



**VCE INDUCTION PACKAGE 2022**

**UNITS 3 AND 4**

**Further Mathematics Units 3 & 4**



**WELCOME!**

Dear students,

Welcome to Further Mathematics Units 3 and 4.

If you are well organised, motivated and have a good work ethic, you will have an enjoyable and successful year in Further Mathematics.

In order to get the most out of this course, there are a number of things that we strongly suggest that you do over the summer and continue throughout 2022.

1. Complete the holiday homework by the due date.
2. Familiarise yourself with the detailed course outline provided in this package.
3. Develop a good working relationship with your class teacher and maintain regular communication with them throughout the year.
4. Develop a study timetable that will assist you in meeting the work deadlines.
5. Ensure that you become familiar with the resources (prescribed textbook, websites, notes, other textbooks)
6. Visit the VCAA website regularly to familiarise yourself with past examination papers and to read the examiners' reports: [www.vcaa.vic.edu.au](http://www.vcaa.vic.edu.au)
7. Become familiar with the school's VCE compliance policy by reading the VCE handbook located on MOODLE.
8. Communicate with students who have studied the subject in previous years to get their perspective and suggestions for success.
9. Ensure that you have a balanced life that consists of schoolwork, exercise, sport, leisure, rest and a healthy diet.

If you have any queries about the course, please contact me at school or by email.

On behalf of the Further Mathematics Study staff, we wish you all the best for your studies next year,

Regards,

Further Mathematics teachers

## Email addresses/Staffroom locations of Staff teaching subject

NAME OF TEACHER	EMAIL ADDRESS	LOCATION
Kath Quintal	<a href="mailto:quintalk@vermontsc.vic.edu.au">quintalk@vermontsc.vic.edu.au</a>	Main staff work room
Claire Glanville	<a href="mailto:glanvillec@vermontsc.vic.edu.au">glanvillec@vermontsc.vic.edu.au</a>	Year 8 Office
Cindy Wu	<a href="mailto:wuc@vermontsc.vic.edu.au">wuc@vermontsc.vic.edu.au</a>	Main staff work room

## Units 3 and 4: Further Mathematics

Further Mathematics consists of two areas of study, a compulsory Core area of study to be completed in Unit 3 and an Applications area of study to be completed in Unit 4. The Core comprises 'Data analysis' and Recursion and financial modelling'. The Applications comprises two modules to be completed in their entirety, from a selection of four possible modules: 'Matrices', 'Networks and decision mathematics', 'Geometry and measurement' and 'Graphs and relations'. 'Data analysis' comprises 40 per cent of the content to be covered, 'Recursion and financial modelling' comprises 20 percent of the content to be covered, and each selected module comprises 20 per cent of the content to be covered.

Assumed knowledge and skills for the Core are contained in the General Mathematics Units 1 and 2 topics: Computation and practical arithmetic', 'Investigating and comparing data distributions', 'Investigating relationships between two numerical variables', 'Linear graphs and modelling', 'Linear relations and equations' and 'Number patterns and recursions'. For each module there are related topics in General Mathematics Units 1 and 2.

In undertaking these units, students are expected to be able to apply techniques, routines, and processes involving rational and real arithmetic, sets, lists and tables, diagrams and geometric constructions, algebraic manipulation, equations, and graphs. They should have a facility with relevant mental and by-hand approaches to estimation and computation. The use of numerical, graphical, geometric, symbolic, financial and statistical functionality of technology for teaching and learning mathematics, for working mathematically, and in related assessment, is to be incorporated throughout each unit as applicable.

### AREAS OF STUDY

There are two areas of study:

#### 1. Data analysis

Recursion and financial modelling.

#### 2. Applications – module material:

Module 1: Matrices

\*Module 2: Networks and decision mathematics

Module 3: Geometry and Measurement

\*Module 4: Graphs and relations

\*note that we will not be doing these modules in 2021.

### 1. The Core

#### **Data Analysis**

This area of study covers the presentation, summary, description and analysis of data, regression analysis and time series data.

#### **Recursion and financial modelling**

This topic covers the use of first –order linear recurrence relations and technology to model and analyse a range of financial situations, and solve related problems involving interest, appreciation and depreciation, loans, annuities and perpetuities

## **2. Applications - Modules**

### **Module 1: Matrices**

This module covers definition of matrices, different types of matrices, matrix operations, transition matrices and the use of first-order linear matrix recurrence relations to model a range of situations and solve related problems. technology is to be used to carry out computations as applicable.

**All students are likely to study this module.**

### **Module 2: Networks and Decision Mathematics**

This module covers definition and representation of different kinds of undirected and directed graphs, eulerian trails, eulerian circuits, bridges, Hamiltonian paths and cycles, and the use of networks to model and solve problems involving travel, connection, flow, matching, allocation and scheduling.

**Not many students are likely to study this module.**

### **Module 3: Geometry and Measurement**

This module covers the use of measurement, geometry and trigonometry to formulate and solve problems involving angle, length, area and volume in two and three dimensions, with respect to objects, the plane and the surface of the earth.

**All students are likely to study this module.**

### **Module 4: Graphs and Relations**

This module covers the use of linear relations, including piecewise defined relations, and non-linear relations to model a range of practical situations and solve related problems, including optimization problems by linear programming.

Familiarity with plotting and sketching straight lines and methods of determining the equation of a straight line given the coordinates of two points on the line, or gradient and one point on the line, is assumed.

**Not many students are likely to study this module.**

## **UNIT 3 OUTCOMES**

For this unit the student is required to demonstrate achievement of three outcomes. As a set these outcomes encompass Area of Study 1.

### **Outcome 1**

On completion of this unit the student should be able to define and explain key terms and concepts as specified in the content from the Area of Study 1, and use this knowledge to apply related mathematical procedures to solve routine application problems.

**Outcome 2**

On completion of this unit the student should be able to use mathematical concepts and skills developed in the Area of Study 1 in a range of contexts of increasing complexity. To be able to analyse a practical and extended situation, and interpret and discuss the outcomes of this analysis in relation to key features of that situation.

**Outcome 3**

On completion of this unit the student should be able to select and appropriately use technology to develop mathematical ideas, produce results and carry out analysis in situations requiring problem solving, modelling or investigative techniques or approaches in the Area of Study 1.

**UNIT 4 OUTCOMES**

For this unit the student is required to demonstrate achievement of three outcomes. As a set these outcomes encompass the two selected modules from the ‘Applications’ area of study.

**Outcome 1**

Define and explain key concepts as specified in the content from the two selected modules, and apply related mathematical techniques and models in routine contexts.

**Outcome 2**

Select and apply the mathematical concepts, models and techniques from the two selected modules in a range of contexts of increasing complexity.

**Outcome 3**

Select and appropriately use numerical, graphical, symbolic and statistical functionalities of technology to develop mathematical ideas, produce results and carry out analysis in situations requiring problem-solving, modelling or investigative techniques or approaches.

# Year 12 Further Maths 2022

WEEK	MONDAY	TOPIC	CONTENT	EXERCISES	ASSESSMENT
<b>Term 4 2020</b>					
10.1	6-DEC	<b>UNIVARIATE STATISTICS</b>	Classifying data, Bar charts and Segmented Bar Charts	Worksheet 1, 2	
10.2			Histograms, Dot plots	3, 4	
10.3	10-DEC		Stem plots and split stems	5, 6	
<b>Term 1 28 Jan – 1 April</b>					
<b><i>Univariate Data Statistics</i></b>					
Friday	28-Jan				<b>Staff return</b>
Monday	31-Jan	<b>UNIVARIATE STATISTICS</b>	Test on holiday homework to meet outcomes. Median, range and interquartile range	Worksheet 8, 9	<b>Students return</b>
Wednesday	2-Feb				
	3-Feb				<b>Year 12 camp</b>
	4-Feb				<b>Year 12 camp</b>

<b>Week 2</b>	<b>7-Feb</b>	<b>UNIVARIATE STATISTICS</b>			
2.1			Five-number summary, box plots Relating a box plot to shape. Reporting on Boxplots	Ex 2C Q1-10 Ex 2D and Ex 2E Q1	
2.2			Rounding and significant figures	Worksheet 7	
2.3					
<b>3</b>	<b>14-Feb</b>	<b>UNIVARIATE STATISTICS</b>	<i>Junior Swimming Sports 16<sup>th</sup> February</i>		
3.1			Histograms with log scales.	Ex 1D	
3.2			Mean. Standard Deviation	Ex 2F-1 and Ex 2F-2	
3.3			Normal distribution	Ex 2G Q1-5	
<b>4</b>	<b>21-Feb</b>	<b>UNIVARIATE STATISTICS</b>			
4.1			Standardised scores	Ex 2H, Ch 2 Review	
4.2		<b>BIVARIATE STATISTICS</b>	Response and Explanatory Variables, Two-way frequency tables and Segmented bar charts	Ex 3A,3B	
4.3			Parallel boxplots and dot plots, back-to-back stem plots	Ex 3C	
<b>5</b>	<b>28-Feb</b>	<b>BIVARIATE STATISTICS</b>	<i>2/3 Sac Ch 1 &amp; 2 Univariate Data</i>		
5.1			Scatterplots, how to interpret scatterplots. Pearson's Correlation coefficient.	Ex 3D, 3E and Ex 3F	
5.2			Coefficient of Determination, Correlation and Causality. Which graph?	Ex 3G Ex 3H, Ex 3I, Ch review	
5.3			Least Squares regression line equation of line using formula and calculator	Ex 4A and Ex 4B	

<b>6</b>	<b>7-Mar</b>	<b>BIVARIATE STATISTICS</b>			
<b>6.1</b>			Sketching a regression line onto a graph. Determining the equation of a regression line from a graph	Worksheet	
<b>6.2</b>			Interpreting the slope and y-intercept of a least squares regression line	Ex 4C Q's 1-5	
<b>6.3</b>			Predictions, interpolation and extrapolation Residual values from question and tables, residual plot	Ex 4C Q's 6-10	
<b>7</b>	<b>14-Mar</b>	<b>BIVARIATE STATISTICS</b>	<b><i>Labour Day Holiday 14th March Athletics Sports Day 18<sup>th</sup> March</i></b>		
<b>7.1</b>			Conducting a regression analysis	Ex 4D	
<b>7.2</b>			Revision		
<b>8</b>	<b>21-Mar</b>	<b>BIVARIATE STATISTICS</b>	<b>23/3 Sac Ch 3&amp;4 Bivariate Data</b>		
<b>8.1</b>			Circle of Transformations	Ex 5A	
<b>8.2</b>			Data Transformations squared		
<b>8.3</b>			Log transformations	Ex 5C	
<b>9</b>	<b>28-Mar</b>	<b>TRANSFORMATIONS</b>			
<b>9.1</b>			Reciprocal Transformations	Ex 5D	
<b>9.2</b>			Revision	Worksheet Ch review	
<b>9.3</b>			Features of Time Series plot. Constructing a time series Plot	Ex 6A	



<b>10</b>	<b>4-April</b>	<b>TIME SERIES</b>	<b>6/4 Sac Ch 5 Transformations</b>		
10.1			Revision		
10.2			Mean smoothing	Ex 6B	
10.3			Median Smoothing.	Ex 6C	
<b>Term 1 Holidays 9-April-25 -April</b>					
<b>1</b>	<b>25-Apr</b>	<b>TIME SERIES</b>	<b>25<sup>th</sup> April Anzac Day public holiday</b>		<b>Term 2</b>
1.1			Seasonal Indices	Ex 6D	
1.2			Seasonal Indices	Ex 6D	
1.3			More seasonal indices. Fitting a trend line and forecasting.	Ex 6E,	
<b>2</b>	<b>2-May</b>	<b>TIME SERIES</b>	<b>4/5 Sac Ch 6 Time Series</b>		
2.1			Revision	Ch 6 review	
2.2			Sequences, Recurrences relations	Worksheet Set 1	
2.3			Simple interest, recurrence relations and rule	Worksheet Set 2	
<b>3.0</b>	<b>9-May</b>	<b>FINANCIAL MATHS</b>			
3.1			Flat rate depreciation, recurrence relation and rule	Worksheet Set 3	
3.2			Unit cost depreciation, recurrence relation and rule	Worksheet Set 4	
3.3			Compound interest recurrence relation and rule	Worksheet Set 5	

4.0	16-May	FINANCIAL MATHS			
4.1			Reducing balance depreciation recurrence relation and rule	Worksheet Set 6	
4.2			Nominal and effective interest rates	Worksheet Set 7	
4.3			Revision		
5	23-May	FINANCIAL MATHS	<i>25/5 Sac Ch 8 Financial</i>		
5.1			Combining growth and decay Reducing-balance loans and their amortisation tables	Ex 9A Ex 9B	
5.2			Reducing-balance loans using a finance solver Reducing-Balance loans with conditions	Ex 9C Q1-6 Ex 9CQ7-9	
5.3			Interest-only loans Annuities and their amortisation tables	Ex 9D Ex 9E Q1-4	
6	30 -May	FINANCIAL MATHS			
6.1			Annuities using a finance solver Perpetuities	Ex 9E Q5-9 Ex 9F	
6.2			Compound interest investments	Ex 9G	
6.3			Ch review		
7	6-June	Matrices	<i>GAT 8<sup>th</sup> June Year 12 Formal 10<sup>th</sup> June</i>		
7.1			Revision		
7.2			What is a matrix? Using Matrices to represent information	11A,11B	
7.3					

<b>8</b>	<b>13-June</b>	<b>Matrices</b>	<b><i>Queen's birthday Monday 13<sup>th</sup> June, Semester 2</i></b>		<b>15/6 Sac Ch 9 Financial</b>
8.1			Matrix Arithmetic, Multiplying a matrix by a number	11C	
8.2			Multiplying a matrix by a matrix - order	11D Q1	
8.3			Multiplying two matrices	11D Q2-11	
<b>9</b>	<b>20-Jun</b>	<b>Matrices</b>			
9.1			Diagonal and percentage change matrices	Worksheet	
9.2			Matrix powers	11E	
9.3			Binary and permutation matrices, communication matrices	11F Q1-5	
			<b><i>Term 2 Holidays 25<sup>th</sup> June-10<sup>th</sup> July</i></b>		
<b>1</b>	<b>11 July</b>	<b>Matrices</b>	<b><i>Term 3 11<sup>th</sup> July-16<sup>th</sup> Sept</i></b>		
1.1			Dominance matrices	11F Q6-7, Ch 11 Review	
1.2			The inverse matrix	12A	
1.3			Simultaneous equations	12B Q1	
<b>2</b>	<b>18-Jul</b>	<b>Matrices</b>			
2.1			Types of solutions	12B Q2-11	
2.2			Matrix equations	Worksheet	
2.3			Transition matrices	12C-1	
<b>3</b>	<b>25-Jul</b>	<b>Matrices</b>			
3.1			Interpreting transition matrices	12C-2	
3.2			Using recursion and rules to find state matrices	12C-3 Q1-2	
3.3			Steady state	12C-3 Q3-5	

<b>4</b>	<b>26-Jul</b>	<b>Matrices</b>			
4.1			Restocking and culling Revision	12C-4, Ch12 Review	
4.2			Similar Figures	Ex 17E	
4.3			Volume and Surface Area	Ex 17F	
<b>5</b>	<b>1-Aug</b>	<b>Geometry</b>	<i>3/8 Ch11 and 12 Sac Matrices</i>		
5.1			Areas, Volumes and similarity	Ex 17G, Ch Review	
5.2			The Sine Rule	Ex 18B	
5.3			Area of a non-right angled Triangle	Ex 18D	
<b>6</b>	<b>8-Aug</b>	<b>Trigonometry</b>			
6.1			Angle of Elevation and Bearings	Ex 18E	
6.2			Problems in Three dimensions	Ex 18 F, Ch review	
6.3			Arc length, Area of a sector, Area of a segment	Ex 19A	
<b>7</b>	<b>15-Aug</b>	<b>Spherical Geometry</b>			
7.1			Latitude and Longitude	Ex 19B Q1-3	
7.2			Distance between two points on the same meridian	Ex 19B Q4-8	
7.3			Distance between two points on the equator	Ex 19B Q13-16	

<b>8</b>	<b>22-Aug</b>	<b>Spherical Geometry</b>		
8.1			Distance around a parallel of latitude, mixed exercises	Ex 19B Q17-22
8.2			Time Zones	Ex 19C
8.3			Time Zones	Worksheets
<b>9</b>	<b>29-Aug</b>	<b>Time Zones</b>		
9.1			Using Pythagoras Theorem in Spheres	Ex 19D
9.2			Revision	
9.3			Revision	
<b>10</b>	<b>5-Sept</b>		<b><i>7/9 Geometry and Trigonometry SAC Ch 17 18 and 19</i></b>	
10.1			Revision	
10.2				
10.3				

VSC has a policy of 90% attendance in VCE. This is strictly monitored in Year 12. Any absence must be followed up with a note for the Student Manager, and if a SAC was missed, then a doctor's certificate is required to allow a re-sit. Make sure you communicate with your teacher if you know you are going to be away for whatever reason eg sport, so that work can be passed on. The onus is on YOU to keep up to date with the class work.

## Assessment

The award of satisfactory completion for a unit is based on a decision that the student has demonstrated achievement of the set of outcomes specified for the unit. This decision will be based on the teacher's assessment of the student's overall performance on assessment tasks designated for the unit.

### Assessment tasks

#### Unit 3 - Total marks 60

A data analysis *application task* (40 marks) using contexts for investigation from a suitable data set selected by the teacher. The task has three components of increasing complexity:

- display and organisation of data
- consideration of general features of the data
- analysis of the data such as regression analysis, the use of transformations to linearity, deseasonalisation, smoothing, or analysis of time series. This task is generally completed over a time period of one week.

**and**

An *analysis task* (20 marks) for Recursion and Financial Modelling.

#### Unit 4 - Total marks 40

Two *analysis tasks*, (20 marks each) with the three outcomes assessed across the tasks. Each *analysis task* is a short item usually completed in a double period.

### Assessment of levels of achievement

The student's level of achievement in Units 3 and 4 will be determined by school-assessed coursework and two end-of-year examinations. School-assessed coursework for Unit 3 will contribute 20 per cent and for Unit 4 will contribute 14 per cent to the study score.

The level of achievement for Units 3 and 4 is also assessed by two end-of-year examinations, which will contribute 66 per cent to the study score.

**Examination 1** - Duration: one and a half hours.

The task is designed to assess students' knowledge of mathematical concepts, their skills in carrying out mathematical algorithms and their ability to apply concepts and skills in standard ways.

The task will consist of **multiple-choice questions** drawn from the 'Data analysis' and 'Applications' areas of study.

An approved graphics calculator or CAS and **one** bound reference, text (which may be annotated) or lecture pad, may be brought into the examination.

The examination will contribute 33 per cent to the study score.

**Examination 2** - Duration: one and a half hours.

Students are required to respond to four sets of extended-answer questions, equally weighted from the Core, 'Data analysis', and the three selected 'Applications' modules. The task is designed to assess students' ability to understand and communicate mathematical ideas, and to interpret, analyse and solve both routine and non-routine problems.

An approved graphics calculator or CAS and **one** bound reference, text (which may be annotated) or lecture pad, may be brought into the examination.

The examination will contribute 33 per cent to the study score.

## Sources of support for the Study – inc. key staff, websites, Sources documentation

### Useful Websites

VCAA

[www.vcaa.vic.edu.au](http://www.vcaa.vic.edu.au)

Mathematical Association of Victoria

[www.mav.vic.edu.au](http://www.mav.vic.edu.au)

Classpad Help Series

<http://www.classpad.com.au/>

Itute (free maths exams/solutions)

[www.itute.com](http://www.itute.com)

## Materials Required – Texts, Stationery, and other Resources

- Writing materials/ruler/eraser
- ‘Essential Further Mathematics (4<sup>th</sup> edition enhanced)
- VCE Further Mathematics Checkpoints 2021
- Casio ClassPad 330 CAS Calculator
- Bound A4 workbooks for class work (NO LOOSE LEAF PAPER!)
- Display Folder/plastic pockets/folios for handouts (at least 4)
- Commitment and dedication

## Holiday Tasks to be completed in preparation for the beginning of the 2021 school year

You will be starting the year with Statistics. Students who do not complete these tasks over the break will be **seriously disadvantaged**.

**Complete it in the Geometry Booklet.** Not on loose leaf.

**You must complete this task.** It is not optional.

In week 5 of the first term you will have a Univariate Data Sac .

Unsatisfactory results, less than 60% will mean you will have a replacement task.