IB Maths Studies - 1 Page Formula Sheet

Topic 1: Number & Algebra

Percentage error	$\varepsilon = \left\|\frac{v_A - v_E}{v_E}\right\| \times 100\%$ v_A = approximate value v_E = exact value
The nth 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 nth term of a geometric sequence	$u_n = u_1 r^{n-1}$
Sum of a geometric sequence	$s_n = \frac{u_1(r^n - 1)}{r - 1} = s_n = \frac{u_1(1 - r^n)}{1 - r}, r \neq 1$
Compound Interest	$FV = PV \times \left(1 + \frac{r}{100k}\right)^{kn}$ FV = Future Value PV = Present Value (initial value) r = Annual interest rate (%) k = Number of compounding period per year n = Number of years

Topic 2: Descriptive Statistics

Mean of a data set	$\bar{x} = \frac{\sum_{i=1}^{k} f_i x_i}{n}$, where $n = \sum_{i=1}^{k} f_i$
Interquartile range (IQR)	IQR = $Q_3 - Q_1$ Q_3 = Upper Quartile Q_1 = Lower Quartile

Topic 3: Logic, Sets & Probability

Truth Tables

Negation (¬)

p	$\neg p$
T	F
F	T

Implication (⟹) & Equivalence (⟺)

p	q	$p \Rightarrow q$	$p \Leftrightarrow q$
T	T	T	T
T	F	F	F
F	T	T	F
F	F	T	T

Conjunction (∧), Disjunction (∨) & Exclusive Disjunction (⊻)

p	q	$p \wedge q$	$p \vee q$	$p \veebar q$
T	T	T	T	F
T	F	F	T	T
F	T	F	T	T
F	F	F	F	F

Probability of an event A occurring	$\mathrm{P}(A) = \frac{\text{number of outcomes in } A}{\text{total number of outcomes}}$
Complementary Events	$\mathrm{P}(A') = 1 - \mathrm{P}(A)$
Combined Events	$\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \cap B)$
Mutually Exclusive Events	$\mathrm{P}(A \cap B) = 0$
Independent Events	$\mathrm{P}(A \cap B) = \mathrm{P}(A)\mathrm{P}(B)$
Conditional Probability	$\mathrm{P}(A\|B) = \frac{\mathrm{P}(A \cap B)}{\mathrm{P}(B)}$

Topic 5: Geometry & Trigonometry

Equations of a straight line	$y = mx + c$ $ax + by + d = 0$
Gradient of a straight line	$m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$
Distance between two points	Point 1: (x_1, y_1). Point 2: (x_2, y_2). $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$
Midpoint of a line with endpoints (x_1, y_1) and (x_2, y_2)	Midpoint Coordinates = $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$
Sine rule	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
Cosine rules	$a^2 = b^2 + c^2 - 2bc\cos A$ $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$
Area: triangle	$A = \frac{1}{2}bh$, or $A = \frac{1}{2}ab\sin C$, where a and b are adjacent sides, C is the angle between a and b
Circumference: Circle	$C = 2\pi r$
Area: Circle	$A = \pi r^2$
Area: Parallelogram	$A = bh$
Area: Trapezium	$A = \frac{1}{2}(a + b)h$ a and b are parallel sides
Area: Cylinder curved surface	$A = 2\pi rh$
Area: Sphere	$A = 4\pi r^2$
Area: Cone curved surface	$A = \pi rl$ l is the slant height
Volume: Pyramid	$V = \frac{1}{3}Ah$ A is the area of the base h is the vertical height of the pyramid
Volume: Cuboid	$V = lwh$
Volume: Cylinder	$V = \pi r^2 h$
Volume: Sphere	$V = \frac{4}{3}\pi r^3$
Volume: Cone	$V = \frac{1}{3}\pi r^2 h$
Volume: Prism	$V = Ah$ A is the cross sectional area

Topic 6: Mathematical Models

Equation of the axis of symmetry for a quadratic function in the form: $y = ax^2 + bx + c$	$x = -\frac{b}{2a}$

Topic 7: Intro to Differential Calculus

Derivative of ax^n	If $f(x) = ax^n$, then, $f'(x) = nax^{n-1}$
Derivative of a sum	If $f(x) = ax^n$ and $g(x) = bx^m$, then, $f'(x) + g'(x) = nax^{n-1} + mbx^{m-1}$