	A		B	
WK	TOPIC	DETAILS	TOPIC	DETAILS
1	**Introduction to complex numbers**	- Recap last year content: what is i, add, subtract, multiply, what is a conjugate, link to "rationalising the denominator". - Solving a quadratic. - solving cubics and quartics - introduce Re(z) and Im(z) notation - polynomials with complex coefficients *(although students don't need to solve them, students need to know that the conjugate rule **does not** apply. Polynomials with complex coefficients could appear in* Roots of Polynomials *questions.)*	**Series**	- know off by heart $\sum 1 = n$ and $\sum r = \frac{1}{2}n(n+1)$, and that $\sum r^2$ $\sum r^3$ are in the formula book. **-writing answers in fully factorised form:** strategies for trying to take out as many common factors such as fractions or (n+1) etc first, rather than immediately multiplying out to get a cubic/quartic -but they could be given questions that force them to multiply out to get a cubic and factorise from there.
			Roots of polynomials	**- introduction/ sum and product of roots of a quadratic**
2 CWC test A & B sides	**Argand Diagrams & Loci**	- Representing a number on a Argand diagram, and link adding/subtracting complex numbers to vectors on an Argand diagram - Modulus and argument form: r(cosθ+isinθ) of a complex no. - the 3 main Loci types: |z-a|=k (circle), |z-a|=|z-b| (perpendicular bisector), arg(z-a)=angle (half-line) - intersecting regions (getting used to "and" , ∩ used) -problem solving on argand diagrams (e.g, for z on loci in part (a), find the minimum value of |z| etc)	**Roots of polynomials (continued)**	**- Cubic and Quartic polynomials:** linking the pattern the happens across all of them, e.g $-\frac{b}{a}$ is always the sum of the roots, $\frac{c}{a}$ is always the sum of the products of pairs of roots, etc **- Rules for finding values of expressions in $\alpha, \beta, (\gamma, \delta)$** e.g reminder about $(ab)^n = a^n b^n$, rules for sums of squares and sums of cubes of the roots **- Use a substitution to find a new polynomial with a linear transformation of the original roots.** Extra thing to look at/show: using substitution method as an alternative way of finding sum of squares/ finding a quadratic, cubic, quartic with roots $\alpha^2, \beta^2, \gamma^2$…..
	Matrices	Introduction to matrices, adding and multiplying (potential for use of flipped learning for this). Should understand what an m×n matrix means for given numbers m and n.	**Proof by induction**	**-** use proof by induction to prove series results
3	**Matrices**	Definition of a linear transformation Introduction to matrix transformations for 2x2, how to apply them, enlargement, rotation, reflection, and how to identify them from given points or from being given the matrix of the transformation (Note: Shear is not in the Edexcel syllabus) -Determinant (6C first half), and scale factor of enlargement of area -inverse of a 2x2 (6D) and link to transformations (7F) -multiple transformations. $(AB)^{-1} = B^{-1}A^{-1}$ rule and proof.	**Proof by induction (continued)** **Series**	Use Proof by induction for: - divisibility - matrices **Extension:** not listed in the textbook, and in theory not in the specification, but due to ambiguity in specification, good idea to briefly cover other types of proof by induction such as proof by induction for simple recurrence relations (e.g $u_1 = 5$ and $u_{n+1} = 3u_n + 2$, prove that $u_n = 2 \times 3^n - 1$, OCR FP1 old spec 2016)
			Vectors- Lines	Find the vector equation of a line Find the Cartesian equation of a line in 3D, and converting between the two forms (exercise 9A)

4	**Matrices 3x3** **Complex Numbers**	Determinant (6C, second half) and inverse of a 3x3 (6E). Must be able to do this using the calculator AND manually by hand -Writing simultaneous equations using matrices and solving using inverse matrix. -Should be familiar with the terms: Singular, consistent, inconsistent, unique solution, sheaf, prism -Wordy simultaneous equations questions.	**Vectors- Lines & Scalar product**	**- Determining whether two vector lines are parallel, intersect or skew** (9E, Q1,2,3,8) - **Scalar Product** and using it to find the angle between 2 lines ({9C all Qs}, {9D q1, 9,10,11}, {9E q6, 7, 9} - **Shortest distance from a point to a line** (9F q4, 9, 11) - **Shortest distance between 2 skew lines not using the cross product**: worth telling them that they will learn a quicker method in FP1 that can be used in Core Pure but it's probably worth them at least being exposed to this alternative method shown in the Core Pure 1 textbook
5	**Matrices** **Invariant points and lines**	**Matrix transformations with 3x3.** Not in the formula book. Need to know reflection in $x = 0, y = 0, z = 0$ planes and rotation about x-axis, y-axis, z-axis. **-**Knowledge that determinant of a 3x3 transformation is the scale factor of enlargement applied to the volume of a shape ***Find invariant points and lines.** This topic isn't properly in textbook. Can use questions from old spec AQA FP4. See Core Pure spec paper 2 to get an idea/evidence. GJB also has some questions.	**Vectors-Planes** **Roots of polynomials**	**- Equations of a plane:** 2 vector equations: $r = a + \lambda b + \mu c$, and $r.n = a.n$, Converting between cartesian equation of a plane ax+by+cz=d and r.n=a.n. (9B) **Shortest distance between a point and a plane**: formula in the formula book **- Angle between a plane and a line-** including ensuring it is the acute angle. Textbook has a "formula", general problem solving using scalar product equally valid method. **- Angle between 2 planes** **- Intersection between a plane and a line** -***Extension*: Can explore the following as there have been in the past questions on things such as:** shortest distance between 2 parallel lines, shortest distance between 2 parallel planes, reflection of a line in a plane **Desmos activity: Vectors formulae check**
6	**Complex Numbers & De Moivre**	**Complex numbers** *-Writing complex numbers in exponential form, linking multiplying and dividing complex numbers with modulus/argument -De Moivre -Converting from multiple angles to powers of trig functions (using de Moivre)	**Method of differences**	Very brief recap: Using partial fractions to express a fraction as the difference between 2 fractions Method of differences in the cases where: • Parts that cancel out in consecutive terms • Parts of a terms in the series cancel out with part of the term that is 2 before it (not many examples of this in textbook, again see old spec for more questions) • **Not in the Pearson/Edexcel textbook but potential area for difficult question in exam:** method of differences with 3 parts to each term. See integral exercise level 2 for the topic and old spec OCR textbook for questions/examples.
			Introduction of Maclaurin Series	What a Maclaurin series is? Using derivatives to generate a maclaurin series

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7 **No Monday (INSET)**	**Complex Numbers & De Moivre**	**Complex numbers** -Converting from powers to multiple angle trig functions (using exponential defintions) -Integrating powers of trig -Infinite trigonometric series (including knowing both methods needed to rewrite the sum in a way that allows us to separate real/imaginary components) -nth roots of a complex number (e.g, solve $Z^n = w$, for a given $w \in \mathbb{C}$)	**Maclaurin Series** **Methods in calculus** **Proof by induction**	Compound Maclaurin series Proper explanation and use of limit notation (could be linked to finding infinite series, e.g answer to a method of differences question which is often a fraction, and let n tend to infinity) Improper integrals Mean Value of a functions over an interval Proving differentiation of inverse trig functions, including justifying why there is no $\pm$ in front of $\surd$
8 Half week/ Open Evenings, PR day, INSET	**Roots of unity**	**Roots of unity:** -for nth roots of unity $\omega^n = 1$ $1 + \omega + \omega^2 + \omega^3 + \cdots + \omega^{n-1} = 0$ has same roots as $z^n = 1$ except for $z = 1$. Lack of questions in textbook-borrow from oldspec OCR FP3 **-Geometric problems** See Core Pure Book 2 chapter that has this title	**Integrating Inverse Trigonometric functions** **Vectors**	Integrating $\frac{1}{\sqrt{a^2-x^2}}$ and $\frac{1}{a^2+x^2}$ Use of integration by substitution/inspection for integrals like e.g $\frac{1}{1+4x^2}$ Completing the square to put fractions in the above form Proving differentiation of inverse trig functions
9	**Volumes of Revolution**	-Recap: Integrating to find area between a line and the y-axis -Volumes of revolution, rotating about the x-axis and y-axis - Modelling with Volumes of Revolution - Parametric Volumes of Revolutions <u>Use questions from both CP1 and CP2 textbooks</u>	**Partial fractions** **Differential Equations**	Partial fractions with non-factorisable quadratic denominator Using partial fractions to integrate **First order differential equations:** Recap 1st Order Differential Equations from maths A-level, including using boundary conditions to find the constant of integration. 1st order differential equations that require an integrating factor
10 CP1/AS paper?	**Polar Coordinates** **Matrices**	What they are Converting from Polar to Cartesian and vice-versa Graphs: Knowing the shape of, and knowing potential regions where r<0 for $r = \sin(n\theta)$, $r = p + q\sin(\theta)$ (and same for cos) Areas of a sector Tangents parallel to y-axis, and x-axis Advanced graph drawing: polar graphs that have extended domains Example: $0 < \theta \leq 4\pi$. This means the graph appears in more than 1 place in each quadrant, so which parts are for $0 < \theta \leq 2\pi$ or $2\pi < \theta \leq 4\pi$	**Differential Equations**	**Second Order homogeneous differential equations** Auxillary equation with 2, 1, 0 real solutions and impact on solutions. Explain why for complex solutions, instead of writing it as $Pe^{(a+bi)x} + Qe^{(a-bi)x}$ we write it e^{ax}**(Acos(bx)+Bsin(bx))** **Second Order non-homogeneous differential equations** 2nd order differential equations that need a particular integral Solving 2nd order differential equations with boundary conditions

11	**Hyperbolic Trigonometry** **Complex Numbers**	-Hyperbolic trig functions and exponential definitions -The graphs -Inverse hyperbolic trig functions (including both formats for the 2nd cosh solution: $-\ln(x+\sqrt{x^2-1})$ vs $\ln(x-\sqrt{x^2-1})$, and proof of all 3 inverse hyp-trig inverse functions) -Proving identities Differentiating Integrating Differentiating and integrating inverse hyperbolic trig	**Differential Equations** **Algebra**	Modelling with differential equations Word-heavy Simple harmonic motion differential equations Damped and forced harmonic motion Coupled 1st order differential equations

	FP1	FS1	FM1
12	**(FP1) Inequalities involving rational functions:** -Reference markschemes in lessons to ensure students set out work in way that gets all marks. -Multiply by squared denominators: even if not taught as preferred/main method for solving the inequalities, students must understand how to use this approach. - dealing with asymptotes in ≤ or ≥ inequalities **Modulus Inequalities**		
13 (Full? week)	**(FP1) Numerical Methods: Differential Equation** - Euler's method - Midpoint method		
XH			XH
14	**(FP1) Numerical Methods: Differential Equation** - 2nd Order Euler's Method -Simultaneous equation method with Midpoint & 2nd Order Euler **(FP1) Vectors - Cross Product:** - Vector Algebra: using properties such as $a \times a = 0$ and $a \times b = -(b \times a)$ -Planes: converting from **r** = **a** + λ**b** + μ**c** to **r.n=a.n** - use of cross product to find shortest distance between skew lines - intersection of 2 planes	**Stats review** **Discrete Random Variables**	Momentum & Impulse
15	**(FP1) Vectors** - (**r** – **a**)×**b**=0 vector equation of a line -area of triangle and parallelogram - volume of tetrahedron and parallelepiped. -Direction Cosines Extensions: volume of a square based pyramid	**Poisson**	Work, energy and power

16	**(FP1) Conic Sections 1** {As set out in textbook} -Parabola and Rectangular hyperbola -Focus and directrix -finding tangents and normal -proof of equation of parabola using loci	Goodness of fit Contingency tables	Collisions in 1D
17	**(FP1) t-formulae & Weierstrass Substitution** -proof of t-formulae using t-formulae to: -solve trig equations -trig identities -find the exact value of trig function given θ is acute/obtuse etc -modelling and finding stationary points **Remind students that t-formulae are not in the formula book** -using the Weierstrass Substitution to integrate	Geometric distribution Negative binomial distribution	Collisions in 2D
18	**(FP1) Taylor Series** -finding Taylor series using the formula -using Taylor Series to find series solution to a differential equation (but not including limits yet) **(FP1) Conic Sections 2** {As set out in textbook} - Ellipses and Hyperbolas - Eccentricty -tangents and normals	Central Limit Theorem	Collisions in 2D
19	**(FP1) Conic Sections 2** -Alternate case of b>a for ellipse and the impact on formulas in formula book -PS+PS' = 2a property for ellipses - Loci problems **(FP1) Limits** -Strategies for dealing with limits of the form: $\lim_{x\to\infty}\frac{polynomial}{polynomial}$ and $\lim_{x\to 0}\frac{polynomial\ with\ no\ constant\ term}{polynomial\ with\ no\ constant\ term}$ -using Taylor Series about $x = a$ to find limits where $x \to a$	**Probability Generating functions** https://www.cut-the-knot.org/arithmetic/combinatorics/Sicherman.shtml	Elastic strings and springs
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20	**(FP1) Limits / Further Calculus** **-L'hospital's rule** with cases that require one or more applications -Knowing when it is appropriate to apply L'hospital's rule -use of $\lim_{x\to a} f(x) = e^{\lim_{x\to a}\ln(f(x))}$ in combination with L'hospital's rule **Leibnitz's theorem**	**Type I and Type II errors**	

21	**(FP1) Further Calculus** **Simpson's Rule** **(FP1) Reducible Differential Equations** -First Order differential equations with a given substitution -Second order differential equations with: 3 letter substitutions (easier type) 2 letter substitutions (harder type)	Power of functions	
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25 Short week			
EH			
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31	**STUDY LEAVE**		
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