



International Baccalaureate
Baccalauréat International
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Diploma Programme

Mathematical studies SL formula booklet

For use during the course and in the examinations

First examinations 2014

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Prior learning

<p>5.0</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 (x_1, y_1) and (x_2, y_2)</p> <p>Coordinates of the midpoint of a line segment with endpoints (x_1, y_1) and (x_2, y_2)</p>	<p>$A = b \times h$, where b is the base, h is the height</p> <p>$A = \frac{1}{2}(b \times h)$, where b is the base, h is the height</p> <p>$A = \frac{1}{2}(a + b)h$, where a and b are the parallel sides, h is the height</p> <p>$A = \pi r^2$, where r is the radius</p> <p>$C = 2\pi r$, where r is the radius</p> <p>$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$</p> <p>$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$</p>
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Topics

Topic 1—Number and algebra

1.2	Percentage error	$\varepsilon = \left \frac{v_A - v_E}{v_E} \right \times 100\%$, 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	$u_n = u_1 r^{n-1}$ $S_n = \frac{u_1(r^n - 1)}{r - 1} = \frac{u_1(1 - r^n)}{1 - r}$, $r \neq 1$
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	$IQR = Q_3 - Q_1$

Topic 3—Logic, sets and probability

3.3	Truth tables	<table border="1"> <thead> <tr> <th>p</th> <th>q</th> <th>$\neg p$</th> <th>$p \wedge q$</th> <th>$p \vee q$</th> <th>$p \vee q$</th> <th>$p \Rightarrow q$</th> <th>$p \Leftrightarrow q$</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
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3.6	Probability of an event A	$P(A) = \frac{\text{number of outcomes in } A}{\text{total number of outcomes}}$																																								
	Complementary events	$P(A') = 1 - P(A)$																																								
3.7	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 and trigonometry

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

Topic 6—Mathematical models

6.3	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

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