theta$ and $tan\,\theta$.*		

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Week	Statements	Teaching activities	Notes
11			SECTION 3 MODELLING WITH TRIGONOMETRIC FUNCTIONS Page 139 EXERCISE 7C Page 144-146

Week	Statements	Teaching activities	Notes
12	1.05d Be able to work with radian measure, including use for arc length and area of sector. *Learners should know the formulae $s = r\theta$ and $A = \frac{1}{2}r^2\theta$.* *Learners should be able to use the relationship between degrees and radians.*		SECTION 4 ARCS AND SECTORS Page 147 EXERCISE 7D Page 149-151

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Week	Statements	Teaching activities	Notes
13			SECTION 5 TRIANGLES AND CIRCLES Page 151 EXERCISE 7E Page 154-155

Week	Statements	Teaching activities	Notes
14	1.05e Understand and be able to use the standard small angle approximations of sine, cosine and tangent: 1. $\sin\theta \approx \theta$, 2. $\cos\theta \approx 1 - \frac{1}{2}\theta^2$, 3. $\tan\theta \approx \theta$, where θ is in radians. *e.g. Find an approximate expression for $\frac{\sin 3\theta}{1+\cos\theta}$ if θ is small enough to neglect terms in θ^3 or above.*		SECTION 6 SMALL ANGLE APPROXIMATIONS Page 155 EXERCISE 7F Page 158-159

Week	Statements	Teaching activities	Notes
15			MIXED PRACTICE 7 Page 161-163

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Week	Statements	Teaching activities	Notes
16	1.05l Understand and be able to use double angle formulae and the formulae for $\sin(A \pm B)$, $\cos(A \pm B)$ and $\tan(A \pm B)$. *Learners may be required to use the formulae to prove trigonometric identities, simplify expressions, evaluate expressions exactly, solve trigonometric equations or find derivatives and integrals.*		CHAPTER 8 FURTHER TRIGONOMETRY Page 164 SECTION 1 COMPOUND ANGLE IDENTITIES Page 165 EXERCISE 8A Page 167

Week	Statements	Teaching activities	Notes
17	1.05l Understand and be able to use double angle formulae and the formulae for $\sin(A \pm B)$, $\cos(A \pm B)$ and $\tan(A \pm B)$. *Learners may be required to use the formulae to prove trigonometric identities, simplify expressions, evaluate expressions exactly, solve trigonometric equations or find derivatives and integrals.*		SECTION 2 DOUBLE ANGLE FORMULAE Page 168 EXERCISE 8B Page 172-173

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Week	Statements	Teaching activities	Notes
18	1.05n Understand and be able to use expressions for $a\cos\theta + b\sin\theta$ in the equivalent forms of $R\cos(\theta \pm \alpha)$ or $R\sin(\theta \pm \alpha)$. *In particular, learners should be able to:* *1. sketch graphs of* $a\cos\theta + b\sin\theta$*,* *2. determine features of the graphs including minimum or maximum points and* *3. solve equations of the form* $a\cos\theta + b\sin\theta = c$		SECTION 3 EXPRESSIONS OF THE FORM 'asinx+bcosx' Page 173 EXERCISE 8C Page 177-178

Week	Statements	Teaching activities	Notes
19	1.05h Understand and be able to use the definitions of secant ($\sec\theta$), cosecant ($\operatorname{cosec}\theta$) and cotangent ($\cot\theta$) and of $\arcsin\theta$, $\arccos\theta$ and $\arctan\theta$ and their relationships to $\sin\theta$, $\cos\theta$ and $\tan\theta$ respectively.		SECTION 4 RECIPROCAL TRIGONOMETRIC FUNCTIONS Page 178 EXERCISE 8D Page 180-181
	1.05i Understand the graphs of the functions given in 1.05h, their ranges and domains.		

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	In particular, learners should know that the principal values of the inverse trigonometric relations may be denoted by $arcsin\ \theta$ or $sin^{-1}\ \theta$, $arccos\ \theta$ or $cos^{-1}\ \theta$, $arctan\ \theta$ or $tan^{-1}\ \theta$ and relate their graphs (for the appropriate domain) to the graphs of $sin\ \theta$, $cos\ \theta$ and $tan\ \theta$.		

Week	Statements	Teaching activities	Notes
20			MIXED PRACTICE 8 Page 182-184

Week	Statements	Teaching activities	Notes
21	1.07j Be able to differentiate e^{kx} and a^{kx} and related sums, differences and constant multiples.		CHAPTER 9 CALCULUS OF EXPONENTIAL AND TRIGONOMETRIC FUNCTIONS Page 185 SECTION 1 DIFFERENTIATION Page 185 EXERCISE 9A Page 189-190

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	1.07k Be able to differentiate $\sin kx$, $\cos kx$, $\tan kx$ and related sums, differences and constant multiples.		
	1.07l Understand and be able to use the derivative of $\ln x$.		

Week	Statements	Teaching activities	Notes
22	1.08c Be able to integrate $\mathrm{e}^{kx}, \frac{1}{x}, \sin kx, \cos kx$ and related sums, differences and constant multiples. [*Integrals of $arcsin$, $arccos$ and $arctan$ will be given if required.*] *This includes using trigonometric relations such as double-angle formulae to facilitate the integration of functions such as $\cos^2 x$.*		SECTION 2 INTEGRATION Page 190 EXERCISE 9B Page 193-195

Week	Statements	Teaching activities	Notes
23			MIXED PRACTICE 9 Page 196

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Week	Statements	Teaching activities	Notes
24	1.07r Be able to differentiate using the chain rule, including problems involving connected rates of change and inverse functions. *In particular, learners should be able to use the following relations:* $\frac{dy}{\mathrm{d}x} = 1 \div \frac{\mathrm{d}x}{\mathrm{d}y}$ *and* $\frac{dy}{\mathrm{d}x} = \frac{\mathrm{d}y}{\mathrm{d}u} \times \frac{\mathrm{d}u}{\mathrm{d}x}$.		CHAPTER 10 FURTHER DIFFERENTIATION Page 197 SECTION 1 THE CHAIN RULE Page 198 EXERCISE 10A Page 201-203

Week	Statements	Teaching activities	Notes
25	1.07q Be able to differentiate using the product rule and the quotient rule.		SECTION 2 THE PRODUCT RULE Page 203 EXERCISE 10B Page 205

Week	Statements	Teaching activities	Notes
26	1.07q Be able to differentiate using the product rule and the quotient rule.		SECTION 3 THE QUOTIENT RULE Page 206

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			EXERCISE 10C Page 208-209

Week	**Statements**	**Teaching activities**	**Notes**
27	1.07s Be able to differentiate simple functions and relations defined implicitly or parametrically for the first derivative only. *They should be able to find the gradient at a point on a curve and to use this to find the equations of tangents and normals, and to solve associated problems.* *Includes differentiation of functions defined in terms of a parameter using the chain rule.*		SECTION 4 IMPLICIT DIFFERENTIATION Page 209 EXERCISE 10D Page 213-214

Week	**Statements**	**Teaching activities**	**Notes**
28	1.07r Be able to differentiate using the chain rule, including problems involving connected rates of change and inverse functions.		SECTION 5 DIFFERENTIATING INVERSE FUNCTIONS Page 214 EXERCISE 10E Page 215-216

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	In particular, learners should be able to use the following relations: $\frac{dy}{dx} = 1 \div \frac{dx}{dy}$ *and* $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$.		

Week	**Statements**	**Teaching activities**	**Notes**
29			MIXED PRACTICE 10 Page 217-218

Week	**Statements**	**Teaching activities**	**Notes**
30			

Week	**Statements**	**Teaching activities**	**Notes**
31			

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