

Mathematics Advanced
Mathematics Extension 1
Mathematics Extension 2

REFERENCE SHEET

Measurement

Length (arc in degrees)
 $l = \frac{\theta}{360} \times 2\pi r$ (circumference of circle)

Area (in degrees)
 (sector) $A = \frac{\theta}{360} \times \pi r^2$ (area of circle)
 (trapezium) $A = \frac{h}{2}(a + b)$

Surface area

(cylinder) $A = 2\pi r^2 + 2\pi rh$
 (sphere) $A = 4\pi r^2$

Volume

(pyramid) $V = \frac{1}{3}Ah$
 (sphere) $V = \frac{4}{3}\pi r^3$

Functions

(quadratic formula)
 $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
 $\Delta > 0$ 2 real roots (distinct)
 $\Delta = 0$ 1 real root
 $\Delta < 0$ 0 real root

For $ax^3 + bx^2 + cx + d = 0$:

$$\alpha + \beta + \gamma = -\frac{b}{a}$$

$$\alpha\beta + \alpha\gamma + \beta\gamma = \frac{c}{a}$$

$$\text{and } \alpha\beta\gamma = -\frac{d}{a}$$

Relations

$$(x - h)^2 + (y - k)^2 = r^2$$

centre of circle (h, k)
 radius is r

Financial Mathematics

$A = P(1 + r)^n$ (compound interest)
 $\uparrow$ FV $\uparrow$ PV $\uparrow$ rate $\uparrow$ period

Sequences and series

$T_n = a + (n - 1)d$ (arith term formula)
 $\uparrow$ first term $\uparrow$ common difference $\uparrow$ term number

$S_n = \frac{n}{2}[2a + (n - 1)d] = \frac{n}{2}(a + l)$ (sum of arith)
 $\uparrow$ first term $\uparrow$ last term

$T_n = ar^{n-1}$ (geo term formula)
 $\uparrow$ first term $\uparrow$ ratio = $\frac{T_{n+1}}{T_n}$

$S_n = \frac{a(1 - r^n)}{1 - r} = \frac{a(r^n - 1)}{r - 1}, r \neq 1$ (sum of geo)

$S = \frac{a}{1 - r}, |r| < 1$

Logarithmic and Exponential Functions

$\log_a a^x = x = a^{\log_a x}$

$\log_a x = \frac{\log_b x}{\log_b a}$

$a^x = e^{x \ln a}$