

Victorian Certificate of Education  
2015

## FURTHER MATHEMATICS

## Written examination 1

Friday 30 October 2015

Reading time: 2.00 pm to 2.15 pm (15 minutes)

Writing time: 2.15 pm to 3.45 pm (1 hour 30 minutes)

## MULTIPLE-CHOICE QUESTION BOOK

## Structure of book

Section	Number of questions	Number of questions to be answered	Number of modules	Number of modules to be answered	Number of marks
A	13	13			13
B	54	27	6	3	27
					Total 40

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, one bound reference, one approved graphics calculator or approved CAS calculator or CAS software and, if desired, one scientific calculator. Calculator memory DOES NOT need to be cleared.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.

**Materials supplied**

- Question book of 37 pages with a detachable sheet of miscellaneous formulas in the centrefold.
- Answer sheet for multiple-choice questions.
- Working space is provided throughout the book.

**Instructions**

- Detach the formula sheet from the centre of this book during reading time.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

**At the end of the examination**

- You may keep this question book.

**Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.**

## SECTION A

### Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** for the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

## SECTION B

### Instructions for Section B

Select **three** modules and answer **all** questions within the modules selected in pencil on the answer sheet provided for multiple-choice questions.

Show the modules you are answering by shading the matching boxes on your multiple-choice answer sheet **and** writing the name of the module in the box provided.

Choose the response that is **correct** for the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

### Module 1: Number patterns

Before answering these questions you must **shade** the Number patterns box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

### Module 2: Geometry and trigonometry

Before answering these questions you must **shade** the Geometry and trigonometry box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

### Module 3: Graphs and relations

Before answering these questions you must **shade** the Graphs and relations box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

### Module 4: Business-related mathematics

Before answering these questions you must **shade** the Business-related mathematics box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

### Module 5: Networks and decision mathematics

Before answering these questions you must **shade** the Networks and decision mathematics box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

### Module 6: Matrices

Before answering these questions you must **shade** the Matrices box on the answer sheet for multiple-choice questions and write the name of the module in the box provided.

# **FURTHER MATHEMATICS**

## **Written examinations 1 and 2**

### **FORMULA SHEET**

#### **Instructions**

Detach this formula sheet during reading time.

This formula sheet is provided for your reference.

## Further Mathematics formulas

### Core: Data analysis

standardised score: 
$$z = \frac{x - \bar{x}}{s_x}$$

least squares regression line: 
$$y = a + bx, \quad \text{where } b = r \frac{s_y}{s_x} \quad \text{and} \quad a = \bar{y} - b\bar{x}$$

residual value: 
$$\text{residual value} = \text{actual value} - \text{predicted value}$$

seasonal index: 
$$\text{seasonal index} = \frac{\text{actual figure}}{\text{deseasonalised figure}}$$

### Module 1: Number patterns

arithmetic series: 
$$a + (a + d) + \dots + (a + (n - 1)d) = \frac{n}{2}[2a + (n - 1)d] = \frac{n}{2}(a + l)$$

geometric series: 
$$a + ar + ar^2 + \dots + ar^{n-1} = \frac{a(1 - r^n)}{1 - r}, \quad r \neq 1$$

infinite geometric series: 
$$a + ar + ar^2 + ar^3 + \dots = \frac{a}{1 - r}, \quad |r| < 1$$

### Module 2: Geometry and trigonometry

area of a triangle: 
$$\frac{1}{2}bc \sin A$$

Heron's formula: 
$$A = \sqrt{s(s - a)(s - b)(s - c)}, \quad \text{where } s = \frac{1}{2}(a + b + c)$$

circumference of a circle: 
$$2\pi r$$

area of a circle: 
$$\pi r^2$$

volume of a sphere: 
$$\frac{4}{3}\pi r^3$$

surface area of a sphere: 
$$4\pi r^2$$

volume of a cone: 
$$\frac{1}{3}\pi r^2 h$$

volume of a cylinder: 
$$\pi r^2 h$$

volume of a prism: 
$$\text{area of base} \times \text{height}$$

volume of a pyramid: 
$$\frac{1}{3} \text{area of base} \times \text{height}$$

Pythagoras' theorem:

$$c^2 = a^2 + b^2$$

sine rule:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

cosine rule:

$$c^2 = a^2 + b^2 - 2ab \cos C$$

### Module 3: Graphs and relations

#### Straight-line graphs

gradient (slope):

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

equation:

$$y = mx + c$$

### Module 4: Business-related mathematics

simple interest:

$$I = \frac{PrT}{100}$$

compound interest:

$$A = PR^n, \quad \text{where } R = 1 + \frac{r}{100}$$

hire-purchase:

$$\text{effective rate of interest} \approx \frac{2n}{n+1} \times \text{flat rate}$$

### Module 5: Networks and decision mathematics

Euler's formula:

$$v + f = e + 2$$

### Module 6: Matrices

determinant of a  $2 \times 2$  matrix:

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}; \quad \det A = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

inverse of a  $2 \times 2$  matrix:

$$A^{-1} = \frac{1}{\det A} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix} \quad \text{where } \det A \neq 0$$



# VCE FURTHER MATHEMATICS

## Written Examination 1

### ANSWER SHEET – 2015

STUDENT  
NAME:

JOHN STUDENT

STUDENT NUMBER

9	9	1	2	3	4	5	6	A
0	0	0	0	0	0	0	0	
1	1		1	1	1	1	1	E
2	2	2		2	2	2	2	F
3	3	3	3		3	3	3	G
4	4	4	4	4		4	4	J
5	5	5	5	5	5		5	L
6	6	6	6	6	6	6		R
7	7	7	7	7	7	7	7	T
8	8	8	8	8	8	8	8	W
		9	9	9	9	9	9	X

## INSTRUCTIONS:



SIGN HERE IF YOUR NAME AND NUMBER ARE PRINTED CORRECTLY.

SIGNATURE: J. Student

If your name or number on this sheet is incorrect, notify the Supervisor.

Use a **PENCIL** for **ALL** entries. For each question, shade the box which indicates your answer.All answers must be completed like **THIS** example:

A		C	D	E
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Marks will **NOT** be deducted for incorrect answers.**NO MARK** will be given if more than **ONE** answer is completed for any question.If you make a mistake, **ERASE** the incorrect answer – **DO NOT** cross it out.

## SUPERVISOR USE ONLY

Shade the "**ABSENT**" box if the student was absent from the examination.**ABSENT** ☐SUPERVISOR'S  
INITIALS
SECTION A  
(Compulsory)

## ONE ANSWER PER LINE

1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E
10	A	B	C	D	E
11	A	B	C	D	E
12	A	B	C	D	E
13	A	B	C	D	E

## SECTION B

Answer **THREE** different modules.Show **EACH MODULE** answered by shading the appropriate box  
AND writing in the box below.

Module:

- ☐ Number patterns
- ☐ Geometry & trigonometry
- ☐ Graphs & relations
- ☐ Business-related mathematics
- ☐ Networks & decision mathematics
- ☐ Matrices

Module:

Module:

- ☐ Number patterns
- ☐ Geometry & trigonometry
- ☐ Graphs & relations
- ☐ Business-related mathematics
- ☐ Networks & decision mathematics
- ☐ Matrices

Module:

Module:

- ☐ Number patterns
- ☐ Geometry & trigonometry
- ☐ Graphs & relations
- ☐ Business-related mathematics
- ☐ Networks & decision mathematics
- ☐ Matrices

Module:

## ONE ANSWER PER LINE

1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E

## ONE ANSWER PER LINE

1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E

## ONE ANSWER PER LINE

1	A	B	C	D	E
2	A	B	C	D	E
3	A	B	C	D	E
4	A	B	C	D	E
5	A	B	C	D	E
6	A	B	C	D	E
7	A	B	C	D	E
8	A	B	C	D	E
9	A	B	C	D	E

Please **DO NOT** fold, bend or staple this form.