

## OCR A2 Level Mathematics – Core Mathematics Scheme of Work

Examination in June of Year 13

The Solomen press worksheets are an excellent resource and incorporated into the SOW

### NUMERICAL METHODS (6 lessons) (Solomen press worksheet Numerical methods pdf)

*Students carried out work in the summer term of year 12 on numerical solutions to equations – using decimal search and linear interpolation, and convergence.*

Topic	Content	Text - A2 Core 3 for OCR	Number of lessons
Numerical methods (Need to be covered for FP2)	Recognising that a change in sign indicates a solution. Finding roots using decimal search.	Ex 8A <i>Solomen press worksheet A</i>	1
	Iteration methods for equation solving including convergent iterations.	Ex 8B & 8C <i>Solomen press worksheet B &amp; C</i>	2
	Numerical integration – Simpson's rule.	Ex 12A, 12B, Misc Ex 12 <i>Solomen press worksheet D</i>	2
	Solve a variety of problems and mixed exam questions	<i>Solomen press worksheet E &amp; F</i>	1
<b>Assessment – Numerical Methods</b>			

**ALGEBRA AND FUNCTIONS (8-10 lessons) - (Solomen press worksheet Functions pdf)**

Topic	Content	Text - A2 Core 4 for OCR	Number of lessons
Functions	Identify the range and domain of a given function in simple cases.	Chapter 2 - Ex 2A <i>Solomen press worksheets A</i>	3-4
	Find the composition of two given functions;	Chapter 2 - Ex 2B <i>Solomen press worksheets B</i>	
	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.	Chapter 2 - Ex 2C <i>Solomen press worksheets C</i>	
	Sketching graphs of functions involving the modulus function.  Understand properties of modulus on the number line  Solve equations involving the modulus function.	Ex 7A <i>Solomen press worksheets D</i>  Ex 7B  Ex 7C <i>Solomen press worksheets D</i>	
	Transformation of graphs.	Ex 1, Misc Ex 1 <i>Solomen press worksheets E &amp; F</i>	2
	Solve a variety of exam style questions involving functions	<i>Solomen press worksheets G &amp; H</i>	1
<b>Assessment - Functions</b>			

**Rational Functions ( 5 lessons)** (Solomen press worksheet Algebra pdf)

<b>Topic</b>	<b>Syllabus</b>	<b>Resources – A2 Core 4 for OCR</b>	<b>Lessons</b>
Rational functions	Simplify rational functions Multiply and divide rational functions Add and subtract rational functions	Ex 6A, Ex 6B, Ex 6C, <i>Solomen press worksheet A</i>	4
Partial fractions	Write rational functions in partial fractions in cases where the denominator has distinct and repeated factors and where the degree of the numerator is less than that of the denominator.  Divide a polynomial by a linear or quadratic polynomial, and identify the quotient and remainder.	Ex 6D (Partial fractions with simple denominators) <i>Solomen press worksheet C</i>  Ex 6E (Partial fractions with repeated factor) <i>Solomen press worksheet B</i>	
Exam Practice	Mixed exam style question practice	<i>Solomen press worksheet F &amp; G (Choose questions as there are some binomial expansion questions)</i>	
<b>Assessment – Algebra &amp; Functions</b>			

## TRIGONOMETRY (8-10 lessons) (Solomen press worksheet Trigonometry pdf)

Topic	Content	Text - A2 Core 3 for OCR	Number of lessons
Trigonometric graphs	Properties of $\sin x$ , $\cos x$ , $\tan x$ , $\sec x$ , $\operatorname{cosec} x$ and $\cot x$ – domain, range, symmetries, periodicity, shapes of graphs. Solving simple equations.	Ex 6A, <i>Solomen press worksheet B</i>	2-3
	Inverse of trigonometric functions.	Ex 6E, <i>Solomen press worksheet A</i>	
Trigonometrical identities and equations.	Addition formulae for $\sin$ , $\cos$ and $\tan$ . Double angle formulae. Writing $a\cos x + b\sin x$ in the form $R\sin(x \pm \alpha)$ or $R\cos(x \pm \alpha)$	Ex 6B, <i>Solomen press worksheet D</i> Ex 6C, <i>Solomen press worksheet D</i> Ex 6D, <i>Solomen press worksheet E</i>	4
	Mixed exam question practice	Misc Ex 6 <i>Solomen press worksheet F &amp; G</i>	2
<b>Assessment - Trigonometry</b>			

## DIFFERENTIATION – Parametric equations (5-6 lessons)

	Syllabus	Resources – A2 Core 4 for OCR	Lessons
Parametric equations	Understand the use of a pair of parametric equations to define a curve, and use a given parametric representation of a curve in simple cases.	Ex 3A	2
	Convert the equation of a curve between parametric and Cartesian forms.	Ex 3B <i>Solomen press worksheet B</i>	
	Find and use the first derivative of a function which is defined parametrically. Apply to finding equations of tangents/ normals and TPs.	Ex 3C <i>Solomen press worksheet C</i>	2
	Use parameters to prove properties about curves	Ex 3D	1
	Solve variety of problems and mixed questions relating to parametric curves	Misc Ex 3	1
<b>Assessment – Parametric equations</b>			

## EXPONENTIAL FUNCTIONS (4 lessons) – (Solomen press worksheet Exponentials & logarithms pdf)

Topic	Content	Text - A2 Core 3 for OCR	Number of lessons
Exponential function and natural logarithm	Introduction to the properties and graphs of $y = e^x$ and $y = \ln(x)$ .	Solomen press worksheet A  Ex 3A, Ex 3B Solomen press worksheet B	2-3
	Solve equations involving $e^x$ and $\ln$ .		
	Understand and solve problems involving discrete and continuous exponential growth and decay	Solomen press worksheet C	1
	Solve exam style questions involving exponentials and $\ln(x)$		
<b>Assessment – Exponential functions</b>			

## BINOMIAL EXPANSIONS (3 lessons) (Solomen press worksheet Algebra pdf)

Topic	Syllabus	Resources – A2 Core 4 for OCR	Lessons
Binomial expansion	Use the expansion of $(1+x)^n$ , where $n \in \mathbb{Q}$ and $x < 1$ (finding a general term is not included, but adapting the standard series to expand, e.g. $(2 - 3x)^n$ is included).	Ex 5 and Misc Ex 5 <i>Solomen press worksheet D &amp; E</i>	2-3
	Mixed exam style question practice	<i>Solomen press worksheet F &amp; G (Need to choose binomial expansion questions)</i>	
<b>Assessment – Series and sequences</b>			

## DIFFERENTIATION 1 (12-15 lessons) (Solomen press worksheet differentiation pdf)

Topic	Content	Text - A2 Core 3 for OCR	Number of lessons
Differentiation	Extend differentiation techniques to include: a) Differentiating $(ax + b)^n$ and expressions of the form $(f(x))^n$ , where $f(x)$ is a polynomial. Apply techniques to solve gradient, tangent and normal problems and to find turning points.	Ex 4A, Ex 4B	2
	Use of the relationship $\frac{dy}{dx} = 1 \div \frac{dx}{dy}$ .	Ex 9C <i>Solomen press worksheet H</i>	1
	Differentiating $y = e^x$ and $y = \ln(x)$ .  Application to exponential growth and decay.	Ex 5A Questions 1-4, Ex 5C <i>Solomen press worksheet A &amp; B</i>  Ex 5B Misc Ex 5 Questions 1, 6, 8, 9, 14, 15, 16 - 19	4
	Use of chain rule to differentiate $y = (f(x))^n$ , $y = e^{f(x)}$ and $y = \ln(f(x))$ .	Ex 9A <i>Solomen press worksheet C &amp; D</i>	
	Connected rates of change – involving chain rule	Ex 9B. Misc Ex 9 <i>Solomen press worksheet C &amp; D</i>	2
	Sum and Product rule	Ex 10A <i>Solomen press worksheet E</i>	2
	Quotient rule with applications.	Ex 10B <i>Solomen press worksheet F</i>	2
	Solve variety of problems involving sum, product and quotient rules	Misc Ex 10 <i>Solomen press worksheet G</i>	1
	Mixed exam style questions on all aspects of differentiation	<i>Solomen press worksheet J &amp; K</i>	1
<b>Assessment – Differentiation 1</b>			

**DIFFERENTIATION 2 – (4 lessons)** (Solomen press worksheet Differentiation pdf)

	<b>Syllabus</b>	<b>Resources – A2 Core 4 for OCR</b>	<b>Lessons</b>
Trigonometric differentiation	Use the derivatives of $\sin x$ , $\cos x$ and $\tan x$ , together with sums, differences and constant multiples – use results in conjunction with the chain, product and quotient rules to differentiate more complex functions. Applications to tangents and TPs.	Ex 1A & 1B, <i>Solomen press worksheet A</i>	2-3
Implicit differentiation	Find and use the first derivative of a function which is defined implicitly (introduce the basics of implicit differentiation – the bulk of the work will be covered with the differential equations)	Ex 8A	1
<b>Assessment – Differentiation 2</b>			

**INTEGRATION 1A (8 lessons)** (Solomen press worksheet Integration pdf)

<b>Topic</b>	<b>Content</b>	<b>Text - A2 Core 3 for OCR</b>	<b>Number of lessons</b>
Integration	Integrating expressions of the form $(ax + b)^n$ and use to find areas under graph	Ex 4C Misc Ex 4 Questions 3, 4, 6, 7, 8, 1112-14, 16, 19 <i>Solomen press worksheet B</i>	4
	Integrate expressions of the form $e^x$ and $e^{ax+b}$	Ex 5A questions 5-7. <i>Solomen press worksheet A</i>	
	Integrate expressions of the form $\ln x$ and $\ln(ax+b)$ Use to find areas	Ex 5C, Ex 5D, Ex 5E <i>Solomen press worksheet A &amp; B</i>	
	Practice Further integration	Misc Ex 5 <i>Solomen press worksheet C</i>	1
	Solids of revolution (rotations about $x$ and $y$ axes).	Ex 11 and Misc Ex 11 <i>Solomen press worksheet D</i>	2
	Mixed exam style question practice	<i>Solomen press worksheet E &amp; F</i>	1
<b>Assessment – Integration 1A</b>			

**INTEGRATION IB – Trigonometry and by parts (4 lessons)** (Solomen press worksheet Integration pdf)

Topic	Syllabus	Resources – A2 Core 4 for OCR	Lessons
Integration of trigonometric functions.	Extend the idea of ‘reverse differentiation’ to include the integration of trigonometric functions (e.g. $\cos x$ and $\sec^2 2x$ ); Use trigonometric relations (such as double angle formulae) in order to facilitate the integration of functions like $\cos^2 x$	Ex 2D	2
By parts	Recognise when an integrand can usefully be regarded as a product, and use integration by parts to integrate, for example, $x \sin 2x$ , $x^2 e^x$ , $\ln x$ . Revise volumes of revolution from C3.	Ex 2A <i>Solomen press worksheet D</i>	2
<b>Assessment – Integration 1B</b>			

**INTEGRATION IC (6 lessons)** (Solomen press worksheet Integration pdf)

Topic	Syllabus	Resources – A2 Core 4 for OCR	Lessons
Integration of rational functions.	Integrate rational functions by means of decomposition into partial fractions	Ex 6E – Questions 2-4 Misc Ex 6 – Questions 6, 8, 9, 13-15, <i>Solomen press worksheet B</i>	2
Method of substitution.	Use the method of integration by recognition and by substitution to evaluate definite and indefinite integrals.	Ex 2B (Indefinite integrals) Ex 2C (Definite integrals) <i>Solomen press worksheet C</i>	2-3
Exam practice	Solve a variety of mixed exam problems	<i>Solomen press worksheet E, F &amp; G</i>	1
<b>Assessment – Integration 1C</b>			



## **FIRST ORDER DIFFERENTIAL EQUATIONS & IMPLICIT DIFFERENTIATION (8-10 lessons)**

<b>Topic</b>	<b>Syllabus</b>	<b>Resources – A2 Core 4 for OCR</b>	<b>Lessons</b>
Differential equations	Modelling a situation as a differential equation. Separate the variables in order to find the general solution of a 1 <sup>st</sup> order differential equation.	Ex 7A, 7B, Misc Ex 7. <i>Solomen press differential equations- wksht A</i>	3
Implicit differentiation	Apply implicit differentiation to finding gradients of curves, tangents, normals and TPs.	Ex 8A	1-2
	Applications of implicit differentiation and differential equations	Ex 8B	1-2
	Solve implicit equations involving products	Ex 8C	1-2
	Solve a variety of exam style questions	<i>Solomen press Differentiation- worksheet D</i>	1
<b>Assessment – Differential equations</b>			

## VECTORS ( 10 Lessons) Solomen press worksheet Vectors pdf)

Topic	Syllabus	Resources – A2 Core 4 for OCR	Lessons
Vectors	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 identify the magnitude of a displacement vector $\overrightarrow{AB}$ as being the distance between the points $A$ and $B$ .	Ex 4A <i>Solomen press worksheet A</i>  Ex 4B <i>Solomen press worksheet B</i>	2
Vector equation of a line.	Understand the significance of all the symbols used when the equation of a straight line is expressed in the form $\mathbf{r}=\mathbf{a}+t\mathbf{b}$ ; Determine whether two lines are parallel, intersect or are skew; Find the point of intersection of two lines when it exists.	Ex 4C <i>Solomen press worksheet C</i>	2
Vectors and 3D	Using vectors in 3 dimension – finding coordinates, vector equations, intersection of lines.	Ex 4D	1-2
Scalar product	Calculate the scalar product of two vectors and use the scalar product to determine the angle between two directions and to solve problems concerning perpendicularity of vectors	Ex 9A, Misc Ex 9 <i>Solomen press worksheet D</i>	2
Geometrical proof	Use scalar products to prove geometrical results involving lengths and angles	Ex 9B, Misc Ex 9	1-2
Exam question practice	Solve a variety of problems and exam questions	<i>Solomen press worksheet F &amp; G</i>	1
<b>Assessment - Vectors</b>			

## ASSESSMENTS

Students should complete an assessment test at the end of each unit of work. Marks for these assessments should be recorded on G4S as soon as they are complete.

**Exam past papers should be used for preparation for the examinations in June.  
Two papers are sat – one for Core 3 and one for Core 4**