

# IB Maths Studies – Formula Sheet

~ Revision Village ~

## Topic 1: Number & Algebra

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

## 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)	<p><math>IQR = Q_3 - Q_1</math></p> <p><math>Q_3</math> = Upper Quartile <math>Q_1</math> = Lower Quartile</p>

## Topic 3: Logic, Sets & Probability

Truth Tables	Negation ( $\neg$ )	<table border="1"> <tr> <td><math>p</math></td> <td><math>\neg p</math></td> </tr> <tr> <td>T</td> <td>F</td> </tr> <tr> <td>F</td> <td>T</td> </tr> </table>	$p$	$\neg p$	T	F	F	T																		
	$p$	$\neg p$																								
	T	F																								
	F	T																								
	Implication ( $\Rightarrow$ ) & Equivalence ( $\Leftrightarrow$ )	<table border="1"> <tr> <td><math>p</math></td> <td><math>q</math></td> <td><math>p \Rightarrow q</math></td> <td><math>p \Leftrightarrow q</math></td> </tr> <tr> <td>T</td> <td>T</td> <td>T</td> <td>T</td> </tr> <tr> <td>T</td> <td>F</td> <td>F</td> <td>F</td> </tr> <tr> <td>F</td> <td>T</td> <td>T</td> <td>F</td> </tr> <tr> <td>F</td> <td>F</td> <td>T</td> <td>T</td> </tr> </table>	$p$	$q$	$p \Rightarrow q$	$p \Leftrightarrow q$	T	T	T	T	T	F	F	F	F	T	T	F	F	F	T	T				
$p$	$q$	$p \Rightarrow q$	$p \Leftrightarrow q$																							
T	T	T	T																							
T	F	F	F																							
F	T	T	F																							
F	F	T	T																							
Conjunction ( $\wedge$ ), Disjunction ( $\vee$ ) & Exclusive Disjunction ( $\veebar$ )	<table border="1"> <tr> <td><math>p</math></td> <td><math>q</math></td> <td><math>p \wedge q</math></td> <td><math>p \vee q</math></td> <td><math>p \veebar q</math></td> </tr> <tr> <td>T</td> <td>T</td> <td>T</td> <td>T</td> <td>F</td> </tr> <tr> <td>T</td> <td>F</td> <td>F</td> <td>T</td> <td>T</td> </tr> <tr> <td>F</td> <td>T</td> <td>F</td> <td>T</td> <td>T</td> </tr> <tr> <td>F</td> <td>F</td> <td>F</td> <td>F</td> <td>F</td> </tr> </table>	$p$	$q$	$p \wedge q$	$p \vee q$	$p \veebar q$	T	T	T	T	F	T	F	F	T	T	F	T	F	T	T	F	F	F	F	F
$p$	$q$	$p \wedge q$	$p \vee q$	$p \veebar q$																						
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	$P(A) = \frac{\text{number of outcomes in } A}{\text{total number of outcomes}}$																									
Complementary Events	$P(A') = 1 - P(A)$																									
Combined Events	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$																									
Mutually Exclusive Events	$P(A \cap B) = 0$																									
Independent Events	$P(A \cap B) = P(A)P(B)$																									
Conditional Probability	$P(A B) = \frac{P(A \cap B)}{P(B)}$																									

## 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	<p>Point 1: <math>(x_1, y_1)</math>. Point 2: <math>(x_2, y_2)</math>.</p> $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$
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	$a^2 = b^2 + c^2 - 2bccosA$ $cosA = \frac{b^2 + c^2 - a^2}{2bc}$
Area: triangle	$A = \frac{1}{2}bh$ , or $A = \frac{1}{2}absinC$ , 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 $ax^n$	<p>If <math>f(x) = ax^n</math>,</p> <p>then, <math>f'(x) = nax^{n-1}</math></p>
Derivative of a sum	<p>If <math>f(x) = ax^n</math> and <math>g(x) = bx^m</math>,</p> <p>then, <math>f'(x) + g'(x) = nax^{n-1} + mbx^{m-1}</math></p>