Mathematics Department C3 SOW

Specification	Reference	Notes/Extra Material
1. Algebra and Functions • Simplification of rational expressions including factorising & cancelling, and algebraic division.	Heinemann Chapter 1 **Section 1:1 to 1.4** - Exercises 1A, 1B, 1C & 1D	Denominators of rational expressions will be linear or quadratic, eg $\frac{1}{ax + b}$ or $\frac{ax + b}{px^2 + qx + r}$ or $\frac{x^3 + 1}{x^2 - 1}$ **Mixed Exercise 1E** **Revision Exercise 1**
• Definition of a function. Domian and range of functions. Composition of functions. Inverse functions and their graphs.	Heinemann Chapter 2 **Section 2.1 to 2.5** Exercises 2A, 2B, 2C, 2D & 2E **Section 2.3** Exercise 2C/2D **Sections 2.2 – 2.5** Exercises 2B – 2E	The concept of a function as a one-one or many-one mapping from R (or a subset of R) to R. The notation f : x → … and f(x) will be used. Candidates should know that fg will mean 'do g first, then f'. Candidates should know that if f^{-1} exists, then $f^{-1}f(x) = ff^{-1}(x) = x$. **Mixed Exercise 2F** **Revision Exercise 2**
• The modulus function	Heinemann Chapter 5 **Section 5.1 to 5.3** Exercises 5A, 5B & 5C	Candidates should be able to sketch the graphs of y = I ax + b I and the graphs of y = I f(x) I and y = f (IxI), given the graph of y = f(x).

• Combinations of the transformations y = f(x) as represented by y = af(x), y = f(x) + a, y = f(x + a), y = f(ax).	Heinemann Chapter 5 **Sections 5.4 to 5.5** - Exercises 5D & 5E **Summary of key points**	Candidates should eb able to sketch the graph of e.g. y = 2f(3x), y = f(-x) + 1, given the graph of y = f(x) or the graph of, e.g. y = 3 + sin 2x, y = -cos (x + л/4). The graph of y = f(ax + b) will **not** be required. **Mixed Exercise 5F** **Revision Exercise 5**
2. Trigonometry • Knowledge of secant, cosecant and cotangent and of arcsin, arcos and arctan. Their relationships to sine, cosine and tangent. Understanding of their graphs and appropriate restricted domains. • Knowledge and use of $\sec^2\theta = 1 + \tan^2\theta$ and $\text{cosec}^2\theta = 1 + \cot^2\theta$ • Knowledge and use of double angle formulae; use of formulae for sin (A ± B), cos (A ± B) and tan (A ± B) and of expressions for acos θ + bsinθ in the equivalent forms of rcos (θ ± α) or rsin (θ±α).	Heinemann Chapter 6 **Sections 6.1 – 6.5** - Exercises 6A , 6B, 6C, 6D & 6E Heinemann Chapter 7 **Sections 7.1 to 7.5** - Exercises 7A, 7B, 7C, 7D & 7E **Summary of key points**	Angles measured in both degrees and radians. **Mixed Exercise 6F** **Revision Exercise 6** To include application to half-angles. Knowledge of the t (tan ½ θ) formula will **not** be required. Candidates should be able to solve equations such as acosθ + bsinθ = c ina given interval and to prove simple identities such as cos x cos 2x + sin x sin 2x = cos x **Mixed Exercise 7F** **Revision Exercise 7**

3. Exponentials & logarithms • The function e^x and its graph. • The function ln x and its graph; ln x as the inverse function of e^x.	Heinemann Chapter 3 **Sections 3.1 to 3.3** - Exercises 3A & 3B **Summary of key points**	To include the graph of $y = e^{ax + b} + c$ Solution of equations of the form $e^{ax + b} = p$ and $\ln (ax + b) = q$ is expected. **Mixed Exercise 3C** **Revision Exercise 3**
4. Differentiation • Differentiation of e^x, ln x, sin x, cos x, tan x and their sums and differences. • Differentiation using the product rule, the quotient rule and the chain rule. • The use of $dy/dx = 1/(dx/dy)$	Heinemann Chapter 8 **Sections 8.1 to 8.10** - Exercises 8A, 8B, 8C, 8D, 8E, 8F, 8G, 8H, 8I & 8J **Summary of key points**	Differentiation of cosec x, cot x and sec x are required. Skill will be expected in the differentiation of functions generated from standard forms using products, quotients and composition, such as $2x^4 \sin x$, e^{3x} / x, $\cos x^2$ and $\tan^2 2x$. e.g. finding dy/dx for $x = \sin 3y$ **Mixed Exercise 8K** **Revision Exercise 8**

5. Numerical methods • Location of roots of f(x) = 0 by considering changes of sign of f(x) in an interval of x in which f(x) is continuous. • Approximate solution of equations using simple iterative methods, including recurrence relations of the form $x_{n+1} = f(x_n)$	Heinemann Chapter 4 **Sections 4.1 – 4.2** - Exercises 4A & 4B **Summary of key points**	 Solutions of equations by use of iterative procedures for which leads will be given. **Mixed Exercise 4C** **Revision Exercise 4**