

# **FURTHER MATHEMATICS**

## **Written examination 2**

### **FORMULA SHEET**

#### **Directions to students**

Remove 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 line: 
$$y = a + bx \text{ where } b = r \frac{s_y}{s_x} \text{ and } a = \bar{y} - b\bar{x}$$

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

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

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

### Module 2: Geometry and trigonometry

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

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

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

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

inverse of a  $2 \times 2$  matrix: 
$$A^{-1} = \frac{1}{\det A} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix} \text{ where } \det A \neq 0$$

**END OF FORMULA SHEET**