IB MATH APPLICATION & INTERPRETATION SL

Complete Formula Sheet

Topic 1: Number & Algebra

1.2	**nth term of an arithmetic sequence**	$u_n = u_1 + (n-1)d$
1.2	**Sum of n terms of an arithmetic sequence**	$S_n = \frac{n}{2}(2u_1 + (n-1)d)$ $S_n = \frac{n}{2}(u_1 + u_n)$
1.3	**nth term of a geometric sequence**	$u_n = u_1 r^{n-1}$
1.3	**Sum of n terms of a finite geometric sequence**	$S_n = \frac{u_1(r^n - 1)}{r - 1} = \frac{u_1(1 - r^n)}{1 - r}, r \neq 1$
1.4	**Compound interest** FV/PV values, compounding periods k over years n	$FV = PV \times (1 + \frac{r}{100k})^{kn}$
1.5	**Exponents & logarithms**	$a^x = b \Leftrightarrow x = \log_a b$ (a>0, a≠1)
1.6	**Percentage error** v_E: exact, v_A: approx	$\varepsilon = \lvert \frac{v_A - v_E}{v_E} \rvert \times 100\%$

Topic 2: Functions

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

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**	$\int x^n dx = \frac{x^{n+1}}{n+1} + C, n \neq -1$
5.5	**Area under a curve** between f(x) and x-axis, f(x) > 0	$A = \int_a^b y\, dx$
5.8	**The trapezoidal rule** where $h = \frac{b-a}{n}$	$\int_a^b y\, dx \approx \frac{1}{2}h\,[(y_0 + y_n) + 2(y_1 + y_2 + \ldots + y_{n-1})]$

Topic 3: Geometry & Trigonometry

Prior Learning / Core Formulas

-	**Area: Parallelogram / Triangle**	$A = bh$ | $A = \frac{1}{2}bh$
-	**Area: Trapezoid / Circle**	$A = \frac{1}{2}(a + b)h$ | $A = \pi r^2$
-	**Circumference / Vol: Cuboid**	$C = 2\pi r$ | $V = lwh$
-	**Volume / Curved SA: Cylinder**	$V = \pi r^2 h$ | $A = 2\pi rh$
-	**Volume of a prism**	$V = Ah$ (A = cross area)
-	**Distance / Midpoint (2D)**	$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$ $(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2})$

SL Syllabus Formulas

3.1	**Distance / Midpoint (3D)**	$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$ $(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}, \frac{z_1+z_2}{2})$
3.1	**Volume: Right-pyramid / Cone**	$V = \frac{1}{3}Ah$ | $V = \frac{1}{3}\pi r^2 h$
3.1	**Curved SA: Cone**	$A = \pi rl$ (l = slant height)
3.1	**Sphere: Volume / Surface Area**	$V = \frac{4}{3}\pi r^3$ | $A = 4\pi r^2$
3.2	**Sine rule**	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
3.2	**Cosine rule**	$c^2 = a^2 + b^2 - 2ab\cos C$ $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$
3.2	**Area of a triangle**	$A = \frac{1}{2}ab\sin C$
3.4	**Arc length / Sector area** (θ in degrees)	$l = \frac{\theta}{360} \times 2\pi r$ $A = \frac{\theta}{360} \times \pi r^2$

Topic 4: Statistics & Probability

4.2	**Interquartile range**	$IQR = Q_3 - Q_1$
4.3	**Mean of a data set**	$\bar{x} = \frac{\sum f_i x_i}{n}$ where $n = \sum f_i$
4.5	**Probability of event A / Comp.**	$P(A) = \frac{n(A)}{n(U)}$ | $P(A) + P(A') = 1$
4.6	**Combined events**	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
4.6	**Mutually exclusive events**	$P(A \cup B) = P(A) + P(B)$
4.6	**Conditional probability**	$P(A \mid B) = \frac{P(A \cap B)}{P(B)}$
4.6	**Independent events**	$P(A \cap B) = P(A)\,P(B)$
4.7	**Expected value (discrete RV)**	$E(X) = \sum x_i\, P(X = x_i)$
4.8	**Binomial distribution** X ~ B(n, p)	Mean: $E(X) = np$ Variance: $Var(X) = np(1-p)$