Prior Learning SL & HL

Topic 1: Number and algebra - SL & HL

The nth term of an arithmetic sequence

\[ u_n = u_1 + (n - 1)d \]

The nth term of a geometric sequence

\[ u_n = u_1 r^{n-1} \]

The sum of a finite geometric sequence

\[ S_n = \frac{u_1 (1 - r^n)}{1 - r} \quad \text{for } |r| < 1 \]

Topics of interest to SL

Exponents & logarithms

\[ a^x \cdot a^y = a^{x+y} \quad a^x / a^y = a^{x-y} \quad (a^x)^y = a^{xy} \]

Percentage error

\[ \text{Percentage error} = \left| \frac{x_{\text{approximate}} - x_{\text{exact}}}{x_{\text{exact}}} \right| \times 100 \]

Topic 2: Functions – SL & HL

Equations of a straight line

\[ y = mx + c; \quad a \neq 0 \quad b \neq 0 \]

Gradient formula

\[ m = \frac{y_2 - y_1}{x_2 - x_1} \]

Area of a parallelogram

\[ A = \text{base} \times \text{height} \]

Topic 3: Geometry and trigonometry – SL & HL

Distance between two points

\[ d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \]

Area of a parallelogram

\[ A = \frac{1}{2} \left| (x_2 - x_1) + (y_2 - y_1) \right| \]

Volume of a cylinder

\[ V = \pi r^2 h \]

Surface area of a sphere

\[ A = 4\pi r^2 \]

Topic 4: Statistics and probability – SL & HL

Interquartile range

\[ IQR = Q_3 - Q_1 \]

Mean, \( \bar{x} \), of a data set

\[ \bar{x} = \frac{\sum \text{f(i)x(i)}}{\sum \text{f(i)}} \]

Probability of an event \( A \)

\[ P(A) = \frac{n(A)}{n(\Omega)} \]

Complementary events

\[ P(A) + P(A^c) = 1 \]

Mutually exclusive events

\[ P(A \cup B) = P(A) + P(B) \]

Conditional probability

\[ P(A|B) = \frac{P(A \cap B)}{P(B)} \]

Independent events

\[ P(A \cap B) = P(A) \times P(B) \]

Unbiased estimate of a discrete random variable

\[ \hat{X} = \sum x \hat{P}(x) \]

Binomial distribution

\[ X \sim \text{Bi}(n, p) \]

Mean; \( \mu \)

\[ \mu = np \]

Variance; \( \sigma^2 \)

\[ \sigma^2 = np(1-p) \]

Transition matrix

\[ T = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \]

Area enclosed by a curve and \( x \)-axis

\[ A = \int a \ dx \]

The trapezoidal rule

\[ A \approx \frac{b-a}{n} \sum_{i=1}^{n} f(x_i) \]

Topic 5: Calculus – SL & HL

Derivative of \( x^n \)

\[ f(x) = x^n \Rightarrow f'(x) = nx^{n-1} \]

Integral of \( x^n \)

\[ \int x^n \ dx = \frac{x^{n+1}}{n+1} + C \quad n \neq -1 \]

Derivative of \( \sin x \)

\[ f(x) = \sin x \Rightarrow f'(x) = \cos x \]

Derivative of \( \cos x \)

\[ f(x) = \cos x \Rightarrow f'(x) = -\sin x \]

Derivative of \( \tan x \)

\[ f(x) = \tan x \Rightarrow f'(x) = \sec^2 x \]

Derivative of \( e^x \)

\[ f(x) = e^x \Rightarrow f'(x) = e^x \]

Derivative of \( ax \)

\[ f(x) = ax \Rightarrow f'(x) = a \]

Chain rule

\[ y = u(x), \quad u'(x) \]