

Ib Math SL Formula Sheet

Mathematics: Analysis & Approaches SL & HL

1 Page Formula Sheet – First Examinations 2021 – Updated Version 1.3

Prior Learning SL & HL

Area: Parallelogram	$A = bh$, b = base, h = height
Area: Triangle	$A = \frac{1}{2}bh$, b = base, h = height
Area: Trapezoid	$A = \frac{1}{2}(a + b)h$, a, b = parallel sides, h = height
Area: Circle	$A = \pi r^2$, r = radius
Circumference: Circle	$C = 2\pi r$, r = radius
Volume: Cuboid	$V = lwh$, l = length, w = width, h = height
Volume: Cylinder	$V = \pi r^2 h$, r = radius, h = height
Volume: Prism	$V = Ah$, A = cross section area, h = height
Area: Cylinder curve	$A = 2\pi rh$, r = radius, h = height
Distance between two points (x_1, y_1) , (x_2, y_2)	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Coordinates of midpoint	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ for endpoints (x_1, y_1) , (x_2, y_2)

Topic 1: Number and algebra – SL & HL

The n th term of an arithmetic sequence	$u_n = a + (n - 1)d$
Sum of n terms of an arithmetic sequence	$S_n = \frac{n}{2}(2a + (n - 1)d) = \frac{n}{2}(u_1 + u_n)$
The n th term of a geometric sequence	$u_n = ar^{n-1}$
Sum of n terms of a finite geometric seq.	$S_n = \frac{a(r^n - 1)}{r - 1}$, $r \neq 1$ $S_n = \frac{a(1 - r^n)}{1 - r}$, $r \neq 1$
Compound interest	$PV = PV_0(1 + \frac{r}{n})^{-nt}$ PV = future value, PV_0 = present value, n is the number of years, i is the number of compounding periods per year, r is the nominal annual rate of interest
Exponents & logarithms	$a^x = b \Leftrightarrow x = \log_a b$, $a, b > 0, a \neq 1$ $\log_a xy = \log_a x + \log_a y$ $\log_a \frac{x}{y} = \log_a x - \log_a y$ $\log_a x^m = m \log_a x$ $\log_a x = \frac{\log_b x}{\log_b a}$
Exponents & logarithms	$\log_a x = \log_a x$ $\log_a x = \log_a x$
The sum of an infinite geometric sequence	$S_{\infty} = \frac{a}{1 - r}$, $ r < 1$
Binomial Theorem	$(x + y)^n = \sum_{k=0}^n \binom{n}{k} x^{n-k} y^k$
Binomial coefficient	$\binom{n}{k} = \frac{n!}{k!(n-k)!}$

Topic 1: Number and algebra – HL only

Combinatorics	$\frac{n!}{k!(n-k)!} = \binom{n}{k}$
Permutations	$\frac{n!}{(n-k)!} = P(n, k)$
Extension of Binomial Theorem, $x \in \mathbb{Q}$	$(x + y)^x = \sum_{k=0}^{\infty} \binom{x}{k} x^{x-k} y^k$
Complex numbers	$z = a + bi$
Modulus argument (arg) & Exponential (Euler) form	$z = r(\cos \theta + i \sin \theta) = re^{i\theta}$
De Moivre's Theorem	$(r(\cos \theta + i \sin \theta))^n = r^n(\cos n\theta + i \sin n\theta)$

Topic 2: Functions – SL & HL

Equations of a straight line	$y = mx + c$, m = gradient, c = y-intercept $y - y_1 = m(x - x_1)$
Gradient formula	$m = \frac{y_2 - y_1}{x_2 - x_1}$
Axis of symmetry of a quadratic function	$f(x) = ax^2 + bx + c$ $x = -\frac{b}{2a}$
Solutions of a quadratic equation in the form $ax^2 + bx + c = 0$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Discriminant	$\Delta = b^2 - 4ac$
Exponential and logarithmic functions	$a^x = e^{x \ln a}$

Topic 2: Functions – HL only

Sum & product of the roots of polynomial equations of the form $ax^2 + bx + c = 0$	$\sum_{i=1}^n x_i = -\frac{b}{a}$ $\prod_{i=1}^n x_i = \frac{c}{a}$
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Topic 3: Geometry and trigonometry – SL & HL

Distance between 2 points (x_1, y_1, z_1) , (x_2, y_2, z_2)	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2 + (z_2 - z_1)^2}$
Coordinates of midpoint of a line with endpoints (x_1, y_1, z_1) , (x_2, y_2, z_2)	$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right)$
Volume: Right pyramid	$V = \frac{1}{3}Ah$, A = base area, h = height
Volume: Right cone	$V = \frac{1}{3}\pi r^2 h$, r = radius, h = height
Area: Cone curve	$A = \pi rl$, r = radius, l = slant height
Volume: Sphere	$V = \frac{4}{3}\pi r^3$, r = radius
Surface area: Sphere	$A = 4\pi r^2$, r = radius
Sine rule	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $a^2 = b^2 + c^2 - 2bc \cos A$ $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$
Cosine rule	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $\cos C = \frac{a^2 + b^2 - c^2}{2ab}$
Area: Triangle	$A = \frac{1}{2}ab \sin C$ $\frac{1}{2} = \frac{1}{2}ab \sin C$, C = angle in radians
Length of an arc	$A = \frac{1}{2}r^2 \theta$, r = radius, θ = angle in radians
Area of a sector	$A = \frac{1}{2}r^2 \theta$, r = radius, θ = angle in radians
Identity for tan θ	$\tan \theta = \frac{\sin \theta}{\cos \theta}$
Pythagorean identity	$\sin^2 \theta + \cos^2 \theta = 1$ $\sin 2\theta = 2 \sin \theta \cos \theta$ $\cos 2\theta = \cos^2 \theta - \sin^2 \theta$ $\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$
Double angle identities	$\sin 2\theta = 2 \sin \theta \cos \theta$ $\cos 2\theta = \cos^2 \theta - \sin^2 \theta$ $\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$

Topic 3: Geometry and trigonometry – HL only

Reciprocal trigonometric identities	$\sec \theta = \frac{1}{\cos \theta}$, $\csc \theta = \frac{1}{\sin \theta}$
Pythagorean identities	$1 + \tan^2 \theta = \sec^2 \theta$, $1 + \cot^2 \theta = \csc^2 \theta$
Compound angle identities	$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$ $\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$ $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$
Double angle identity for tan	$\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$
Magnitude of a vector	$ a = \sqrt{a_1^2 + a_2^2 + a_3^2}$
Scalar product	$a \cdot b = a b \cos \theta$ $\cos \theta = \frac{a \cdot b}{ a b }$
Angle between two vectors	$\cos \theta = \frac{a \cdot b}{ a b }$
Vector eqn. of a line	$r = a + \lambda b$
Parametric form of the equation of a line	$x = x_0 + \lambda a$, $y = y_0 + \lambda b$, $z = z_0 + \lambda c$
Cartesian equations of a line	$\frac{x - x_0}{a} = \frac{y - y_0}{b} = \frac{z - z_0}{c}$
Vector product	$a \times b = \begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix}$ $ a \times b = a b \sin \theta$
Area of a parallelogram	$A = a \times b $
Vector eqn. of a plane	$r \cdot n = p$
Equation of a plane	$ax + by + cz = d$
Cartesian eqn. of a plane	$ax + by + cz = d$

Topic 4: Statistics and probability – SL & HL

Interquartile range	$IQR = Q_3 - Q_1$
Mean, \bar{x} , of a set of data	$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$
Probability of an event A	$P(A) = \frac{n(A)}{n(S)}$
Complementary events	$P(A) + P(\bar{A}) = 1$
Combined events	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
Mutually exclusive events	$P(A \cup B) = P(A) + P(B)$
Conditional probability	$P(A B) = \frac{P(A \cap B)}{P(B)}$
Independent events	$P(A \cap B) = P(A)P(B)$
Binomial distribution	$X \sim B(n, p)$ $E(X) = np$ $Var(X) = np(1 - p)$
Standardized normal variable	$Z = \frac{X - \mu}{\sigma}$

Topic 4: Statistics and probability – HL only

Bayes' theorem	$P(A B) = \frac{P(A \cap B)}{P(B)}$ $P(A B) = \frac{P(B A)P(A)}{P(B A)P(A) + P(B \bar{A})P(\bar{A})}$
Variance σ^2	$\sigma^2 = \frac{1}{n} \sum_{i=1}^n (x_i - \bar{x})^2 = \frac{1}{n} \sum_{i=1}^n x_i^2 - \bar{x}^2$
Standard Deviation σ	$\sigma = \sqrt{\sigma^2}$
Linear transformation of a single random variable	$E(aX + b) = aE(X) + b$ $Var(aX + b) = a^2 Var(X)$
Expected value: Continuous random variable X	$E(X) = \int_{-\infty}^{\infty} x f(x) dx$
Variance	$Var(X) = E[(X - \mu)^2] = E[X^2] - \mu^2$
Variance of a discrete random variable X	$Var(X) = \sum_{i=1}^n (x_i - \mu)^2 P(X = x_i)$
Variance of a continuous random variable X	$Var(X) = \int_{-\infty}^{\infty} (x - \mu)^2 f(x) dx$

Topic 5: Calculus – SL & HL

Derivative of a^x	$\frac{d}{dx} a^x = a^x \ln a$
Integral of a^x	$\int a^x dx = \frac{a^x}{\ln a} + C$, $a > 0, a \neq 1$
Area between curves	$y = f(x)$, $y = g(x)$ $A = \int_a^b f(x) - g(x) dx$
Derivative of $\sin x$	$\frac{d}{dx} \sin x = \cos x$
Derivative of $\cos x$	$\frac{d}{dx} \cos x = -\sin x$
Derivative of e^x	$\frac{d}{dx} e^x = e^x$
Derivative of $\ln x$	$\frac{d}{dx} \ln x = \frac{1}{x}$
Chain rule	$y = g(u)$, $u = f(x)$ $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$
Product rule	$y = uv$ $\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$
Quotient rule	$y = \frac{u}{v}$ $\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$
Acceleration	$a = \frac{dv}{dt}$
Distance, Displacement	Displacement from t_1 to t_2 $s = \int_{t_1}^{t_2} v dt$
Standard integrals	$\int \frac{1}{x} dx = \ln x + C$ $\int \sin x dx = -\cos x + C$ $\int \cos x dx = \sin x + C$ $\int x^n dx = \frac{x^{n+1}}{n+1} + C$, $n \neq -1$
Area enclosed by a curve and x-axis	$A = \int_a^b f(x) dx$

Topic 5: Calculus – HL only

Derivative of $f(x)$ from first principles	$\frac{dy}{dx} = f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$
Standard derivatives	$\frac{d}{dx} \tan x = \sec^2 x$ $\frac{d}{dx} \sec x = \sec x \tan x$ $\frac{d}{dx} \csc x = -\csc x \cot x$ $\frac{d}{dx} \cot x = -\csc^2 x$
Integration by parts	$\int u \frac{dv}{dx} dx = u v - \int v \frac{du}{dx} dx$
Area enclosed by a curve and y-axis	$A = \int_c^d g(y) dy$
Volume of revolution about x or y-axis	$V = \pi \int_a^b x^2 dy$ or $V = \pi \int_c^d y^2 dx$
Euler's method	$y' = f(x, y)$ $y_{n+1} = y_n + h f(x_n, y_n)$
Impagating factor for $y' + p(x)y = q(x)$	$e^{\int p(x) dx}$
Maclaurin series	$f(x) = f(0) + x f'(0) + \frac{x^2}{2!} f''(0) + \dots$ $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$ $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots$ $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \dots$

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IB Math SL formula sheet is an essential tool for students preparing for the International Baccalaureate (IB) Mathematics Standard Level examination. This formula sheet serves as a comprehensive compilation of key formulas, concepts, and theorems that are vital for solving mathematical problems across various topics. In this article, we will delve into the significance of the IB Math SL formula sheet, highlight the key areas covered, and provide tips for effectively utilizing it for exam preparation.

Understanding the IB Math SL Curriculum

The IB Mathematics Standard Level (SL) course is designed for students who have a foundational understanding of mathematics and seek to deepen their knowledge. The syllabus encompasses a wide

range of topics, including:

- Algebra
- Functions and equations
- Geometry and trigonometry
- Statistics and probability
- Calculus

Each of these areas requires a solid grasp of various formulas and concepts, making the formula sheet a vital resource for students.

The Importance of the IB Math SL Formula Sheet

The IB Math SL formula sheet serves several important functions:

1. Quick Reference

During the exam, time management is crucial. The formula sheet provides a quick reference for students, enabling them to quickly recall essential formulas without wasting precious minutes flipping through notes or textbooks.

2. Comprehensive Coverage

The formula sheet includes all the fundamental formulas required for the SL curriculum, ensuring that students do not miss any critical information. This comprehensive nature allows students to approach problems with confidence, knowing they have access to all necessary formulas.

3. Study Aid

Beyond the exam, the formula sheet is a valuable study aid. It can help students consolidate their learning,

understand relationships between different mathematical concepts, and reinforce their knowledge through repeated exposure to key formulas.

4. Reduces Anxiety

Familiarity with the formula sheet can reduce exam anxiety. Knowing that you have a reliable resource at hand to guide you through complex problems can boost your confidence and overall performance.

Key Areas Covered in the IB Math SL Formula Sheet

The formula sheet for IB Math SL covers a variety of topics. Below is a breakdown of some of the most important sections and their associated formulas.

1. Algebra

In this section, students will find formulas related to:

- Factoring and expanding polynomials
- Quadratic equations:

- Quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

- Exponential and logarithmic functions:

- Properties of logarithms

- Change of base formula: $\log_b a = \frac{\log_k a}{\log_k b}$

2. Functions and Equations

This section includes:

- Function notation and properties
- Transformations of functions
- Inverse functions

3. Geometry and Trigonometry

Key formulas in geometry and trigonometry include:

- Area and perimeter of common shapes
- Pythagorean theorem: $a^2 + b^2 = c^2$
- Trigonometric ratios:
 - Sine, cosine, and tangent
 - Unit circle values

4. Statistics and Probability

In statistics and probability, students find:

- Measures of central tendency:
 - Mean, median, and mode

- Standard deviation and variance

- Probability formulas:

- $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

5. Calculus

This section provides crucial formulas for differentiation and integration:

- Derivatives:

- Power rule: $\left(\frac{d}{dx} \right) (x^n) = nx^{n-1}$

- Product rule: $(uv)' = u'v + uv'$

- Quotient rule: $\left(\frac{u}{v} \right)' = \frac{u'v - uv'}{v^2}$

- Integrals:

- Basic integration formulas

- Definite and indefinite integrals

Tips for Using the IB Math SL Formula Sheet Effectively

To maximize the benefits of the formula sheet, students should consider the following strategies:

1. Familiarization

Become thoroughly familiar with the formula sheet before the exam. This means not only memorizing the formulas but also understanding when and how to apply them.

2. Practice Problems

Practice using the formula sheet by solving past exam papers and sample problems. This helps reinforce your understanding and improves your ability to recall formulas under exam conditions.

3. Annotate Your Sheet

If permitted, consider annotating your formula sheet with additional notes or reminders that are helpful for you. Personalizing your sheet can make it more effective for your learning style.

4. Group Study

Engage in group study sessions where you can quiz each other on formulas and their applications. Teaching others can greatly enhance your own understanding.

5. Time Management During the Exam

Use the formula sheet strategically during the exam. Quickly locate the formulas you need and ensure you are not spending too much time searching for them.

Conclusion

The IB Math SL formula sheet is an invaluable asset for students preparing for their examinations. By providing quick access to essential formulas and concepts, it enables students to approach problems with greater confidence and efficiency. Understanding the key areas covered in the formula sheet, along with effective study strategies, can significantly enhance a student's performance in the IB Math SL course. As students prepare for their exams, they should leverage this tool not only as a reference but as a means to solidify their understanding of mathematics as a whole.

Frequently Asked Questions

What is the IB Math SL formula sheet?

The IB Math SL formula sheet is a reference document provided to students during examinations, containing essential formulas and concepts for the Standard Level Mathematics course.

Where can I find the latest IB Math SL formula sheet?

The latest IB Math SL formula sheet can typically be found on the official International Baccalaureate (IB) website or through your school's IB coordinator.

What topics are covered in the IB Math SL formula sheet?

The IB Math SL formula sheet covers a variety of topics including algebra, geometry, statistics, and calculus, providing key formulas and definitions relevant to these areas.

How can I effectively use the IB Math SL formula sheet during exams?

To effectively use the IB Math SL formula sheet during exams, familiarize yourself with its layout, practice applying the formulas in different problems, and ensure you understand each concept it represents.

Are there any specific formulas I should memorize for IB Math SL?

While the formula sheet provides all necessary formulas, it's beneficial to memorize key concepts and frequently used formulas to save time during the exam.

Can the IB Math SL formula sheet be used in both Paper 1 and Paper 2?

Yes, the IB Math SL formula sheet can be used in both Paper 1 and Paper 2 of the exam, allowing students to reference it throughout both sections.

Is there a difference between the formula sheet for IB Math SL and IB Math HL?

Yes, there are differences; the IB Math HL formula sheet includes additional advanced topics and formulas that are not present in the SL version, reflecting the higher level of complexity.

What is the importance of the IB Math SL formula sheet in exam preparation?

The IB Math SL formula sheet is crucial for exam preparation as it provides a quick reference for formulas, helping students to solve problems efficiently and accurately during the exam.

Can I bring my own formula sheet to the IB Math SL exam?

No, students are not allowed to bring their own formula sheets; they must use the official IB Math SL formula sheet provided during the exam.

How do I practice using the IB Math SL formula sheet before the exam?

To practice using the IB Math SL formula sheet, work on past exam papers, ensure you refer to the sheet while solving problems, and integrate its use into your study routine.

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IB International Baccalaureate (IBO) is a non-profit organization that provides a rigorous, balanced, and internationally recognized education for students aged 16-19. The IB program is designed to develop students' intellectual, personal, and social skills, preparing them for the challenges of the 21st century.

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A-level IB AP SAT ACT - IB

IB K12 International Baccalaureate (IBO) is a non-profit organization that provides a rigorous, balanced, and internationally recognized education for students aged 16-19. The IB program is designed to develop students' intellectual, personal, and social skills, preparing them for the challenges of the 21st century. A-Level is a qualification offered by the IB.

IB AP A-LEVEL ...

IB International Baccalaureate (IBO) is a non-profit organization that provides a rigorous, balanced, and internationally recognized education for students aged 16-19. The IB program is designed to develop students' intellectual, personal, and social skills, preparing them for the challenges of the 21st century. IB offers a variety of programs, including the IB Diploma Program (IBDP), IB Career-related Program (IBCP), and IB Middle Years Program (IBMYP).

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