C4 Scheme of Work 2017/18

August 21, 2018

Specification	Learning Outcomes	Resources	Homework	Lesson
1. Algebraic Fractions Rational functions. Partial fractions (denominators not more complicated than repeated linear terms)	Be able to split a fraction whose denominator is a product of linear expressions, e.g. $\frac{2x+3}{x(x+1)}$ Be able to split a fraction where one (or more) of the factors in the denominator are squared, e.g. $\frac{2x+3}{x^2(x+1)}$ Deal with top-heavy fractions where the highest power in the denominator is greater or equal to the highest power in the denominator, e.g. $\frac{x^2+2}{x(x+1)}$	Pearson Chapter 1 PPQ's Solomon Worksheets A and B (Partial Fractions)	PPQ's	Weeks 1 and 2

2. Binomial Expansion Binomial series for any rational n	Expanding out an expression of the form $(1 + kx)^n$, where n is negative or fractional. Expanding out an expression of the form $(a + kx)^n$, where a needs to be factorised out first. Finding the product of two Binomial expansions, e.g. $\frac{\sqrt{1+x}}{\sqrt{1-x}}$ goes to $(1+x)^{\frac{1}{2}}(1-x)^{-\frac{1}{2}}$	Pearson Chapter 3 PPQ's Solomon Worksheets – Series A-C	Solomon Worksheets A-C – good for practice PPQ's	Weeks 3 and 4

3. Vectors Vectors in two and three dimensions Magnitude of a vector Algebraic operations of vector addition and multiplication by scalars, and their geometrical interpretations. Position vectors. The distance between two points Vector equations of lines The scalar product. Its use for calculating the angle between two lines.	Find the point of intersection of two lines or prove that two lines do not intersect. Find the angle between two lines. Finding a missing $x/y/z$ value of a point on a line. Find the length of a vector or the distance between two points. Find the nearest point on a line to a point not on the line (often the origin) – note: not in your textbook! Show lines are perpendicular. Show a point lies on a line. Show 3 points are collinear (i.e. lie on the same straight line) Find the area of a rectangle, parallelogram or triangle formed by vectors.	Pearson Chapter 5 PPQ's Solomon Worksheets A-F	PPQ's Solomon Worksheets A-F	Weeks 5, 7-9

4. Coordinate Geometry in the (x, y) plane Parametric equations of curves and conversion between Cartesian and parametric forms.	Know that $\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dy}{dx}}$ Be able to integrate parametric equations. Be able to convert parametric equations into a single Cartesian one.	Pearson Chapter 2 PPQ's	PPQ's Exercises from the book Ex: 2D, Ex: 2E	Weeks 10-13

5. Differentiation Differentiation of simple functions defined implicitly or parametrically Exponential growth and decay. Formation of simple differential equations.	Appreciate that $y = a^x$ represents 'exponential growth' when $a > 1$, and 'exponential decay' when $0 < a < 1$ (and from C3, know the graphs for each). Know that $\frac{d}{dx} a^x = a^x \ln a$ (proof unlikely to be asked for) Be able to differentiate implicitly, e.g. $\frac{d}{dx} y^2 = 2y \frac{dy}{dx}$ and subsequently be able to make $\frac{dy}{dx}$ the subject. Be able to set up differential equations, e.g. understand that "the temperature falls at a rate proportional to its current temperature" could be represented as $\frac{dT}{dt} = -kT$ Connect different derivatives involving rates, e.g. $\frac{dA}{dx} = \frac{dA}{dt} \times \frac{dt}{dx}$	Pearson Chapter 4 PPQ's Solomon Worksheets A-F	PPQ's Solomon Worksheets A-F	Week 15-17

6. Integration Integration of e^x, 1/x, sin x, cos x. Evaluation of volume of revolution Simple cases of integration by substitution and integration by parts. These methods as the reverse processes of the chain and product rules respectively. Simple cases of integration using partial fractions. Analytical solution of simple first order differential equations with separable variables. Numerical integration of functions	Integrating trig functions, including reciprocal functions and squared functions $\sin^2 x$, $\cos^2 x$, $\sec^2 2x$, etc. Integrating by 'reverse chain rule' (also known as 'integration by inspection'). Integrating by a given substitution. Integration by parts. Integrating by use of partial fractions. Integrating top heavy fractions by algebraic division. Be able to differentiate parametric equations: $\int y\,dx = \int y \frac{dx}{dt}\,dt$ Calculate volumes of revolution both for normal and parametric equations: $V = \pi\int y^2\,dx$ $V = \pi \int y^2 \frac{dx}{dt}\,dt$ Solve differential equations. e.g. $\frac{dy}{}$	Pearson Chapter 6 PPQ's Solomon Worksheets A-P	PPQ's Solomon Worksheets A-P	Week 18-25

Mock Week Dates: Week 6, 13, 19 & 24