

IB Maths SL – Formula Sheet

~ Revision Village ~

Topic 1: Algebra

The n^{th} term of an arithmetic sequence	$u_n = u_1 + (n - 1)d$
Sum of an arithmetic sequence	$s_n = \frac{n}{2}(2u_1 + (n - 1)d) = \frac{n}{2}(u_1 + u_n)$
The n^{th} term of a geometric sequence	$u_n = u_1 r^{n-1}$
Sum of a geometric sequence	$s_n = \frac{u_1(r^n - 1)}{r - 1} = s_n = \frac{u_1(1 - r^n)}{1 - r}, r \neq 1$
Sum of an infinity geometric sequence	$s_{\infty} = \frac{u_1}{1 - r}, r < 1$
Exponents & logs	$a^x = b \leftrightarrow x = \log_a b$
Log laws	$\log_a b + \log_a c = \log_a bc$ $\log_a b - \log_a c = \log_a \frac{b}{c}$ $\log_a b^r = r \log_a b$ $\log_c b = \frac{\log_a b}{\log_a c}$
Binomial coefficient	$\binom{n}{r} = \frac{n!}{r!(n - r)!}$
Binomial expansion	$(a + b)^n = a^n + \binom{n}{1} a^{n-1} b + \dots + \binom{n}{r} a^{n-r} b^r + \dots + b^n$

Topic 2: Functions & Equations

Axis of symmetry	$x = \frac{-b}{2a}$
Log & exponential functions	$a^x = e^{x \ln a}$ $\log_a a^x = x = a^{\log_a x}$
Quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Discriminant	$\Delta = b^2 - 4ac$

Topic 3: Circular Functions & Trigonometry

Length of arc	$l = \theta r$
Area of sector	$A = \frac{1}{2} \theta r^2$
Trig identities	$\tan \theta = \frac{\sin \theta}{\cos \theta}$ $\cos^2 \theta + \sin^2 \theta = 1$ $\sin 2\theta = 2 \sin \theta \cos \theta$ $\cos 2\theta = \cos^2 \theta - \sin^2 \theta = 2 \cos^2 \theta - 1 = 1 - 2 \sin^2 \theta$
Cosine rule	$c^2 = a^2 + b^2 - 2ab \cos C$ $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$
Sine rule	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
Area of triangle	$A = \frac{1}{2} ab \sin C$

Topic 4: Vectors

Magnitude of a vector	$ v = \sqrt{v_1^2 + v_2^2 + v_3^2}$
Dot / Scalar product	$v \cdot w = v w \cos \theta$ $v \cdot w = v_1 w_1 + v_2 w_2 + v_3 w_3$
Angle between 2 vectors	$\cos \theta = \frac{v \cdot w}{ v w }$
Vector equation of a line	$r = a + tb$

Topic 5: Statistics & Probability

Mean of a set of data	$\bar{x} = \frac{\sum_{i=1}^n f_i x_i}{\sum_{i=1}^n f_i}$
Probability of an event A	$P(A) = \frac{n(A)}{n(u)}$
Complementary events	$P(A) + P(A') = 1$
Combined events	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
Mutually exclusive events	$P(A \cup B) = P(A) + P(B)$
Conditional probability	$P(A \cap B) = P(A)P(B A)$
Independent events	$P(A \cap B) = P(A)P(B)$
Expected value of a discrete random variable X	$E(X) = \mu = \sum_x x P(X = x)$
Binomial distribution	$X \sim B(n, p)$ $P(X = r) = \binom{n}{r} p^r (1 - p)^{n-r}, r = 0, 1, 2, \dots, n$
Mean	$E(X) = np$
Variance	$Var(X) = np(1 - p)$
Standardized normal variable	$z = \frac{x - \mu}{\sigma}$

Topic 6: Calculus

Derivative of a function	$\frac{dy}{dx} = f'(x) = \lim_{h \rightarrow 0} \left(\frac{f(x+h) - f(x)}{h} \right)$
Standard derivatives	$f(x) = x^n \rightarrow f'(x) = nx^{n-1}$ $f(x) = \sin x \rightarrow f'(x) = \cos x$ $f(x) = \cos x \rightarrow f'(x) = -\sin x$ $f(x) = \tan x \rightarrow f'(x) = \frac{1}{\cos^2 x}$ $f(x) = e^x \rightarrow f'(x) = e^x$ $f(x) = \ln x \rightarrow f'(x) = \frac{1}{x}$
Chain rule	$y = g(u), u = f(x) \rightarrow \frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$
Product rule	$y = uv \rightarrow \frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$
Quotient rule	$y = \frac{u}{v} \rightarrow \frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$
Standard integrals	$\int x^n dx = \frac{x^{n+1}}{n+1} + C, n \neq -1$ $\int \frac{1}{x} dx = \ln x + C, x > 0$ $\int \sin x dx = -\cos x + C$ $\int \cos x dx = \sin x + C$ $\int e^x dx = e^x + C$
Area under a curve between $x = a$ and $x = b$	$A = \int_a^b y dx$
Volume of revolution about the x-axis from $x = a$ to $x = b$	$V = \int_a^b \pi y^2 dx$
Total distance travelled from t_1 to t_2	distance = $\int_{t_1}^{t_2} v(t) dt$