

# CCEA AS Mathematics and Further Mathematics

## Teaching Schedules

**Updated August 2020**

These schedules are based upon shared teaching with equal times for each of 2 teachers.

Please note that this teaching order should be followed by all teachers.

They will allow either **consecutive or parallel** teaching of AS Mathematics and Further Mathematics.

### **Mathematics**

This schedule is designed to cover **all of Unit 1 first**, then followed by Unit 2A and Unit 2B.

### **Further Mathematics**

These schedules are designed to cover **all of Unit 1 first**, then followed by each of the other two Applied Units.

**AS Mathematics**

Week	Teacher 1	Teacher 2
1	<p><b><u>Vectors</u></b></p> <ul style="list-style-type: none"> <li>• Use of vectors in 2 dimensions</li> <li>• Calculate magnitude and direction</li> <li>• Convert between component form and magnitude/direction form</li> </ul>	<p><b><u>Quadratics</u></b></p> <ul style="list-style-type: none"> <li>• Factorising</li> <li>• Solution of equations</li> <li>• Completing the square (and applications)</li> <li>• Disguised quadratics</li> </ul>
2	<ul style="list-style-type: none"> <li>• Addition of vectors and multiplication by a scalar</li> <li>• Position vectors</li> <li>• Distance between 2 points represented by position vectors</li> </ul>	<p><b><u>Simultaneous Equations</u></b></p> <ul style="list-style-type: none"> <li>• Linear with 2/3 variables</li> <li>• Linear and quadratic</li> </ul>
3	<p><b><u>Trigonometry</u></b></p> <ul style="list-style-type: none"> <li>• Sine and cosine rules</li> <li>• Area of triangle</li> <li>• Graphs of sine, cosine and tangent and their properties</li> <li>• Use of <math>\tan \theta = \frac{\sin \theta}{\cos \theta}</math></li> <li>• Use of <math>\sin^2 \theta + \cos^2 \theta = 1</math></li> <li>• Solution of simple trig. equations in a given interval</li> </ul>	<p><b><u>Surds</u></b></p> <ul style="list-style-type: none"> <li>• Use and manipulate surds</li> <li>• Rationalise denominator</li> </ul>
4		<p><b><u>Indices</u></b></p> <ul style="list-style-type: none"> <li>• Use of laws for all rational exponents</li> </ul>
5		<p><b><u>Further Quadratics</u></b></p> <ul style="list-style-type: none"> <li>• Use of discriminant</li> <li>• Linear and quadratic inequalities</li> </ul>
6		
7	<p><b><u>Coordinate Geometry</u></b></p> <ul style="list-style-type: none"> <li>• Equation of a straight line</li> <li>• Midpoint of a line</li> <li>• Length of line segment</li> <li>• Conditions for parallel/perpendicular lines</li> </ul>	
8	<p><b><u>Differentiation</u></b></p> <ul style="list-style-type: none"> <li>• Differentiation of <math>x^n</math> and related multiples, sums and differences</li> <li>• Interpretation of derivative as gradient of curve</li> <li>• Interpretation as rate of change</li> <li>• Application to                             <ul style="list-style-type: none"> <li>○ Gradients and stationary points</li> <li>○ Use of 2<sup>nd</sup> derivative</li> <li>○ Increasing and decreasing functions</li> <li>○ Tangents and normal</li> </ul> </li> </ul>	<p><b><u>Polynomials</u></b></p> <ul style="list-style-type: none"> <li>• Algebraic manipulation</li> <li>• Long division</li> <li>• Use of remainder and factor theorems</li> </ul>
9		<p><b><u>Binomial Theorem</u></b></p> <ul style="list-style-type: none"> <li>• Use of binomial expansion of <math>(a + bx)^n</math>, where <math>n</math> is a positive integer</li> </ul>
10		<p><b><u>Graphs</u></b></p> <ul style="list-style-type: none"> <li>• Sketch graphs of                             <ul style="list-style-type: none"> <li>○ quadratics and cubics</li> <li>○ reciprocal functions</li> </ul> </li> <li>• Interpret solution of equations</li> <li>• Use points of intersection to solve equations</li> </ul>
11		<p><b><u>Graph Transformations</u></b></p>
12		
13	<p><b><u>Integration</u></b></p> <ul style="list-style-type: none"> <li>• Understanding as reverse of differentiation</li> <li>• Integration of <math>x^n</math> (<math>n \neq -1</math>) and related multiples, sums and differences</li> <li>• Definite integrals</li> <li>• Application to area between a curve and either axis</li> </ul>	<p><b><u>Logarithms</u></b></p> <ul style="list-style-type: none"> <li>• Graphs of exponential and log functions</li> <li>• Relationship between exponential and log functions</li> <li>• Laws of logs</li> <li>• Solution of equations and inequations involving exponential functions</li> <li>• Exponential growth and decay</li> </ul>
14		
15		<p><b><u>Circle Geometry</u></b></p> <ul style="list-style-type: none"> <li>• Equation of a circle</li> <li>• Find the centre and radius</li> <li>• Find the equation of a tangent at a given point on the circumference</li> <li>• Use of standard circle properties</li> </ul>
16		<p><b><u>Histograms</u></b></p> <ul style="list-style-type: none"> <li>• Interpretation and use</li> </ul>

Week	Teacher 1	Teacher 2
17	<u><b>Displacement, Velocity, Acceleration</b></u> <ul style="list-style-type: none"> <li>• Understanding of associated units and language</li> <li>• <math>s - t</math> and <math>v - t</math> graphs</li> <li>• Equations of motion</li> <li>• To include use of vectors</li> </ul>	<u><b>Statistical Measures</b></u> <ul style="list-style-type: none"> <li>• Calculation and interpretation of mean, median, mode</li> <li>• Calculation and interpretation of standard deviation and variance</li> <li>• Use of either <math>\sigma_n</math> or <math>s_n</math> as appropriate</li> </ul>
18		
19	<u><b>Force</b></u> <ul style="list-style-type: none"> <li>• Force as a vector</li> <li>• Resolving forces</li> <li>• Resultant of forces</li> <li>• Equilibrium</li> </ul>	<u><b>Correlation</b></u> <ul style="list-style-type: none"> <li>• Interpretation of scatter graphs and regression lines</li> <li>• Simple interpretation of correlation</li> <li>• Calculate and interpret product-moment correlation</li> </ul>
20		<u><b>Interpretation of Data</b></u> <ul style="list-style-type: none"> <li>• Select suitable presentation technique</li> <li>• Recognise outliers</li> <li>• Clean data</li> </ul>
21	<u><b>Newton's Laws</b></u> <ul style="list-style-type: none"> <li>• Newton's 2<sup>nd</sup> law</li> <li>• Use of weight</li> <li>• Use of friction (including limiting friction)</li> <li>• Newton's 3<sup>rd</sup> law</li> </ul>	<u><b>Probability</b></u> <ul style="list-style-type: none"> <li>• Use of addition and multiplication laws</li> <li>• Know and use <ul style="list-style-type: none"> <li>○ Mutually exclusive events</li> <li>○ Exhaustive events</li> <li>○ Statistical dependence/independence</li> </ul> </li> <li>• Calculate combined probabilities – to include <ul style="list-style-type: none"> <li>○ Tree diagrams</li> <li>○ Venn diagrams</li> <li>○ 2-way tables</li> </ul> </li> </ul>
22		
23		<u><b>Binomial Distribution</b></u> <ul style="list-style-type: none"> <li>• Calculate probabilities using the binomial distribution</li> <li>• Links to binomial expansion and tree diagrams</li> </ul>
24		

**AS Further Mathematics - Units 1, 2A & 2B**

<b>Week</b>	<b>Teacher 1</b>	<b>Teacher 2</b>
<b>1</b>	<b><u>Complex Numbers(i)</u></b> <ul style="list-style-type: none"> <li>• Definitions of real and imaginary parts</li> <li>• Add, subtract, multiply and divide complex numbers</li> <li>• Complex roots of equations</li> <li>• Complex conjugates</li> </ul>	<b><u>Matrices</u></b> <ul style="list-style-type: none"> <li>• Add, subtract, multiply, divide</li> <li>• Zero and identity matrices</li> </ul>
<b>2</b>	<b><u>Complex Numbers(ii)</u></b> <ul style="list-style-type: none"> <li>• Modulus-Argument form                             <ul style="list-style-type: none"> <li>○ Use of radian measure</li> <li>○ Multiply and divide complex numbers</li> </ul> </li> </ul>	<b><u>Simultaneous Equations</u></b> <ul style="list-style-type: none"> <li>• Determinants</li> <li>• Inverse matrices</li> <li>• Application to solution of <math>2 \times 2</math> and <math>3 \times 3</math> equations</li> <li>• Conditions for systems of linear equations to have unique, infinitely many or no solutions</li> </ul>
<b>3</b>	<b><u>Complex Numbers(iii)</u></b> <ul style="list-style-type: none"> <li>• Argand diagrams                             <ul style="list-style-type: none"> <li>○ Use and interpret</li> <li>○ Simple loci</li> </ul> </li> </ul>	
<b>4</b>		
<b>5</b>	<b><u>Vectors(i)</u></b>	<b><u>Transformation Matrices</u></b> <ul style="list-style-type: none"> <li>• Use of matrices to represent 2-d linear transformations</li> <li>• Successive transformations</li> <li>• Invariant points and lines</li> <li>• Determinant as scale factor</li> <li>• Implication of singular matrices</li> </ul>
<b>6</b>	<ul style="list-style-type: none"> <li>• Vectors in 3-d</li> <li>• Equation of line in vector and Cartesian form</li> <li>• Scalar product</li> <li>• Angle between 2 vectors/lines</li> <li>• Parallel/perpendicular lines</li> <li>• Intersecting and skew lines</li> </ul>	
<b>7</b>		
<b>8</b>	<b><u>Vectors(ii)</u></b>	<b><u>Hooke's Law</u></b> <ul style="list-style-type: none"> <li>• Tension in an elastic string/spring</li> <li>• Application to problems involving elastic strings/springs</li> <li>• Elastic limits</li> </ul>
<b>9</b>	<ul style="list-style-type: none"> <li>• Vector and Cartesian form of the equation of a plane</li> <li>• Angle between 2 planes</li> <li>• Angle between line and plane</li> <li>• Intersection of line and plane</li> <li>• Vector product</li> <li>• Application to areas and volumes</li> <li>• Perpendicular distance between 2 lines</li> <li>• Distance from point to line</li> <li>• Distance from point to plane</li> <li>• Equation of line of intersection of 2 planes</li> </ul>	
<b>10</b>		

Week	Teacher 1	Teacher 2
11	<b>Quadratics</b>	<b>Work &amp; Energy</b>
12	<ul style="list-style-type: none"> <li>Use of relationship between roots and coefficients of quadratic equation</li> <li>Formation of quadratic equation with roots related to those of a given quadratic equation.</li> </ul>	<ul style="list-style-type: none"> <li>Calculation of WD in the case of: <ul style="list-style-type: none"> <li>Simple linear motion</li> <li>Motion given in vector form</li> <li>A variable force</li> </ul> </li> </ul>
13	<b>Circular Motion</b>	<ul style="list-style-type: none"> <li>Calculation of: <ul style="list-style-type: none"> <li>Kinetic energy</li> <li>Gravitational potential energy</li> <li>Elastic potential energy</li> </ul> </li> <li>Relationship between work done and energy for conservative and non-conservative forces</li> </ul>
14	<ul style="list-style-type: none"> <li>Problems involving motion in a horizontal circle <ul style="list-style-type: none"> <li>Banked tracks</li> <li>Conical pendulum</li> <li>Inside of sphere/hemisphere</li> </ul> </li> </ul>	<b>Power</b>
15		<ul style="list-style-type: none"> <li>Definition of power as: <ul style="list-style-type: none"> <li>Rate of change of work</li> <li>Rate of change of energy</li> </ul> </li> <li>Application to: <ul style="list-style-type: none"> <li>Vehicles in motion</li> <li>Pumps raising and ejecting water</li> </ul> </li> </ul>
16		<b>Further Circular Motion</b>
17	<ul style="list-style-type: none"> <li>Motion in a vertical circle</li> <li>To include proofs of standard results</li> </ul>	<b>Relative Velocity</b>
18		<ul style="list-style-type: none"> <li>Resultant velocity in graphical or vector form</li> <li>Calculation of relative velocity</li> <li>Interception problems</li> <li>Minimum distance problems</li> </ul>
19	<b>Dimensions</b>	
	<ul style="list-style-type: none"> <li>Check equations and expressions for dimensional consistency</li> <li>Use method of dimensions to derive equations connecting physical quantities, assuming a product relationship</li> </ul>	
20	<b>Gravitation</b>	<b>Further Particle Equilibrium</b>
21	<ul style="list-style-type: none"> <li>Use of universal law of gravitation</li> <li>Application to problems involving satellite motion</li> </ul>	<ul style="list-style-type: none"> <li>More complex problems including elastic strings or springs on a rough plane</li> </ul>

**AS Further Mathematics - Units 1, 2A & 2C**

<b>Week</b>	<b>Teacher 1</b>	<b>Teacher 2</b>
<b>1</b>	<p><b><u>Complex Numbers(i)</u></b></p> <ul style="list-style-type: none"> <li>• Definitions of real and imaginary parts</li> <li>• Add, subtract, multiply and divide complex numbers</li> <li>• Complex roots of equations</li> <li>• Complex conjugates</li> </ul>	<p><b><u>Matrices</u></b></p> <ul style="list-style-type: none"> <li>• Add, subtract, multiply, divide</li> <li>• Zero and identity matrices</li> </ul>
<b>2</b>	<p><b><u>Complex Numbers(ii)</u></b></p> <ul style="list-style-type: none"> <li>• Modulus-Argument form                             <ul style="list-style-type: none"> <li>○ Use of radian measure</li> <li>○ Multiply and divide complex numbers</li> </ul> </li> </ul>	<p><b><u>Simultaneous Equations</u></b></p> <ul style="list-style-type: none"> <li>• Determinants</li> <li>• Inverse matrices</li> <li>• Application to solution of <math>2 \times 2</math> and <math>3 \times 3</math> equations</li> <li>• Conditions for systems of linear equations to have unique, infinitely many or no solutions</li> </ul>
<b>3</b>	<p><b><u>Complex Numbers(iii)</u></b></p> <ul style="list-style-type: none"> <li>• Argand diagrams                             <ul style="list-style-type: none"> <li>○ Use and interpret</li> <li>○ Simple loci</li> </ul> </li> </ul>	
<b>4</b>		
<b>5</b>	<p><b><u>Vectors(i)</u></b></p>	<p><b><u>Transformation Matrices</u></b></p> <ul style="list-style-type: none"> <li>• Use of matrices to represent 2-d linear transformations</li> <li>• Successive transformations</li> <li>• Invariant points and lines</li> <li>• Determinant as scale factor</li> <li>• Implication of singular matrices</li> </ul>
<b>6</b>	<ul style="list-style-type: none"> <li>• Vectors in 3-d</li> <li>• Equation of line in vector and Cartesian form</li> <li>• Scalar product</li> <li>• Angle between 2 vectors/lines</li> <li>• Parallel/perpendicular lines</li> <li>• Intersecting and skew lines</li> </ul>	
<b>7</b>		
<b>8</b>	<p><b><u>Vectors(ii)</u></b></p>	<p><b><u>Hooke's Law</u></b></p> <ul style="list-style-type: none"> <li>• Tension in an elastic string/spring</li> <li>• Application to problems involving elastic strings/springs</li> <li>• Elastic limits</li> </ul>
<b>9</b>	<ul style="list-style-type: none"> <li>• Vector and Cartesian form of the equation of a plane</li> <li>• Angle between 2 planes</li> <li>• Angle between line and plane</li> <li>• Intersection of line and plane</li> <li>• Vector product</li> <li>• Application to areas and volumes</li> <li>• Perpendicular distance between 2 lines</li> <li>• Distance from point to line</li> <li>• Distance from point to plane</li> <li>• Equation of line of intersection of 2 planes</li> </ul>	
<b>10</b>		

Week	Teacher 1	Teacher 2
11	<b>Quadratics</b>	<b>Work &amp; Energy</b>
12	<ul style="list-style-type: none"> <li>Use of relationship between roots and coefficients of quadratic equation</li> <li>Formation of quadratic equation with roots related to those of a given quadratic equation.</li> </ul>	<ul style="list-style-type: none"> <li>Calculation of WD in the case of: <ul style="list-style-type: none"> <li>Simple linear motion</li> <li>Motion given in vector form</li> <li>A variable force</li> </ul> </li> </ul>
13	<b>Circular Motion</b>	<ul style="list-style-type: none"> <li>Calculation of: <ul style="list-style-type: none"> <li>Kinetic energy</li> <li>Gravitational potential energy</li> <li>Elastic potential energy</li> </ul> </li> <li>Relationship between work done and energy for conservative and non-conservative forces</li> </ul>
14	<ul style="list-style-type: none"> <li>Problems involving motion in a horizontal circle <ul style="list-style-type: none"> <li>Banked tracks</li> <li>Conical pendulum</li> <li>Inside of sphere/hemisphere</li> </ul> </li> </ul>	<b>Power</b>
15		
16	<b>Discrete Probability Distributions</b>	<ul style="list-style-type: none"> <li>Definition of power as: <ul style="list-style-type: none"> <li>Rate of change of work</li> <li>Rate of change of energy</li> </ul> </li> <li>Application to: <ul style="list-style-type: none"> <li>Vehicles in motion</li> <li>Pumps raising and ejecting water</li> </ul> </li> </ul>
17	<ul style="list-style-type: none"> <li>Understanding of probability function, mean, variance and standard deviation</li> <li>Calculation of <math>P(a \leq X \leq b)</math>, <math>E(X)</math> and <math>\text{Var}(X)</math></li> <li>Calculate and use the expressions for <math>E(aX + b)</math> and <math>\text{Var}(aX + b)</math></li> <li>Calculation of associated values of a geometric distribution</li> </ul>	<b>Sampling</b>
18	<b>Poisson Distribution</b>	<b>Bivariate Distributions</b>
19	<ul style="list-style-type: none"> <li>Calculation of probabilities using the Poisson distribution</li> <li>Application to problems involving Poisson distributions</li> <li>Use of the mean and variance of the binomial, geometric and Poisson distributions</li> </ul>	
20	<b>Continuous Probability Distributions</b>	<b>Probability</b>
21	<ul style="list-style-type: none"> <li>Calculation of <math>P(a &lt; X \leq b)</math>, <math>E(X)</math> and <math>\text{Var}(X)</math></li> <li>Calculate and use the expressions for <math>E(aX + b)</math> and <math>\text{Var}(aX + b)</math></li> </ul>	

**AS Further Mathematics - Units 1, 2A & 2D**

<b>Week</b>	<b>Teacher 1</b>	<b>Teacher 2</b>
<b>1</b>	<p><b><u>Complex Numbers(i)</u></b></p> <ul style="list-style-type: none"> <li>• Definitions of real and imaginary parts</li> <li>• Add, subtract, multiply and divide complex numbers</li> <li>• Complex roots of equations</li> <li>• Complex conjugates</li> </ul>	<p><b><u>Matrices</u></b></p> <ul style="list-style-type: none"> <li>• Add, subtract, multiply, divide</li> <li>• Zero and identity matrices</li> </ul>
<b>2</b>	<p><b><u>Complex Numbers(ii)</u></b></p> <ul style="list-style-type: none"> <li>• Modulus-Argument form                             <ul style="list-style-type: none"> <li>○ Use of radian measure</li> <li>○ Multiply and divide complex numbers</li> </ul> </li> </ul>	<p><b><u>Simultaneous Equations</u></b></p> <ul style="list-style-type: none"> <li>• Determinants</li> <li>• Inverse matrices</li> <li>• Application to solution of <math>2 \times 2</math> and <math>3 \times 3</math> equations</li> <li>• Conditions for systems of linear equations to have unique, infinitely many or no solutions</li> </ul>
<b>3</b>	<p><b><u>Complex Numbers(iii)</u></b></p> <ul style="list-style-type: none"> <li>• Argand diagrams                             <ul style="list-style-type: none"> <li>○ Use and interpret</li> <li>○ Simple loci</li> </ul> </li> </ul>	
<b>4</b>		
<b>5</b>	<p><b><u>Vectors(i)</u></b></p>	<p><b><u>Transformation Matrices</u></b></p> <ul style="list-style-type: none"> <li>• Use of matrices to represent 2-d linear transformations</li> <li>• Successive transformations</li> <li>• Invariant points and lines</li> <li>• Determinant as scale factor</li> <li>• Implication of singular matrices</li> </ul>
<b>6</b>	<ul style="list-style-type: none"> <li>• Vectors in 3-d</li> <li>• Equation of line in vector and Cartesian form</li> <li>• Scalar product</li> <li>• Angle between 2 vectors/lines</li> <li>• Parallel/perpendicular lines</li> <li>• Intersecting and skew lines</li> </ul>	
<b>7</b>		
<b>8</b>	<p><b><u>Vectors(ii)</u></b></p>	<p><b><u>Hooke's Law</u></b></p> <ul style="list-style-type: none"> <li>• Tension in an elastic string/spring</li> <li>• Application to problems involving elastic strings/springs</li> <li>• Elastic limits</li> </ul>
<b>9</b>	<ul style="list-style-type: none"> <li>• Vector and Cartesian form of the equation of a plane</li> <li>• Angle between 2 planes</li> <li>• Angle between line and plane</li> <li>• Intersection of line and plane</li> <li>• Vector product</li> <li>• Application to areas and volumes</li> <li>• Perpendicular distance between 2 lines</li> <li>• Distance from point to line</li> <li>• Distance from point to plane</li> <li>• Equation of line of intersection of 2 planes</li> </ul>	
<b>10</b>		



Week	Teacher 1	Teacher 2
11	<b>Quadratics</b>	<b>Work &amp; Energy</b>
12	<ul style="list-style-type: none"> <li>Use of relationship between roots and coefficients of quadratic equation</li> <li>Formation of quadratic equation with roots related to those of a given quadratic equation.</li> </ul>	<ul style="list-style-type: none"> <li>Calculation of WD in the case of: <ul style="list-style-type: none"> <li>Simple linear motion</li> <li>Motion given in vector form</li> <li>A variable force</li> </ul> </li> </ul>
13	<b>Circular Motion</b> <ul style="list-style-type: none"> <li>Use of angular speed and the relation <math>v = r\omega</math></li> <li>Use of acceleration and the formulae <math>a = r\omega^2</math> and <math>a = v^2/r</math></li> <li>Problems involving motion in a horizontal circle <ul style="list-style-type: none"> <li>Banked tracks</li> <li>Conical pendulum</li> <li>Inside of sphere/hemisphere</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Calculation of: <ul style="list-style-type: none"> <li>Kinetic energy</li> <li>Gravitational potential energy</li> <li>Elastic potential energy</li> </ul> </li> <li>Relationship between work done and energy for conservative and non-conservative forces</li> </ul>
14		<b>Power</b>
15		<ul style="list-style-type: none"> <li>Definition of power as: <ul style="list-style-type: none"> <li>Rate of change of work</li> <li>Rate of change of energy</li> </ul> </li> <li>Application to: <ul style="list-style-type: none"> <li>Vehicles in motion</li> <li>Pumps raising and ejecting water</li> </ul> </li> </ul>
16	<b>Recurrence Relations</b> <ul style="list-style-type: none"> <li>Use of basic recurrence models</li> <li>Solve recurrence relations – to include: <ul style="list-style-type: none"> <li>Homogenous</li> <li>Constant coefficient</li> <li>Linear</li> <li>Fibonacci-type</li> </ul> </li> </ul>	<b>Group Theory</b>
17		<ul style="list-style-type: none"> <li>Definition of binary operation, commutative and associative laws and closure</li> <li>Conditions for a binary operation to form a group</li> <li>Groups may include symmetry groups, permutation groups, groups of <math>2 \times 2</math> matrices, groups under modulo arithmetic</li> <li>Order of group</li> <li>Period of element</li> <li>Subgroups – knowledge of Lagrange’s theorem</li> <li>Cyclic groups – knowledge of generators</li> <li>Isomorphisms</li> </ul>
18	<b>Graph Theory</b>	
19	<ul style="list-style-type: none"> <li>Basic concepts of graph theory and associated terminology</li> <li>Knowledge of specific types of graphs such as: <ul style="list-style-type: none"> <li>Complete graph</li> <li>Complete bipartite graph</li> <li>Star on <math>n</math> vertices</li> </ul> </li> <li>Knowledge of traversability of graphs and associated terminology</li> <li>Use of weighted edges and digraphs</li> <li>Knowledge of basic concepts of trees and the associated terminology</li> </ul>	
20	<b>Algorithms</b>	<b>Truth Tables</b>
21	<ul style="list-style-type: none"> <li>Definition of an algorithm, including the greedy algorithm</li> <li>Solution of problems involving critical path analysis</li> <li>Use of Prim’s algorithm</li> <li>Binary trees and breadth first search and depth first search</li> <li>Use of Dijkstra’s algorithm</li> </ul>	<ul style="list-style-type: none"> <li>Use of truth tables to prove equivalence of propositional statements</li> </ul>

**AS Further Mathematics - Units 1, 2C & 2D**

<b>Week</b>	<b>Teacher 1</b>	<b>Teacher 2</b>
<b>1</b>	<p><b><u>Complex Numbers(i)</u></b></p> <ul style="list-style-type: none"> <li>• Definitions of real and imaginary parts</li> <li>• Add, subtract, multiply and divide complex numbers</li> <li>• Complex roots of equations</li> <li>• Complex conjugates</li> </ul>	<p><b><u>Matrices</u></b></p> <ul style="list-style-type: none"> <li>• Add, subtract, multiply, divide</li> <li>• Zero and identity matrices</li> </ul>
<b>2</b>	<p><b><u>Complex Numbers(ii)</u></b></p> <ul style="list-style-type: none"> <li>• Modulus-Argument form                             <ul style="list-style-type: none"> <li>○ Use of radian measure</li> <li>○ Multiply and divide complex numbers</li> </ul> </li> </ul>	<p><b><u>Simultaneous Equations</u></b></p> <ul style="list-style-type: none"> <li>• Determinants</li> <li>• Inverse matrices</li> <li>• Application to solution of <math>2 \times 2</math> and <math>3 \times 3</math> equations</li> <li>• Conditions for systems of linear equations to have unique, infinitely many or no solutions</li> </ul>
<b>3</b>	<p><b><u>Complex Numbers(iii)</u></b></p> <ul style="list-style-type: none"> <li>• Argand diagrams                             <ul style="list-style-type: none"> <li>○ Use and interpret</li> <li>○ Simple loci</li> </ul> </li> </ul>	
<b>4</b>		
<b>5</b>	<p><b><u>Vectors(i)</u></b></p>	<p><b><u>Transformation Matrices</u></b></p> <ul style="list-style-type: none"> <li>• Use of matrices to represent 2-d linear transformations</li> <li>• Successive transformations</li> <li>• Invariant points and lines</li> <li>• Determinant as scale factor</li> <li>• Implication of singular matrices</li> </ul>
<b>6</b>	<ul style="list-style-type: none"> <li>• Vectors in 3-d</li> <li>• Equation of line in vector and Cartesian form</li> <li>• Scalar product</li> <li>• Angle between 2 vectors/lines</li> <li>• Parallel/perpendicular lines</li> <li>• Intersecting and skew lines</li> </ul>	
<b>7</b>		
<b>8</b>	<p><b><u>Vectors(ii)</u></b></p>	<p><b><u>Quadratics</u></b></p> <ul style="list-style-type: none"> <li>• Use of relationship between roots and coefficients of quadratic equation</li> <li>• Formation of quadratic equation with roots related to those of a given quadratic equation.</li> </ul>
<b>9</b>	<ul style="list-style-type: none"> <li>• Vector and Cartesian form of the equation of a plane</li> <li>• Angle between 2 planes</li> <li>• Angle between line and plane</li> <li>• Intersection of line and plane</li> <li>• Vector product</li> <li>• Application to areas and volumes</li> <li>• Perpendicular distance between 2 lines</li> <li>• Distance from point to line</li> <li>• Distance from point to plane</li> <li>• Equation of line of intersection of 2 planes</li> </ul>	
<b>10</b>		

Week	Teacher 1	Teacher 2
11	<p><b><u>Sampling</u></b></p> <ul style="list-style-type: none"> <li>Understanding of sampling techniques: <ul style="list-style-type: none"> <li>Simple random</li> <li>Stratified</li> <li>Opportunity</li> <li>Quota</li> <li>Cluster</li> </ul> </li> <li>Select and critique techniques</li> </ul>	<p><b><u>Discrete Probability Distributions</u></b></p> <ul style="list-style-type: none"> <li>Understanding of probability function, mean, variance and standard deviation</li> <li>Calculation of <math>P(a \leq X \leq b)</math>, <math>E(X)</math> and <math>\text{Var}(X)</math></li> <li>Calculate and use the expressions for <math>E(aX + b)</math> and <math>\text{Var}(aX + b)</math></li> <li>Calculation of associated values of a geometric distribution</li> </ul>
12	<p><b><u>Bivariate Distributions</u></b></p>	<p><b><u>Poisson Distribution</u></b></p> <ul style="list-style-type: none"> <li>Calculation of probabilities using the Poisson distribution</li> <li>Application to problems involving Poisson distributions</li> <li>Use of the mean and variance of the binomial, geometric and Poisson distributions</li> </ul>
13	<ul style="list-style-type: none"> <li>Understanding of independent and dependent variables</li> <li>Calculation and interpretation of product-moment correlation coefficient</li> <li>Calculation of equation of regression line</li> <li>Use of regression line to make predictions</li> <li>Understanding of dangers of extrapolation</li> </ul>	
14	<p><b><u>Probability</u></b></p>	<p><b><u>Continuous Probability Distributions</u></b></p> <ul style="list-style-type: none"> <li>Calculation of <math>P(a &lt; X \leq b)</math>, <math>E(X)</math> and <math>\text{Var}(X)</math></li> <li>Calculate and use the expressions for <math>E(aX + b)</math> and <math>\text{Var}(aX + b)</math></li> </ul>
15	<ul style="list-style-type: none"> <li>Calculate the number of arrangements/combinations of <math>r</math> objects from <math>n</math> objects</li> <li>Calculate arrangements and combinations taking account of repetitions and/or restrictions</li> <li>Evaluate probabilities in simple cases using permutations and combinations</li> </ul>	
16	<p><b><u>Recurrence Relations</u></b></p>	<p><b><u>Group Theory</u></b></p> <ul style="list-style-type: none"> <li>Definition of binary operation, commutative and associative laws and closure</li> <li>Conditions for a binary operation to form a group</li> <li>Groups may include symmetry groups, permutation groups, groups of <math>2 \times 2</math> matrices, groups under modulo arithmetic</li> <li>Order of group</li> <li>Period of element</li> <li>Subgroups – knowledge of Lagrange’s theorem</li> <li>Cyclic groups – knowledge of generators</li> <li>Isomorphisms</li> </ul>
17	<ul style="list-style-type: none"> <li>Use of basic recurrence models</li> <li>Solve recurrence relations – to include: <ul style="list-style-type: none"> <li>Homogenous</li> <li>Constant coefficient</li> <li>Linear</li> <li>Fibonacci-type</li> </ul> </li> </ul>	
18	<p><b><u>Graph Theory</u></b></p>	
19	<ul style="list-style-type: none"> <li>Basic concepts of graph theory and associated terminology</li> <li>Knowledge of specific types of graphs such as: <ul style="list-style-type: none"> <li>Complete graph</li> <li>Complete bipartite graph</li> <li>Star on <math>n</math> vertices</li> </ul> </li> <li>Knowledge of traversability of graphs and associated terminology</li> <li>Use of weighted edges and digraphs</li> <li>Knowledge of basic concepts of trees and the associated terminology</li> </ul>	
20	<p><b><u>Algorithms</u></b></p>	<p><b><u>Truth Tables</u></b></p> <ul style="list-style-type: none"> <li>Use of truth tables to prove equivalence of propositional statements</li> </ul>
21	<ul style="list-style-type: none"> <li>Definition of an algorithm, including the greedy algorithm</li> <li>Solution of problems involving critical path analysis</li> <li>Use of Prim’s algorithm</li> <li>Binary trees and breadth first search and depth first search</li> <li>Use of Dijkstra’s algorithm</li> </ul>	