

IB Maths: Applications and Interpretation

SL formula booklet

Every formula you get in the exam,
SL content only, in syllabus order

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Prior learning

Area of a parallelogram	$A = bh$ (b base, h height)
Area of a triangle	$A = \frac{1}{2}(bh)$ (b base, h height)
Area of a trapezoid	$A = \frac{1}{2}(a + b)h$ (a, b parallel sides, h height)
Area of a circle	$A = \pi r^2$ (r radius)
Circumference of a circle	$C = 2\pi r$ (r radius)
Volume of a cuboid	$V = lwh$ (l length, w width, h height)
Volume of a cylinder	$V = \pi r^2 h$ (r radius, h height)
Volume of a prism	$V = Ah$ (A area of cross-section, h height)
Curved surface area of a cylinder	$A = 2\pi rh$ (r radius, h height)
Distance between (x_1, y_1) and (x_2, y_2)	$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$
Midpoint of the segment from (x_1, y_1) to (x_2, y_2)	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Topic 1: Number and algebra

1.2	Arithmetic sequence: n th term	$u_n = u_1 + (n - 1)d$
	Arithmetic sequence: sum of n terms	$S_n = \frac{n}{2}(2u_1 + (n - 1)d); \quad S_n = \frac{n}{2}(u_1 + u_n)$
1.3	Geometric sequence: n th term	$u_n = u_1 r^{n-1}$
	Finite geometric sequence: sum of n terms	$S_n = \frac{u_1(r^n - 1)}{r - 1} = \frac{u_1(1 - r^n)}{1 - r}, \quad r \neq 1$
1.4	Compound interest	$FV = PV \times \left(1 + \frac{r}{100k}\right)^{kn}$ FV future value, PV present value, n number of years, k compounding periods per year, $r\%$ nominal annual rate of interest
1.5	Exponents and logarithms	$a^x = b \iff x = \log_a b, \quad a > 0, b > 0, a \neq 1$
1.6	Percentage error	$\varepsilon = \left \frac{v_A - v_E}{v_E} \right \times 100\%$ v_E exact value, v_A approximate value of v

Topic 2: Functions

2.1	Equations of a straight line	$y = mx + c; \quad ax + by + d = 0; \quad y - y_1 = m(x - x_1)$
	Gradient formula	$m = \frac{y_2 - y_1}{x_2 - x_1}$
2.5	Axis of symmetry of the graph of a quadratic function	$f(x) = ax^2 + bx + c \Rightarrow$ axis of symmetry $x = -\frac{b}{2a}$

Topic 3: Geometry and trigonometry

3.1	Distance between (x_1, y_1, z_1) and (x_2, y_2, z_2)	$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$
	Midpoint of the segment from (x_1, y_1, z_1) to (x_2, y_2, z_2)	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right)$
	Volume of a right pyramid	$V = \frac{1}{3}Ah$ (A area of the base, h height)
	Volume of a right cone	$V = \frac{1}{3}\pi r^2 h$ (r radius, h height)
	Curved surface area of a cone	$A = \pi rl$ (r radius, l slant height)
	Volume of a sphere	$V = \frac{4}{3}\pi r^3$ (r radius)
	Surface area of a sphere	$A = 4\pi r^2$ (r radius)
3.2	Sine rule	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
	Cosine rule	$c^2 = a^2 + b^2 - 2ab \cos C$; $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$
	Area of a triangle	$A = \frac{1}{2}ab \sin C$
3.4	Length of an arc (degrees)	$l = \frac{\theta}{360} \times 2\pi r$ (θ angle in degrees, r radius)
	Area of a sector (degrees)	$A = \frac{\theta}{360} \times \pi r^2$ (θ angle in degrees, r radius)

Topic 4: Statistics and probability

4.2	Interquartile range	$IQR = Q_3 - Q_1$
4.3	Mean $\bar{x}$ of a set of data	$\bar{x} = \frac{\sum_{i=1}^k f_i x_i}{n}$, where $n = \sum_{i=1}^k f_i$
4.5	Probability of an event A	$P(A) = \frac{n(A)}{n(U)}$
	Complementary events	$P(A) + P(A') = 1$
4.6	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	$P(A B) = \frac{P(A \cap B)}{P(B)}$
	Independent events	$P(A \cap B) = P(A)P(B)$
4.7	Expected value of a discrete random variable X	$E(X) = \sum x P(X = x)$
4.8	Binomial distribution $X \sim B(n, p)$	Mean $E(X) = np$ Variance $\text{Var}(X) = np(1 - p)$

Topic 5: Calculus

5.3	Derivative of x^n	$f(x) = x^n \Rightarrow f'(x) = nx^{n-1}$
5.5	Integral of x^n	$\int x^n dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$
	Area between a curve $y = f(x)$ and the x -axis, where $f(x) > 0$	$A = \int_a^b y dx$
5.8	The trapezoidal rule	$\int_a^b y dx \approx \frac{1}{2}h((y_0 + y_n) + 2(y_1 + y_2 + \dots + y_{n-1}))$, where $h = \frac{b-a}{n}$