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IB Exam Revision - Online

Mathematics SL 1 Page Formula Sheet

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	$s_\infty = \frac{u_1}{1-r}, \lvert r \rvert < 1$
Exponents & logs	$a^x = b \quad \leftrightarrow \quad x = \log_a b$
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	$(a+b)^n$ $= a^n + \binom{n}{1}a^{n-1}b + \ldots + \binom{n}{r}a^{n-r}b^r + \ldots + b^n$

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

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	$P(A \cap B) = P(A)P(B\lvert A)$
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	$X \sim B(n,p)$ $P(X = r) = \binom{n}{r}p^r(1-p)^{n-r}, r = 0,1,2..n$
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	$\frac{dy}{dx} = f'(x) = \lim_{h \to 0}\left(\frac{f(x+h) - f(x)}{h}\right)$
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	$\text{distance} = \int_{t_1}^{t_2} \lvert v(t) \rvert\,dt$