



International Baccalaureate  
Baccalauréat International  
Bachillerato Internacional

Diploma Programme

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# Mathematical studies SL formula booklet

For use during the course and in the examinations

First examinations 2014

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## Prior learning

<p><b>5.0</b></p>	<p>Area of a parallelogram</p> <p>Area of a triangle</p> <p>Area of a trapezium</p> <p>Area of a circle</p> <p>Circumference of a circle</p> <p>Distance between two points <math>(x_1, y_1)</math> and <math>(x_2, y_2)</math></p> <p>Coordinates of the midpoint of a line segment with endpoints <math>(x_1, y_1)</math> and <math>(x_2, y_2)</math></p>	<p><math>A = b \times h</math>, where <math>b</math> is the base, <math>h</math> is the height</p> <p><math>A = \frac{1}{2}(b \times h)</math>, where <math>b</math> is the base, <math>h</math> is the height</p> <p><math>A = \frac{1}{2}(a + b)h</math>, where <math>a</math> and <math>b</math> are the parallel sides, <math>h</math> is the height</p> <p><math>A = \pi r^2</math>, where <math>r</math> is the radius</p> <p><math>C = 2\pi r</math>, where <math>r</math> is the radius</p> <p><math>d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}</math></p> <p><math>\left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)</math></p>
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## Topic 1—Number and algebra

1.2	Percentage error	$\mathcal{E} = \left  \frac{v_A - v_E}{v_E} \right  \times 100\%$ , where $v_E$ is the exact value and $v_A$ is the approximate value of $v$
1.7	The $n$ th term of an arithmetic sequence  The sum of $n$ terms of an arithmetic sequence	$u_n = u_1 + (n - 1)d$  $S_n = \frac{n}{2}[2u_1 + (n - 1)d] = \frac{n}{2}(u_1 + u_n)$
1.8	The $n$ th term of a geometric sequence  The sum of $n$ terms of a geometric sequence	$u_n = u_1 r^{n-1}$  $S_n = \frac{u_1(r^n - 1)}{r - 1} = \frac{u_1(1 - r^n)}{1 - r}, \quad r \neq 1$
1.9	Compound interest	$FV = PV \times \left( 1 + \frac{r}{100k} \right)^{kn}$ , where $FV$ = future value, $PV$ = present value, $n$ = number of years, $k$ = number of compounding periods per year, $r\%$ = nominal annual rate of interest

## Topic 2—Descriptive statistics

2.5	Mean of a set of data	$\bar{x} = \frac{\sum_{i=1}^k f_i x_i}{n}$ , where $n = \sum_{i=1}^k f_i$
2.6	Interquartile range	$\text{IQR} = Q_3 - Q_1$

## Topic 3—Logic, sets and probability

3.3	Truth tables	<table border="1"> <thead> <tr> <th><math>p</math></th> <th><math>q</math></th> <th><math>\neg p</math></th> <th><math>p \wedge q</math></th> <th><math>p \vee q</math></th> <th><math>p \vee q</math></th> <th><math>p \Rightarrow q</math></th> <th><math>p \Leftrightarrow q</math></th> </tr> </thead> <tbody> <tr> <td>T</td> <td>T</td> <td>F</td> <td>T</td> <td>T</td> <td>F</td> <td>T</td> <td>T</td> </tr> <tr> <td>T</td> <td>F</td> <td>F</td> <td>F</td> <td>T</td> <td>T</td> <td>F</td> <td>F</td> </tr> <tr> <td>F</td> <td>T</td> <td>T</td> <td>F</td> <td>T</td> <td>T</td> <td>T</td> <td>F</td> </tr> <tr> <td>F</td> <td>F</td> <td>T</td> <td>F</td> <td>F</td> <td>F</td> <td>T</td> <td>T</td> </tr> </tbody> </table>	$p$	$q$	$\neg p$	$p \wedge q$	$p \vee q$	$p \vee q$	$p \Rightarrow q$	$p \Leftrightarrow q$	T	T	F	T	T	F	T	T	T	F	F	F	T	T	F	F	F	T	T	F	T	T	T	F	F	F	T	F	F	F	T	T
$p$	$q$	$\neg p$	$p \wedge q$	$p \vee q$	$p \vee q$	$p \Rightarrow q$	$p \Leftrightarrow q$																																			
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3.6	Probability of an event $A$  Complementary events	$P(A) = \frac{\text{number of outcomes in } A}{\text{total number of outcomes}}$ $P(A') = 1 - P(A)$																																								
3.7	Combined events  Mutually exclusive events  Independent events  Conditional probability	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $P(A \cap B) = 0$ $P(A \cap B) = P(A) P(B)$ $P(A   B) = \frac{P(A \cap B)}{P(B)}$																																								

## Topic 5—Geometry and trigonometry

5.1	Equation of a straight line  Gradient formula	$y = mx + c; ax + by + d = 0$  $m = \frac{y_2 - y_1}{x_2 - x_1}$
5.3	Sine rule  Cosine rule  Area of a triangle	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$  $a^2 = b^2 + c^2 - 2bc \cos A; \cos A = \frac{b^2 + c^2 - a^2}{2bc}$  $A = \frac{1}{2} ab \sin C$ , where $a$ and $b$ are adjacent sides, $C$ is the included angle
5.5	Area of the curved surface of a cylinder  Surface area of a sphere  Area of the curved surface of a cone  Volume of a pyramid  Volume of a cuboid  Volume of a cylinder  Volume of a sphere  Volume of a cone  Volume of a prism	$A = 2\pi rh$ , where $r$ is the radius, $h$ is the height  $A = 4\pi r^2$ , where $r$ is the radius  $A = \pi rl$ , where $r$ is the radius, $l$ is the slant height  $V = \frac{1}{3} Ah$ , where $A$ is the area of the base, $h$ is the vertical height  $V = l \times w \times h$ , where $l$ is the length, $w$ is the width, $h$ is the height  $V = \pi r^2 h$ , where $r$ is the radius, $h$ is the height  $V = \frac{4}{3} \pi r^3$ , where $r$ is the radius  $V = \frac{1}{3} \pi r^2 h$ , where $r$ is the radius, $h$ is the vertical height  $V = Ah$ , where $A$ is the area of cross-section, $h$ is the height

## Topic 6—Mathematical models

<b>6.3</b>	Equation of the axis of symmetry for the graph of the quadratic function $y = ax^2 + bx + c$	$x = -\frac{b}{2a}$
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## Topic 7—Introduction to differential calculus

<b>7.2</b>	Derivative of $ax^n$	$f(x) = ax^n \Rightarrow f'(x) = nax^{n-1}$
	Derivative of a sum	$f(x) = ax^n, g(x) = bx^m \Rightarrow f'(x) + g'(x) = nax^{n-1} + mbx^{m-1}$