

**Victorian Certificate of Education  
Year****FURTHER MATHEMATICS****Written examinations 1 and 2****FORMULA SHEET****Instructions**

This formula sheet is provided for your reference.

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

## Further Mathematics formulas

### Core – Data analysis

|                                    |                                                                                |
|------------------------------------|--------------------------------------------------------------------------------|
| standardised score                 | $z = \frac{x - \bar{x}}{s_x}$                                                  |
| lower and upper fence in a boxplot | lower $Q_1 - 1.5 \times IQR$ upper $Q_3 + 1.5 \times IQR$                      |
| least squares line of best fit     | $y = a + bx$ ,      where $b = r \frac{s_y}{s_x}$ and $a = \bar{y} - b\bar{x}$ |
| residual value                     | residual value = actual value – predicted value                                |
| seasonal index                     | seasonal index = $\frac{\text{actual figure}}{\text{deseasonalised figure}}$   |

### Core – Recursion and financial modelling

|                                                                       |                                                                                              |
|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| first-order linear recurrence relation                                | $u_0 = a, \quad u_{n+1} = bu_n + c$                                                          |
| effective rate of interest for a compound interest loan or investment | $r_{\text{effective}} = \left[ \left( 1 + \frac{r}{100n} \right)^n - 1 \right] \times 100\%$ |

### Module 1 – 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     | $A^{-1} = \frac{1}{\det A} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}, \quad \text{where} \quad \det A \neq 0$        |
| recurrence relation                  | $S_0 = \text{initial state}, \quad S_{n+1} = TS_n + B$                                                                    |

### Module 2 – Networks and decision mathematics

|                 |                 |
|-----------------|-----------------|
| Euler's formula | $v + f = e + 2$ |
|-----------------|-----------------|

**Module 3 – Geometry and measurement**

|                           |                                                                                |
|---------------------------|--------------------------------------------------------------------------------|
| area of a triangle        | $A = \frac{1}{2}bc \sin(\theta^\circ)$                                         |
| Heron's formula           | $A = \sqrt{s(s-a)(s-b)(s-c)}, \quad \text{where} \quad s = \frac{1}{2}(a+b+c)$ |
| sine rule                 | $\frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin(C)}$                    |
| cosine rule               | $a^2 = b^2 + c^2 - 2bc \cos(A)$                                                |
| circumference of a circle | $2\pi r$                                                                       |
| length of an arc          | $r \times \frac{\pi}{180} \times \theta^\circ$                                 |
| area of a circle          | $\pi r^2$                                                                      |
| area of a sector          | $\pi r^2 \times \frac{\theta^\circ}{360}$                                      |
| 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 prism         | area of base $\times$ height                                                   |
| volume of a pyramid       | $\frac{1}{3} \times \text{area of base} \times \text{height}$                  |

**Module 4 – Graphs and relations**

|                                     |                                   |
|-------------------------------------|-----------------------------------|
| gradient (slope) of a straight line | $m = \frac{y_2 - y_1}{x_2 - x_1}$ |
| equation of a straight line         | $y = mx + c$                      |