

FURTHER MATHEMATICS

Written examination 1

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: $y = a + bx$ 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 = $\frac{\text{actual figure}}{\text{deseasonalised figure}}$

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

circumference of a circle: $2\pi r$

area of a circle: πr^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: area of base $\times$ height

volume of a pyramid: $\frac{1}{3}$ area of base $\times$ 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 2×2 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 2×2 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