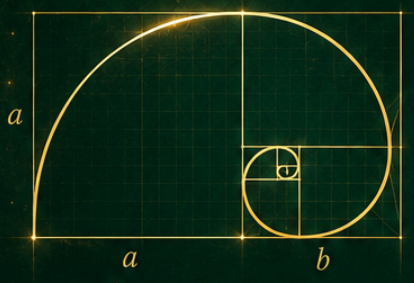
IBDP MATHEMATICS

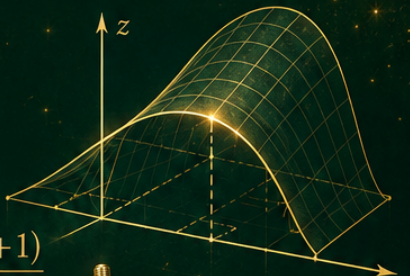
100 AI PROMPTS

for Smarter Revision *and* Exam Prep

Active recall, exam technique, and mark-scheme thinking — without cheating.



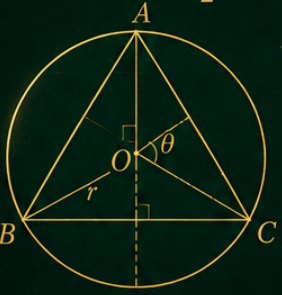
$$\int_a^b f(x)\,dx$$



$$\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$$

$$\frac{a+b}{a} = \frac{a}{b} = \varphi$$

$$\varphi = \frac{1+\sqrt{5}}{2}$$

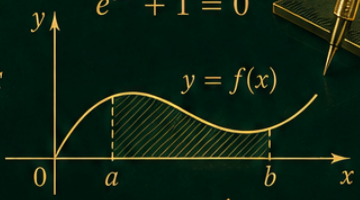


In $\triangle ABC$,

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

$$e^{i\pi} + 1 = 0$$



by James R. Martin

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The author has made use of artificial intelligence tools to assist with drafting, structuring, and generating example material. All educational guidance, explanations, and exam-related advice have been reviewed, edited, and curated by the author. Any resemblance to specific published materials is unintentional.

This book is intended to support revision and exam preparation. It does not replace formal teaching, textbooks, or official specifications. Students are responsible for ensuring that all work submitted for assessment is their own.

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How to Use This Book

For a long time, high-quality tutoring has been a major contributor to elite academic achievement. Used well, AI can now act as a powerful tutor that most students and parents could not previously afford.

This book is a **starting point**, not a rulebook. Each prompt is designed to help you revise, test your understanding, and think more clearly — not to give perfect answers. You are encouraged to **adapt, improve, and remix** these prompts.

You are learning how to think carefully about the questions you ask — a skill that will matter far beyond these exams.

Note on Exam Boards and Syllabi

This revision guide is designed for the International Baccalaureate Diploma Programme (IBDP) Mathematics: Analysis and Approaches (AA) course, covering both Standard Level (SL) and Higher Level (HL) content. The prompts align with the IB Mathematics AA syllabus and reflect the emphasis on analytical thinking, proof, and mathematical rigour that distinguishes this course.

The IB Mathematics AA assessment consists of Paper 1 (no calculator, testing algebraic fluency and reasoning), Paper 2 (graphic display calculator permitted, often featuring contextual problems), and Paper 3 (HL only, an extended problem-solving paper). The prompts in this guide prepare you for all three papers by building both technology-free skills and calculator-supported problem-solving strategies.

Many prompts in this guide are also valuable for students taking Mathematics: Applications and Interpretation (AI), particularly those covering statistics, probability, functions, and calculus fundamentals. Where prompts are specific to AA (such as proof by induction or complex integration techniques), this is noted. AI students should adapt terminology and focus areas accordingly.

The Internal Assessment (IA), known as the Mathematical Exploration, accounts for 20% of your final grade. Several prompts specifically target the planning, mathematical communication, and personal engagement criteria assessed in the Exploration markbands. Use IB command terms such as 'show that', 'hence', 'deduce', and 'justify' throughout your revision to build familiarity with how questions are phrased.

HL-only topics are indicated where relevant, including complex numbers, proof by induction, advanced calculus techniques, and vectors in three dimensions with planes. SL students should focus on the core prompts and use HL-tagged prompts as extension challenges to deepen understanding.

Contents

Section 1

Number and Algebra

Number and algebra form the foundation of the IB Mathematics AA course, encompassing sequences, series, the binomial theorem, and mathematical proof. Mastery of arithmetic and geometric sequences, along with their summation formulae, is essential for both Paper 1 and Paper 2 success.

At HL, this topic extends to proof by induction, complex numbers, and the factor and remainder theorems. Understanding the logic of proof and the structure of formal mathematical argument distinguishes strong candidates in this subject.

Use these prompts to build fluency with algebraic manipulation, develop your ability to identify sequence types from context, and practise constructing clear, logical proofs that meet IB examiner expectations.

Prompt 1: Arithmetic Sequence Identification

Copy this prompt into your AI tool:

Present me with five real-world scenarios and ask me to determine which involve arithmetic sequences. For each one I identify correctly, ask me to state the common difference and write a general term formula. Challenge me with one scenario that looks arithmetic but is not. Require me to justify each step using formal mathematical reasoning, identifying where I apply specific theorems or properties.

What this helps you practise:

Identifying arithmetic sequences and writing general terms

How to use it well:

Use this prompt to build confidence recognising arithmetic patterns in context, a skill frequently tested in Paper 2 application problems.

Prompt 2: Geometric Series and Convergence

Copy this prompt into your AI tool:

Give me a geometric series and ask me to determine whether it converges. If it does, ask me to find the sum to infinity. Then change one parameter so it diverges and ask me to explain why convergence fails. Require me to justify each algebraic step using formal mathematical reasoning.

What this helps you practise:

Evaluating convergence and sum of geometric series

How to use it well:

Practise this prompt several times with different common ratios to develop intuition for when infinite sums exist and how to calculate them.

Prompt 3: Sigma Notation Fluency

Copy this prompt into your AI tool:

Write three summation expressions in sigma notation and ask me to expand and evaluate each one without a calculator. Then give me three expanded sums and ask me to express them in sigma notation. Provide feedback on my notation precision. Incorporate a TOK perspective: Discuss whether mathematical proof constitutes the most certain form of knowledge, and evaluate why mathematicians regard proof by contradiction as valid even though it does not construct the object it proves to exist.

What this helps you practise:

Converting between sigma notation and expanded series

How to use it well:

Run this prompt to develop sigma notation fluency required for Paper 1, where calculator-free algebraic manipulation is essential and supports TOK discussion.

Prompt 4: Binomial Theorem Application

Copy this prompt into your AI tool:

Ask me to expand a binomial expression using the binomial theorem, then challenge me to find a specific term in the expansion without writing all terms. Increase difficulty by including fractional or negative indices for HL practice. Ask me to verify my solution by substituting back into the original equation and interpreting the result graphically.

What this helps you practise:

Applying the binomial theorem to find specific terms

How to use it well:

Work through this prompt with progressively harder binomials to build speed and accuracy for exam questions on specific term identification.

Prompt 5: Proof by Mathematical Induction

Copy this prompt into your AI tool:

Offer a statement involving a sum formula or divisibility claim and guide me through constructing a proof by mathematical induction. After I attempt each step, evaluate whether my base case, inductive hypothesis, and inductive step meet IB standards for rigour. Challenge me to identify precisely where a common student error might occur in this calculation and explain how to avoid it.

What this helps you practise:

Structuring proof by induction with correct IB terminology

How to use it well:

HL students should revisit this prompt weekly, as

induction proofs appear frequently on Paper 1 and require precise logical structure.

Prompt 6: Logarithmic and Exponential Equations

Copy this prompt into your AI tool:

Set me four equations involving logarithms and exponentials of increasing difficulty. After each attempt, check my use of log laws and ask me to verify my answer by substitution. Highlight any common errors in my reasoning. Then present a related problem that requires me to generalise the method to a different algebraic structure.

What this helps you practise:

Solving logarithmic and exponential equations accurately

How to use it well:

Use this prompt to reinforce log laws and exponential solving techniques that are essential across multiple syllabus topics.

Prompt 7: Partial Fractions and Algebraic Division

Copy this prompt into your AI tool:

Give me a rational expression and ask me to decompose it into partial fractions. Then present an improper rational function and ask me to perform polynomial long division first. Assess the accuracy of each step in my working. Ask me to explain the connection between the algebraic and graphical representations of this concept.

What this helps you practise:

Decomposing rational expressions using partial fractions

How to use it well:

HL students should practise this as preparation for

integration of rational functions, ensuring each algebraic step is clearly shown.

Prompt 8: Systems of Equations in Context

Copy this prompt into your AI tool:

Set up a real-world scenario that requires me to define variables, form a system of three linear equations, and solve using elimination or matrices. Then ask me to interpret the solution in context. Require me to justify each algebraic step using formal mathematical reasoning. Then ask me to verify my solution using an alternative method and explain which approach is more efficient for examination conditions.

What this helps you practise:

Modelling and solving systems of linear equations

How to use it well:

This prompt develops the modelling skills tested in Paper 2, where translating context into algebra is as important as solving.

Prompt 9: Complex Numbers Fundamentals

Copy this prompt into your AI tool:

Introduce two complex numbers and ask me to perform addition, multiplication, division, and find the modulus and argument of each. Then ask me to represent these operations on an Argand diagram and explain the geometric meaning. Ask me to verify my solution by substituting back into the original equation and interpreting the result graphically.

What this helps you practise:

Performing operations with complex numbers and Argand diagrams

How to use it well:

HL students should use this prompt to build fluency with complex number arithmetic before moving to de Moivre's theorem applications.

Prompt 10: Counting Principles and Permutations

Copy this prompt into your AI tool:

Pose five counting problems that require me to decide between permutations and combinations. After each answer, ask me to justify my choice of formula and identify whether repetition or ordering matters. Include one problem with restrictions. Challenge me to identify precisely where a common student error might occur in this calculation and explain how to avoid it.

What this helps you practise:

Distinguishing permutations from combinations in context

How to use it well:

Work through this prompt to sharpen your ability to select the correct counting method, a common source of error in exam conditions.

Prompt 11: Sequence and Series Problem Synthesis

Copy this prompt into your AI tool:

Create a multi-part IB-style exam question that combines arithmetic and geometric sequences in a financial context such as savings or depreciation. Ask me to find specific terms, partial sums, and make predictions. Mark my response against IB Paper 2 standards. Then present a related problem that requires me to generalise the method to a different algebraic structure.

What this helps you practise:

Solving extended sequence problems in applied contexts

How to use it well:

Use this as a timed practice exercise to simulate the

extended-response format and develop your ability to sustain mathematical reasoning.

Section 2

Functions

Functions are central to the IB Mathematics AA course, underpinning work in calculus, trigonometry, and mathematical modelling. You must be fluent in domain and range, composite and inverse functions, and the transformations that connect different function families.

This section covers polynomial, rational, exponential, and logarithmic functions, along with their graphical behaviour. Understanding asymptotic behaviour, intercepts, and the effect of transformations on graphs is essential for both calculator and non-calculator papers.

These prompts develop your ability to move flexibly between algebraic, graphical, and numerical representations of functions, a skill that IB examiners reward with strong marks across all papers.

Prompt 12: Domain and Range from Graphs

Copy this prompt into your AI tool:

Supply me with four different function graphs and quiz me on the domain and range of each using correct interval notation. Include at least one piecewise function and one function with a restricted domain. Correct any notation errors I make. Require me to sketch the graph, identifying all asymptotes, intercepts, and key features using correct mathematical notation.

What this helps you practise:

Determining domain and range from graphical representations

How to use it well:

Run this prompt to build accuracy with interval and set notation, which IB examiners expect to be used precisely in written responses.

Prompt 13: Composite Function Construction

Copy this prompt into your AI tool:

Define two functions f and g, then ask me to find f(g(x)) and g(f(x)). Ask me to state the domain of each composite and explain why the domains might differ. Then challenge me to find a value of x where f(g(x)) equals a given constant. Challenge me to identify the most common student error in this type of problem and explain how the IB mark scheme would penalise it.

What this helps you practise:

Forming, evaluating, and analysing composite functions

How to use it well:

Practise this prompt with different function types to develop the algebraic manipulation skills needed for Paper 1 composite function questions.

Prompt 14: Inverse Functions and Reflections

Copy this prompt into your AI tool:

Give me a one-to-one function and ask me to find its inverse algebraically. Then ask me to verify the inverse by computing $f(f^{-1}(x))$ and to describe the graphical relationship between f and f^{-1}. Finally, ask me to state any domain restrictions needed. Consider how this type of function modelling could form the basis of your Mathematical Exploration (IA), identifying a real-world data set you could fit and analyse.

What this helps you practise:

Finding and verifying inverse functions algebraically

How to use it well:

Use this prompt to reinforce finding inverses algebraically and the geometric interpretation as reflection in y = x, which also supports Exploration ideas.

Prompt 15: Transformations of Functions

Copy this prompt into your AI tool:

Starting from a base function, apply a sequence of three transformations and ask me to write the equation of the resulting function. Then give me a transformed equation and ask me to describe the transformations in the correct order. Test whether I distinguish between horizontal and vertical effects. Ask me to interpret the mathematical result in the context of the original problem, using correct units and appropriate significant figures.

What this helps you practise:

Describing and applying sequences of function transformations

How to use it well:

This prompt builds the transformation vocabulary and ordering precision that IB mark schemes reward in Paper 1 and Paper 2 questions.

Prompt 16: Polynomial Behaviour Analysis

Copy this prompt into your AI tool:

Provide a cubic or quartic polynomial and ask me to analyse its end behaviour, find its zeros by factoring, and sketch its graph showing all intercepts and turning points. Ask me to explain how the leading coefficient and degree determine the overall shape. Challenge me to describe the transformations applied in sequence, using function notation to express each transformation precisely.

What this helps you practise:

Analysing polynomial behaviour and sketching their graphs

How to use it well:

Work through this prompt to develop the graph-sketching skills tested on Paper 1, where you must produce accurate sketches without technology.

Prompt 17: Rational Function Asymptotes

Copy this prompt into your AI tool:

Give me a rational function and ask me to identify all vertical and horizontal asymptotes, find any intercepts, and determine the behaviour near each asymptote. Then ask me to sketch the function and label all key features. Challenge me with an oblique asymptote case for HL. Address a TOK knowledge question: To what extent are mathematical functions 'discovered' features of reality versus human inventions designed to model observed patterns? Evaluate whether mathematics is created or uncovered.

What this helps you practise:

Identifying asymptotes and sketching rational functions

How to use it well:

Use this prompt repeatedly with different rational functions to master the systematic approach to analysing asymptotic behaviour. This also prepares you for TOK discussions about mathematical knowledge.

Prompt 18: Exponential and Logarithmic Modelling

Copy this prompt into your AI tool:

Set me a scenario involving exponential growth or decay and ask me to form an appropriate model. Then challenge me to use logarithms to solve for a

specific time or quantity, and finally ask me to evaluate the model's limitations in the given context. Ask me to determine the domain and range, justifying any restrictions with reference to the original function.

What this helps you practise:

Building and solving exponential models in context

How to use it well:

This prompt mirrors the modelling questions common on Paper 2, where forming the equation is as important as solving it correctly.

Prompt 19: Graph Interpretation Under Exam Conditions

Copy this prompt into your AI tool:

Display a function graph with several key features and give me 90 seconds to list all intercepts, asymptotes, turning points, and intervals of increase and decrease. Then reveal the features I missed and ask me to explain how I could identify them systematically. Require me to sketch the graph, identifying all asymptotes, intercepts, and key features using correct mathematical notation.

What this helps you practise:

Rapidly extracting information from function graphs

How to use it well:

Simulate exam time pressure with this prompt to improve your speed and completeness when reading function graphs under timed conditions.

Prompt 20: Piecewise Functions and Continuity

Copy this prompt into your AI tool:

Define a piecewise function with three pieces and ask me to evaluate it at several points, including the boundary values. Then ask me to determine whether the function is continuous at each boundary and to sketch the complete graph. Challenge me to

describe the transformations applied in sequence, using function notation to express each transformation precisely.

What this helps you practise:

Evaluating, graphing, and interpreting piecewise functions

How to use it well:

Practise this prompt to strengthen your handling of piecewise definitions, which appear in both pure mathematics and applied modelling contexts.

Prompt 21: Function Equations from Graphs

Copy this prompt into your AI tool:

Present a transformed exponential or quadratic graph described by specific features such as asymptotes, vertices, and intercepts. Ask me to determine the equation of the function from these features alone. Then verify my answer by checking each feature matches. Ask me to determine the domain and range, justifying any restrictions with reference to the original function.

What this helps you practise:

Deducing function equations from graphical information

How to use it well:

This reverse-engineering skill is frequently tested on Paper 1 and Paper 2 and rewards students who understand how parameters affect graph shape.

Prompt 22: Self-Inverse and Special Functions

Copy this prompt into your AI tool:

Ask me to determine whether given functions are self-inverse by computing f(f(x)). Then present a function and ask me to find values of parameters that would make it self-inverse. Connect this to the graphical test of symmetry about y = x. Require me to sketch the graph, identifying all asymptotes,

intercepts, and key features using correct mathematical notation.

What this helps you practise:

Investigating self-inverse functions and their properties

How to use it well:

Use this as an extension prompt to deepen your understanding of inverse functions and develop the investigative skills valued in the IA.

Prompt 23: Absolute Value Functions and Equations

Copy this prompt into your AI tool:

Prepare three equations and two inequalities involving absolute value functions. Ask me to solve each algebraically and verify my solutions graphically. Then give me an absolute value function and ask me to sketch its graph, identifying vertex, intercepts, and domain restrictions. Challenge me to describe the transformations applied in sequence, using function notation to express each transformation precisely.

What this helps you practise:

Solving absolute value equations and inequalities algebraically and graphically

How to use it well:

Absolute value questions appear on Paper 1 where graphical reasoning must replace calculator verification — practise both the algebraic and visual approaches.

Section 3

Trigonometry and Circular Functions

Trigonometry in the IB AA course extends from right-angled triangle definitions through the unit circle to the analytical study of trigonometric functions and identities. You must be comfortable working in both degrees and radians, with radians being the default for calculus.

Key skills include solving trigonometric equations across specified domains, proving identities, and understanding the graphical properties of sine, cosine, and tangent functions including their transformations. HL students must also master the double angle and compound angle formulae.

These prompts build your ability to think flexibly about trigonometric relationships, moving between the unit circle, algebraic identities, and graphical representations that IB questions demand.

Prompt 24: Unit Circle Exact Values

Copy this prompt into your AI tool:

Quiz me on exact values of sine, cosine, and tangent for the standard angles in all four quadrants. Present angles in both radians and degrees. After each response, ask me to justify my answer using the unit circle rather than memorised values. Require me to derive the result from first principles rather than simply applying a memorised formula.

What this helps you practise:

Recalling exact trigonometric values using the unit circle

How to use it well:

Run this prompt daily in the weeks before Paper 1 to

ensure instant recall of exact values, which saves significant time under exam pressure.

Prompt 25: Trigonometric Equation Solving

Copy this prompt into your AI tool:

Set me three trigonometric equations to solve over a specified domain: one linear in sin or cos, one requiring a double angle formula, and one needing factorisation. After each, verify I have found all solutions in the domain and used correct reasoning. Challenge me to verify my answer using a different trigonometric identity and explain which approach is more efficient.

What this helps you practise:

Solving trigonometric equations across specified domains

How to use it well:

This prompt addresses the most common trigonometric question type on Paper 1 and builds the systematic approach needed to find all solutions.

Prompt 26: Trigonometric Identity Proof

Copy this prompt into your AI tool:

Put forward a trigonometric identity and ask me to prove it by manipulating one side only. Evaluate each step of my proof for logical validity and correct use of fundamental identities. Then give me a harder identity that requires substitution of double angle formulae. Ask me to represent the solution on the unit circle and explain the geometric significance of each value.

What this helps you practise:

Proving trigonometric identities with clear working

How to use it well:

HL students should practise identity proofs regularly, as they require the methodical algebraic reasoning that Paper 1 rewards with full marks.

Prompt 27: Sine and Cosine Rule Applications

Copy this prompt into your AI tool:

Pose a triangle problem involving non-right-angled triangles and ask me to decide whether to use the sine rule or cosine rule. Then challenge me to solve for the unknown and check for the ambiguous case. Include a problem requiring the area formula with sine. Connect this to TOK: Evaluate the claim that mathematics is a universal language by considering whether trigonometric relationships exist independently of human culture, or whether they are culturally constructed tools.

What this helps you practise:

Applying sine and cosine rules to triangle problems

How to use it well:

Use this prompt to build confidence choosing the correct rule and handling the ambiguous case, which is a frequent exam discriminator.

Prompt 28: Trigonometric Graph Transformations

Copy this prompt into your AI tool:

Give me the equation of a transformed sine or cosine function and ask me to determine the amplitude, period, phase shift, and vertical shift. Then ask me to sketch two complete cycles and label all key features. Reverse the process by giving me a graph and asking for the equation.

What this helps you practise:

Analysing and sketching transformed trigonometric functions

How to use it well:

Practise both directions — equation to graph and graph to equation — as IB exams test both skills across Paper 1 and Paper 2.

Prompt 29: Radian Measure and Arc Length

Copy this prompt into your AI tool:

Pose problems involving arc length, sector area, and segment area using radian measure. Ask me to set up the correct formula, substitute values, and express answers in exact form where possible. Include one problem that combines multiple circular measure concepts. Require me to derive the result from first principles rather than simply applying a memorised formula.

What this helps you practise:

Calculating arc lengths and sector areas in radians

How to use it well:

Work through this prompt to reinforce radian measure calculations, ensuring you can handle the exact form answers expected on Paper 1.

Prompt 30: Compound Angle Formulae

Copy this prompt into your AI tool:

Ask me to derive the exact value of a trigonometric ratio for a non-standard angle by expressing it as a sum or difference of standard angles. Then ask me to use compound angle formulae to simplify an expression. Assess whether my algebraic manipulation is efficient. Then present a variation that changes one condition, requiring me to adapt my method and explain why the original approach must be modified.

What this helps you practise:

Applying compound angle formulae to find exact values

How to use it well:

HL students should use this prompt to develop fluency with compound angle formulae, which are foundational for further identity work and calculus.

Prompt 31: Modelling with Trigonometric Functions

Copy this prompt into your AI tool:

Introduce a periodic real-world phenomenon such as tides or temperature variation and ask me to fit a trigonometric model. Ask me to determine appropriate values for amplitude, period, and vertical shift from given data, then use the model to make predictions. Suggest how this trigonometric application could be developed into an Exploration topic, discussing what data you would collect and how you would demonstrate personal engagement.

What this helps you practise:

Constructing trigonometric models from real-world data

How to use it well:

This prompt mirrors Paper 2 modelling questions where you extract parameters from context and apply trigonometric functions, building strong Exploration ideas.

Prompt 32: Reciprocal and Inverse Trigonometric Functions

Copy this prompt into your AI tool:

Test my understanding of arcsin, arccos, and arctan by asking me to evaluate expressions, state domains and ranges, and solve equations involving inverse trigonometric functions. Then ask me to sketch each inverse function and explain the domain restrictions. Challenge me to verify my answer using a different trigonometric identity and explain which approach is more efficient.

What this helps you practise:

Working with inverse trigonometric functions and their properties

How to use it well:

Use this prompt to clarify the distinction between

reciprocal and inverse trigonometric functions, a common source of confusion in exams.

Prompt 33: Trigonometric Equations with Multiple Methods

Copy this prompt into your AI tool:

Give me a trigonometric equation and ask me to solve it using two different methods — for example, using an identity versus factoring. After I complete both approaches, ask me to compare the methods and explain which is more efficient and why. Require me to sketch the relevant graph, labelling all key features including intercepts, asymptotes, and turning points with exact coordinates.

What this helps you practise:

Comparing solution strategies for trigonometric equations

How to use it well:

Developing flexibility in approach helps you select the most efficient method under exam time pressure, particularly on Paper 1.

Prompt 34: Trigonometry Exam Question Synthesis

Copy this prompt into your AI tool:

Create a multi-part IB Paper 1 style question that begins with exact value recall, progresses through identity use, and ends with solving an equation on a given domain. Mark my response using IB mark scheme conventions, noting where I would earn method marks even if my final answer is incorrect.

What this helps you practise:

Completing extended trigonometry exam questions under IB conditions

How to use it well:

Use this as a full exam simulation to practise

sustaining accuracy and clear communication across a multi-step trigonometry problem.

Section 4

Calculus — Differentiation

Differentiation is arguably the most important topic in IB Mathematics AA, appearing across both papers and forming the basis for optimisation, curve sketching, and related rates problems. You must be able to differentiate from first principles and apply a range of rules fluently.

At SL, you need mastery of the power rule, chain rule, product rule, and quotient rule applied to polynomial, trigonometric, exponential, and logarithmic functions. HL extends this to implicit differentiation, related rates, and the analysis of concavity and points of inflection.

These prompts progress from fundamental techniques through to sophisticated applications, building the layered understanding that IB examiners expect to see in well-structured solutions.

Prompt 35: Differentiation from First Principles

Copy this prompt into your AI tool:

Ask me to differentiate a simple polynomial function from first principles using the limit definition. Evaluate whether I correctly form the difference quotient, simplify, and take the limit. Then ask me to explain why this process defines the derivative. Challenge me to extend this problem by considering a boundary case or limiting value, and discuss what the result reveals about the underlying mathematics.

What this helps you practise:

Deriving gradients using the limit definition of the derivative

How to use it well:

Although rarely examined in full, understanding first

principles demonstrates the conceptual foundation that IB examiners test in short questions.

Prompt 36: Chain Rule Application

Copy this prompt into your AI tool:

Outline five composite functions of increasing complexity and ask me to differentiate each using the chain rule. Include functions involving trigonometric, exponential, and logarithmic outer or inner functions. After each, ask me to identify the inner and outer functions explicitly. Ask me to connect this concept to another area of the syllabus, explaining how the same mathematical structure appears in a different topic.

What this helps you practise:

Applying the chain rule to composite functions

How to use it well:

Run this prompt repeatedly until chain rule differentiation becomes automatic, as it is the most frequently required technique across all calculus questions.

Prompt 37: Product and Quotient Rules

Copy this prompt into your AI tool:

Give me three functions requiring the product rule and three requiring the quotient rule. After I differentiate each, ask me to simplify the result fully and check whether either rule could have been avoided through algebraic manipulation first. Then test whether I can solve the problem under timed conditions, showing all working as required by IB Paper 2 mark scheme conventions.

What this helps you practise:

Differentiating products and quotients of functions

How to use it well:

Use this prompt to build fluency with both rules and

develop judgement about when simplification before differentiation is more efficient.

Prompt 38: Tangent and Normal Lines

Copy this prompt into your AI tool:

Set me a curve and a point, and ask me to find the equations of both the tangent and the normal at that point. Then ask me to find where the tangent meets the curve again. Extend by asking me to find points on the curve where the tangent has a specified gradient.

What this helps you practise:

Finding equations of tangents and normals to curves

How to use it well:

This classic IB question type appears on both Paper 1 and Paper 2, and practising it builds essential connections between algebra and calculus.

Prompt 39: Increasing and Decreasing Intervals

Copy this prompt into your AI tool:

Frame a function and ask me to find its derivative, determine critical points, and use a sign diagram to identify intervals where the function is increasing or decreasing. Then ask me to classify each critical point as a local maximum, minimum, or neither. Require me to express my solution using correct mathematical notation throughout, and penalise any ambiguous or informal expressions.

What this helps you practise:

Using the first derivative to analyse function behaviour

How to use it well:

Practise constructing sign diagrams to develop the systematic approach that earns method marks even when arithmetic errors occur.

Prompt 40: Optimisation Problems

Copy this prompt into your AI tool:

Set me a contextual optimisation problem involving maximising area, minimising cost, or optimising another quantity. Ask me to define variables, form the objective function, differentiate, find critical values, and verify the nature of the optimum. Assess whether I justify my answer as a maximum or minimum. Require me to justify each step using formal mathematical reasoning, identifying where I apply specific theorems or properties.

What this helps you practise:

Solving optimisation problems in applied contexts

How to use it well:

Optimisation is a high-value Paper 2 topic — use this prompt to practise the complete modelling-to-solution process that earns full marks.

Prompt 41: Second Derivative and Concavity

Copy this prompt into your AI tool:

Ask me to find the second derivative of a function, determine intervals of concavity, and locate any points of inflection. Then ask me to explain the geometric meaning of concavity and how points of inflection appear on a graph. Then ask me to verify my solution using an alternative method and explain which approach is more efficient for examination conditions.

What this helps you practise:

Analysing concavity and inflection using the second derivative

How to use it well:

HL students must be comfortable with concavity analysis for curve sketching — this prompt builds both the technique and the conceptual understanding.

Prompt 42: Related Rates

Copy this prompt into your AI tool:

Show a related rates problem involving changing geometric quantities such as a balloon inflating or a ladder sliding. Guide me through identifying the relationship between variables, differentiating implicitly with respect to time, and substituting known rates. Evaluate my use of units. Challenge me to identify the most common student error in this type of problem and explain how the IB mark scheme would penalise it.

What this helps you practise:

Solving related rates problems using implicit differentiation

How to use it well:

HL students should work through several related rates scenarios to develop confidence with this challenging application of the chain rule.

Prompt 43: Implicit Differentiation

Copy this prompt into your AI tool:

Give me an implicitly defined curve and ask me to find dy/dx using implicit differentiation. Then ask me to find the gradient at a specific point on the curve and determine the equation of the tangent line there. Include an example where I must find d^2y/dx^2. Explain how an optimisation problem like this could serve as the foundation for your IA Exploration, identifying criteria for mathematical depth and meaningful reflection.

What this helps you practise:

Differentiating implicitly and finding tangent equations

How to use it well:

HL students should master implicit differentiation for related rates and curve analysis, a technique that also opens strong IA Exploration possibilities.

Prompt 44: Curve Sketching Synthesis

Copy this prompt into your AI tool:

Set me a function and ask me to produce a complete curve sketch by finding the domain, intercepts, asymptotes, first derivative information, second derivative information, and any symmetry. Assess whether my sketch is consistent with all the information I found and whether I have labelled all key features. Ask me to interpret the mathematical result in the context of the original problem, using correct units and appropriate significant figures.

What this helps you practise:

Producing complete curve sketches using calculus techniques

How to use it well:

This comprehensive prompt combines multiple differentiation skills into the type of extended analysis that appears in Paper 1 Section B questions.

Prompt 45: Differentiation Mixed Practice

Copy this prompt into your AI tool:

Create a set of eight functions to differentiate, mixing power, trigonometric, exponential, logarithmic, composite, product, and quotient types. Time me and then review my accuracy and speed. Identify which function types I need to practise further. Then present a variation that changes one condition, requiring me to adapt my method and explain why the original approach must be modified.

What this helps you practise:

Building speed and accuracy across all differentiation techniques

How to use it well:

Use this as a regular warm-up exercise to maintain fluency with differentiation rules across all function families tested in the IB.

Section 5

Calculus — Integration

Integration in IB Mathematics AA builds upon differentiation as its reverse process, extending to definite integrals for calculating areas and volumes. SL students must master basic integration techniques and area calculations, while HL students encounter integration by substitution, by parts, and volume of revolution.

The connection between differentiation and integration through the Fundamental Theorem of Calculus is a key conceptual understanding that IB examiners expect students to articulate clearly. Being able to explain why integration gives area under a curve demonstrates the depth of understanding that earns top marks.

These prompts develop both technical integration skills and the ability to apply integration in geometric and kinematic contexts, preparing you for the range of question types that appear across Paper 1, Paper 2, and Paper 3.

Prompt 46: Antiderivative Recognition

Copy this prompt into your AI tool:

Compose eight functions and ask me to find the antiderivative of each, including the constant of integration. Mix polynomial, trigonometric, exponential, and simple rational functions. After each, ask me to verify my answer by differentiating it. Require me to sketch the relevant graph, labelling all key features including intercepts, asymptotes, and turning points with exact coordinates.

What this helps you practise:

Finding antiderivatives of standard function types

How to use it well:

Build speed with this prompt by treating it as a timed drill — fast antiderivative recognition is essential for efficiency on Paper 1.

Prompt 47: Definite Integrals and Area

Copy this prompt into your AI tool:

Give me a function and an interval, then ask me to evaluate the definite integral. Follow up by asking me to interpret the result as a signed area and to calculate the total area between the curve and the x-axis, explaining why these might differ. Challenge me to extend this problem by considering a boundary case or limiting value, and discuss what the result reveals about the underlying mathematics.

What this helps you practise:

Evaluating definite integrals and interpreting area

How to use it well:

Understanding the distinction between signed and total area is a common exam discriminator — use this prompt to cement this conceptual difference.

Prompt 48: Area Between Two Curves

Copy this prompt into your AI tool:

Define two functions and ask me to find the area enclosed between them. Require me to first find intersection points, then set up the correct integral with the appropriate integrand. Ask me to justify which function is on top throughout the interval. Ask me to connect this concept to another area of the syllabus, explaining how the same mathematical structure appears in a different topic.

What this helps you practise:

Calculating areas between curves using integration

How to use it well:

Practise setting up the integral correctly, as the

method marks for identifying the correct integrand are often worth more than the final answer.

Prompt 49: Integration by Substitution

Copy this prompt into your AI tool:

Present four integrals requiring u-substitution of increasing difficulty. For each, ask me to identify the substitution, transform the integral, evaluate, and convert back to the original variable. Assess whether my choice of substitution is optimal. Then test whether I can solve the problem under timed conditions, showing all working as required by IB Paper 2 mark scheme conventions.

What this helps you practise:

Performing u-substitution for definite and indefinite integrals

How to use it well:

HL students should practise recognising which part of the integrand to substitute, as this pattern recognition speeds up problem solving significantly.

Prompt 50: Integration by Parts

Copy this prompt into your AI tool:

Give me three integrals requiring integration by parts. Include one that needs repeated application and one involving a logarithmic function. After each attempt, evaluate my choice of u and dv and discuss whether an alternative choice would have been simpler. Require me to express my solution using correct mathematical notation throughout, and penalise any ambiguous or informal expressions.

What this helps you practise:

Applying integration by parts to various function types

How to use it well:

HL students should use this prompt to develop strategic thinking about which function to

differentiate and which to integrate in the parts formula.

Prompt 51: Volume of Revolution

Copy this prompt into your AI tool:

Present a curve and ask me to find the volume generated when the region bounded by the curve and the x-axis is rotated 2π radians about the x-axis. Then ask me to set up the integral for rotation about the y-axis. Compare the two volumes and discuss the geometric interpretation.

What this helps you practise:

Calculating volumes of revolution about both axes

How to use it well:

HL students should practise both axes of rotation, paying careful attention to whether the formula uses x or y as the variable of integration.

Prompt 52: Kinematics with Calculus

Copy this prompt into your AI tool:

Give me a velocity function and initial conditions, then ask me to find displacement and acceleration functions. Pose questions about when the particle changes direction, the total distance travelled in a given time interval, and the maximum displacement from the origin. Discuss how calculating areas or volumes using integration could be extended into a Mathematical Exploration, and outline what research question you might pose.

What this helps you practise:

Applying integration and differentiation to kinematics problems

How to use it well:

Kinematics questions connect differentiation and integration in one context — practise moving fluently between displacement, velocity, and acceleration for Paper 2.

Prompt 53: Differential Equations: Separation of Variables

Copy this prompt into your AI tool:

Present a first-order separable differential equation with an initial condition. Ask me to separate variables, integrate both sides, apply the initial condition, and express the particular solution explicitly. Then ask me to interpret the solution in a given context. Require me to justify each step using formal mathematical reasoning, identifying where I apply specific theorems or properties.

What this helps you practise:

Solving separable differential equations with initial conditions

How to use it well:

HL students encounter differential equations on Paper 3 — this prompt builds the systematic approach of separate, integrate, and apply conditions.

Prompt 54: Fundamental Theorem of Calculus

Copy this prompt into your AI tool:

Ask me to state the Fundamental Theorem of Calculus and explain its significance. Then give me problems that require applying the theorem to evaluate integrals or find derivatives of integral functions. Test whether I can explain the connection between area and antiderivatives. Then ask me to verify my solution using an alternative method and explain which approach is more efficient for examination conditions.

What this helps you practise:

Understanding and applying the Fundamental Theorem of Calculus

How to use it well:

Use this prompt to develop the conceptual

understanding that underpins all integration work and is tested through explanation-style IB questions.

Prompt 55: Integration Strategy Selection

Copy this prompt into your AI tool:

Present ten integrals without indicating which technique to use. Ask me to identify the most efficient method for each — direct integration, substitution, by parts, or partial fractions — and then evaluate three of them fully. Discuss cases where multiple approaches work. Challenge me to identify the most common student error in this type of problem and explain how the IB mark scheme would penalise it.

What this helps you practise:

Selecting the right integration technique under pressure

How to use it well:

This decision-making prompt is excellent preparation for Paper 1, where choosing the right technique quickly is essential for completing all questions.

Prompt 56: Integration Exam Question Synthesis

Copy this prompt into your AI tool:

Write a multi-part Paper 2 style question that starts with finding an indefinite integral, applies it to calculate an area, and extends to a volume of revolution or kinematic interpretation. Mark my response and identify where I would gain or lose marks under IB conventions. Ask me to interpret the mathematical result in the context of the original problem, using correct units and appropriate significant figures.

What this helps you practise:

Completing extended integration exam questions under IB conditions

How to use it well:
Simulate exam conditions with this prompt to practise the sustained reasoning and clear presentation required for high marks on extended questions.

Section 6

Statistics and Probability

Statistics and probability in IB Mathematics AA range from descriptive statistics and probability fundamentals at SL to hypothesis testing and continuous distributions at HL. Understanding when and how to apply statistical tools to real data is as important as computational accuracy.

You must be comfortable interpreting data displays, calculating measures of central tendency and dispersion, and working with probability distributions including the binomial and normal distributions. GDC skills are particularly important in this topic for Paper 2.

These prompts develop your ability to select appropriate statistical methods, interpret results in context, and communicate conclusions using the precise language that IB mark schemes require.

Prompt 57: Descriptive Statistics Interpretation

Copy this prompt into your AI tool:

Present a data set and ask me to calculate the mean, median, mode, range, interquartile range, and standard deviation. Then ask me to determine which measure of central tendency is most appropriate given the shape of the distribution. Challenge me to explain my reasoning. Then present a variation that changes one condition, requiring me to adapt my method and explain why the original approach must be modified.

What this helps you practise:

Calculating and interpreting measures of central tendency and spread

How to use it well:

Use this prompt to practise both the calculations and the contextual interpretation that IB Paper 2 questions require alongside numerical answers.

Prompt 58: Probability Fundamentals

Copy this prompt into your AI tool:

Pose five probability questions involving independent events, conditional probability, and mutually exclusive events. Require me to use tree diagrams, Venn diagrams, or two-way tables as appropriate. After each, ask me to justify why I chose that particular representation. Require me to sketch the relevant graph, labelling all key features including intercepts, asymptotes, and turning points with exact coordinates.

What this helps you practise:

Solving probability problems using appropriate diagrams

How to use it well:

Practise selecting the right diagram for each problem type, as this organisational skill prevents errors and earns method marks in exams.

Prompt 59: Conditional Probability and Bayes

Copy this prompt into your AI tool:

Construct a scenario involving medical testing or quality control and ask me to calculate conditional probabilities using a tree diagram. Then challenge me to apply Bayes' theorem to reverse the conditioning. Assess whether I can interpret the results in plain language. Challenge me to extend this problem by considering a boundary case or limiting value, and discuss what the result reveals about the underlying mathematics.

What this helps you practise:
Calculating conditional probabilities and applying Bayes theorem
How to use it well:
Conditional probability questions often appear in Paper 2 with real-world contexts — this prompt develops both computation and interpretation skills.

Prompt 60: Binomial Distribution Application
Copy this prompt into your AI tool:
Present a scenario that follows a binomial distribution and ask me to verify the conditions are met. Then ask me to calculate specific probabilities using the binomial formula, find the expected value and variance, and use my GDC to verify results. Include a cumulative probability question. Ask me to connect this concept to another area of the syllabus, explaining how the same mathematical structure appears in a different topic.
What this helps you practise:
Modelling and calculating with the binomial distribution
How to use it well:
Run this prompt to build fluency moving between the binomial formula and GDC calculations, both of which are tested across Paper 1 and Paper 2.

Prompt 61: Normal Distribution Calculations
Copy this prompt into your AI tool:
Give me problems involving the normal distribution: finding probabilities for given intervals, finding values for given probabilities (inverse normal), and standardising using the z-score formula. Ask me to sketch the distribution and shade the relevant area for each problem. Link this to a TOK discussion: Analyse the extent to which statistical evidence can establish causal knowledge, and discuss why

correlation does not imply causation despite often being treated as if it does in public discourse.

What this helps you practise:

Solving normal distribution problems with and without technology

How to use it well:

Practise both the standardisation method for Paper 1 and the GDC approach for Paper 2, as both are assessed in IB examinations.

Prompt 62: Expected Value and Variance

Copy this prompt into your AI tool:

Define a discrete random variable with a probability distribution table, including one unknown probability. Ask me to find the unknown, then calculate the expected value E(X) and variance Var(X). Follow up by asking me to find E(3X + 2) and Var(3X + 2) using the linear transformation rules. Then test whether I can solve the problem under timed conditions, showing all working as required by IB Paper 2 mark scheme conventions.

What this helps you practise:

Computing expected value and variance of discrete random variables

How to use it well:

Use this prompt to reinforce the algebraic rules for expected value and variance, particularly the effect of linear transformations on these measures.

Prompt 63: Correlation and Regression

Copy this prompt into your AI tool:

Provide a bivariate data set and ask me to describe the correlation, calculate or estimate the correlation coefficient, and find the equation of the regression line. Then pose a prediction question and ask me to evaluate whether interpolation or extrapolation is appropriate. Require me to express my solution

using correct mathematical notation throughout, and penalise any ambiguous or informal expressions.

What this helps you practise:

Analysing bivariate data with regression and correlation

How to use it well:

Paper 2 frequently tests regression in context — this prompt develops the critical evaluation skills needed to discuss reliability of predictions.

Prompt 64: Probability Distributions Comparison

Copy this prompt into your AI tool:

Present two scenarios and ask me to determine whether each follows a binomial, normal, or other distribution. For each, ask me to justify the choice by checking the defining conditions. Then ask me to calculate a probability for each scenario using the appropriate distribution. Require me to justify each step using formal mathematical reasoning, identifying where I apply specific theorems or properties.

What this helps you practise:

Selecting and justifying the appropriate probability distribution

How to use it well:

Practise distribution selection to avoid the common error of applying formulas without verifying that the conditions for a particular distribution are met.

Prompt 65: Hypothesis Testing Fundamentals

Copy this prompt into your AI tool:

Set up an experimental scenario and ask me to formulate null and alternative hypotheses, select an appropriate significance level, perform a chi-squared or t-test calculation, and state my conclusion in context. Assess whether I correctly interpret the p-

value and avoid common misstatements. Evaluate how a hypothesis testing investigation could form a strong IA Exploration topic, considering data collection methods, sample size, and how to demonstrate mathematical sophistication.

What this helps you practise:

Conducting, interpreting, and concluding hypothesis tests

How to use it well:

HL students should develop the precise statistical language required for hypothesis testing conclusions in IB mark schemes and IA write-ups.

Prompt 66: Chi-Squared Test for Independence

Copy this prompt into your AI tool:

Present a contingency table and ask me to perform a chi-squared test for independence. Require me to state hypotheses, calculate expected frequencies, compute the test statistic, find degrees of freedom, and compare with the critical value. Ask me to state my conclusion using appropriate IB terminology. Then ask me to verify my solution using an alternative method and explain which approach is more efficient for examination conditions.

What this helps you practise:

Performing chi-squared tests and interpreting expected frequencies

How to use it well:

This prompt covers a common HL Paper 2 question type — practise the complete process to ensure you can earn all available method and reasoning marks.

Prompt 67: Statistics Problem in Context

Copy this prompt into your AI tool:

Create an IB-style Paper 2 question that provides data in a real-world context and requires me to choose between statistical methods, perform

calculations, and interpret results. Include a part that asks me to discuss limitations of the statistical model used. Mark my response against IB standards. Challenge me to identify the most common student error in this type of problem and explain how the IB mark scheme would penalise it.

What this helps you practise:

Applying statistical methods to contextual exam problems

How to use it well:

Use this as an extended practice question to develop the contextual reasoning and clear communication that distinguishes top-scoring responses.

Section 7

Vectors

Vectors in IB Mathematics AA progress from two-dimensional operations at SL to three-dimensional geometry including lines and planes at HL. The ability to work with vectors both algebraically and geometrically is essential for success in this topic.

At SL, you must master vector addition, scalar multiplication, the scalar (dot) product, and its applications to angles and perpendicularity. HL extends to the vector (cross) product, equations of lines and planes in three dimensions, and the relationships between geometric objects in space.

These prompts build your vector skills from foundational operations through to the three-dimensional spatial reasoning that challenges many HL candidates and distinguishes strong performance on Paper 1.

Prompt 68: Vector Operations Fundamentals

Copy this prompt into your AI tool:

Give me pairs of vectors and ask me to perform addition, subtraction, and scalar multiplication both algebraically and by describing the geometric effect. Then ask me to find the magnitude and unit vector for each result. Assess my notation precision throughout. Ask me to interpret the mathematical result in the context of the original problem, using correct units and appropriate significant figures.

What this helps you practise:

Performing basic vector operations with correct notation

How to use it well:

Start here to establish solid foundations with vector

arithmetic and notation before moving to more complex applications involving dot and cross products.

Prompt 69: Scalar Product and Angles

Copy this prompt into your AI tool:

Present pairs of vectors and ask me to calculate the scalar (dot) product using both the component formula and the angle formula. Then ask me to find the angle between the vectors and determine whether any pairs are perpendicular. Include a proof that uses the scalar product. Then present a variation that changes one condition, requiring me to adapt my method and explain why the original approach must be modified.

What this helps you practise:

Using the scalar product to find angles between vectors

How to use it well:

Practise connecting the two scalar product formulas, as IB questions often require you to use one formula to find a result and the other to verify it.

Prompt 70: Vector Equations of Lines

Copy this prompt into your AI tool:

Give me information about a line in three-dimensional space (a point and direction, or two points) and ask me to write the vector equation, parametric equations, and Cartesian equation. Then ask me to determine whether a given point lies on the line. Require me to sketch the relevant graph, labelling all key features including intercepts, asymptotes, and turning points with exact coordinates.

What this helps you practise:

Writing and converting between forms of vector line equations

How to use it well:

HL students must move fluently between equation forms — this prompt builds the conversion skills tested frequently on Paper 1.

Prompt 71: Intersection and Skew Lines

Copy this prompt into your AI tool:

Present two lines in three-dimensional space and ask me to determine whether they intersect, are parallel, or are skew. If they intersect, ask me to find the point of intersection and the acute angle between them. If skew, ask me to find the shortest distance between them. Challenge me to extend this problem by considering a boundary case or limiting value, and discuss what the result reveals about the underlying mathematics.

What this helps you practise:

Analysing relationships between lines in three dimensions

How to use it well:

This is one of the most challenging HL vector topics — use this prompt systematically to develop a clear decision-making process for classifying line relationships.

Prompt 72: Cross Product and Applications

Copy this prompt into your AI tool:

Give me two vectors and ask me to calculate their cross product. Then ask me to verify that the result is perpendicular to both original vectors. Follow up with applications: finding the area of a parallelogram and determining a normal to a plane. Assess my working at each stage. Ask me to connect this concept to another area of the syllabus, explaining how the same mathematical structure appears in a different topic.

What this helps you practise:

Computing and applying the vector cross product

How to use it well:

HL students should practise the cross product calculation until it is reliable, as errors here cascade through plane equation and area problems.

Prompt 73: Equations of Planes

Copy this prompt into your AI tool:

Ask me to find the equation of a plane given three points, or a point and a normal vector. Then ask me to determine whether a given point lies on the plane and to find the angle between the plane and a given line. Include converting between vector and Cartesian forms.

What this helps you practise:

Finding and working with equations of planes

How to use it well:

HL students should use this prompt to build confidence with plane equations, which often appear as multi-step problems on Paper 1 and Paper 3.

Prompt 74: Distances in Three Dimensions

Copy this prompt into your AI tool:

Pose problems asking me to find: the distance from a point to a line, the distance from a point to a plane, and the distance between two parallel planes. For each, ask me to derive the method using vector projections rather than just applying a formula. Then test whether I can solve the problem under timed conditions, showing all working as required by IB Paper 2 mark scheme conventions.

What this helps you practise:

Calculating distances using vector projection methods

How to use it well:

Understanding the derivation of distance formulas,

not just memorising them, prepares you for the 'show that' style questions common in IB exams.

Prompt 75: Vector Proofs in Geometry

Copy this prompt into your AI tool:

Present a geometric property such as the diagonals of a parallelogram bisecting each other or the medians of a triangle being concurrent. Ask me to prove it using vector methods. Evaluate whether my proof is logically complete and uses vectors effectively. Require me to express my solution using correct mathematical notation throughout, and penalise any ambiguous or informal expressions.

What this helps you practise:

Constructing geometric proofs using vector methods

How to use it well:

Vector proofs develop the abstract reasoning that IB values highly — practise translating geometric statements into vector equations and vice versa.

Prompt 76: Position Vectors and Ratios

Copy this prompt into your AI tool:

Give me position vectors of points and ask me to find the point that divides a line segment in a given ratio. Then ask me to find the centroid of a triangle and the position vector of the midpoint of a segment. Extend to three-dimensional problems. Require me to justify each step using formal mathematical reasoning, identifying where I apply specific theorems or properties.

What this helps you practise:

Using position vectors to find division points and centroids

How to use it well:

This prompt reinforces the section formula and its applications, which frequently appear as early parts of extended vector questions on Paper 1.

Prompt 77: Vectors Exam Question Synthesis

Copy this prompt into your AI tool:

Construct an extended IB Paper 1 vector question that begins with basic operations, progresses through line and plane equations, and culminates in finding a distance or angle. Mark my response using IB conventions, awarding method marks appropriately and noting where follow-through marks apply. Then ask me to verify my solution using an alternative method and explain which approach is more efficient for examination conditions.

What this helps you practise:

Completing multi-part vector exam questions under IB conditions

How to use it well:

Simulate full exam questions to practise sustaining accuracy across many steps, where follow-through marking means early errors need not cost all subsequent marks.

Prompt 78: Scalar Product Applications in Physics

Copy this prompt into your AI tool:

Present problems where vectors represent forces or velocities and ask me to use the scalar product to calculate work done or resolve components. Then ask me to interpret the physical meaning of a zero scalar product in context. Challenge me to identify the most common student error in this type of problem and explain how the IB mark scheme would penalise it.

What this helps you practise:

Applying scalar products to physical scenarios

How to use it well:

Cross-curricular applications strengthen

understanding and are valued in the Mathematical Exploration, where connecting mathematics to other disciplines earns engagement marks.

Section 8

Mathematical Exploration (IA) Preparation

The Mathematical Exploration, or Internal Assessment (IA), is a piece of independent mathematical writing worth 20% of your final IB Mathematics grade. It is assessed against five criteria: Presentation, Mathematical Communication, Personal Engagement, Reflection, and Use of Mathematics.

Choosing a strong topic is crucial — it must allow you to explore mathematics at an appropriate level while demonstrating genuine personal interest. The best explorations connect mathematics to a real-world context, another subject, or a question that genuinely intrigues you.

These prompts guide you through every stage of the Exploration process, from brainstorming topics through to refining your final draft, ensuring your work meets the IB markband descriptors for each criterion.

Prompt 79: Topic Brainstorming and Selection

Copy this prompt into your AI tool:

Ask me about my personal interests, hobbies, and other IB subjects. Based on my responses, suggest five potential Exploration topics that connect my interests to Mathematics AA syllabus content. For each suggestion, outline what mathematical tools I would use and what level of difficulty it represents. For each suggested topic, ask me to identify the specific syllabus content it connects to and justify why it offers sufficient scope for mathematical analysis at my level.

What this helps you practise:

Generating personally engaging IA topic ideas

How to use it well:

Use this prompt early in the IA process to find a topic where your personal engagement will be genuine, which is essential for scoring well on Criterion C.

Prompt 80: Research Question Refinement

Copy this prompt into your AI tool:

I will share my Exploration topic idea with you. Help me refine it into a focused research question that is neither too broad nor too narrow. Assess whether the question allows for sufficient mathematical depth at AA SL or HL level and suggest modifications to improve its scope. Then challenge me to outline three mathematical techniques I could apply to the research question and evaluate whether they demonstrate appropriate depth for IB assessment.

What this helps you practise:

Crafting a focused and mathematically rich research question

How to use it well:

Run this prompt once you have a general topic to ensure your question is specific enough to investigate thoroughly within the word count.

Prompt 81: Mathematical Communication Standards

Copy this prompt into your AI tool:

Present a sample paragraph from a Mathematical Exploration and ask me to improve its mathematical communication. Test whether I can identify where variables should be defined, where graphs need labels, and where mathematical notation should replace words. Grade the sample against Criterion

B. Require me to rewrite each section using correct mathematical notation, including defined variables, properly labelled diagrams, and referenced formulae from the IB formula booklet.

What this helps you practise:

Evaluating and improving mathematical communication quality

How to use it well:

Use this prompt to develop an eye for the presentation standards that distinguish a top-scoring Exploration from an average one.

Prompt 82: Personal Engagement Demonstration

Copy this prompt into your AI tool:

Ask me to describe my Exploration topic and my motivation for choosing it. Then challenge me to identify three specific ways I can demonstrate personal engagement in my writing — beyond simply stating interest. Evaluate whether my ideas align with the Criterion C markband descriptors. Then ask me to draft a paragraph that demonstrates genuine curiosity about my topic, and evaluate whether it goes beyond surface-level interest to show authentic mathematical inquiry.

What this helps you practise:

Articulating genuine personal engagement in mathematical writing

How to use it well:

Personal engagement cannot be faked — use this prompt to plan how you will weave your authentic connection to the topic throughout the Exploration.

Prompt 83: Reflection Quality Enhancement

Copy this prompt into your AI tool:

Present three examples of reflection statements: one superficial, one adequate, and one excellent. Ask me

to rank them and explain what makes the excellent one score highest against Criterion D. Then ask me to write a reflection paragraph for my own Exploration topic. Then ask me to write my own reflection paragraph that demonstrates critical evaluation of my mathematical process, not merely a summary of what I did.

What this helps you practise:

Writing meaningful reflections that meet IB Criterion D standards

How to use it well:

Practise distinguishing between description and genuine reflection to ensure your Exploration contains the critical evaluation that earns top marks.

Prompt 84: Mathematical Depth Assessment

Copy this prompt into your AI tool:

I will describe the mathematics I plan to use in my Exploration. Evaluate whether it demonstrates sufficient depth and sophistication for my level (SL or HL). Suggest specific ways I could extend the mathematical content to reach a higher markband for Criterion E, Use of Mathematics. Ask me to identify two specific extensions that would elevate the mathematical depth — such as applying a different model, generalising a result, or connecting to an unfamiliar area of mathematics.

What this helps you practise:

Assessing and enhancing the mathematical depth of an Exploration

How to use it well:

Use this prompt to verify that your planned mathematics goes beyond routine calculations and demonstrates genuine understanding and application.

Prompt 85: Structure and Presentation Planning

Copy this prompt into your AI tool:

Ask me to outline the structure of my Exploration. Evaluate whether it follows a logical progression with clear introduction, methodology, analysis, and conclusion sections. Suggest improvements to meet the Criterion A presentation standards, including appropriate use of headings and page count guidelines. Challenge me to justify why each section is necessary, identify any gaps in logical flow, and suggest where additional mathematical analysis would strengthen the overall argument.

What this helps you practise:

Organising an Exploration with clear structure and presentation

How to use it well:

Plan your structure before writing to ensure your Exploration flows logically and stays within the recommended 12 to 20 page length.

Prompt 86: Data Collection and Analysis Planning

Copy this prompt into your AI tool:

Test me about my data collection plan for the Exploration. Evaluate whether my planned sample size is appropriate, my methodology is sound, and my analysis techniques match the type of data I will collect. Suggest improvements and identify potential pitfalls. Ask me to identify potential sources of bias or error in my data and explain how I would address each one, including appropriate statistical tests to validate my findings.

What this helps you practise:

Planning robust data collection for a Mathematical Exploration

How to use it well:

If your Exploration involves data, use this prompt to ensure your collection method and analysis plan are statistically sound before you begin.

Prompt 87: Exploration Draft Review

Copy this prompt into your AI tool:

I will share a section of my Exploration draft with you. Provide detailed feedback against all five IB Exploration criteria: Presentation, Mathematical Communication, Personal Engagement, Reflection, and Use of Mathematics. Suggest specific, actionable improvements for each criterion. Require me to identify three specific areas where my draft could demonstrate greater mathematical sophistication, and ask me to revise those passages with deeper analytical reasoning.

What this helps you practise:

Receiving structured feedback on Exploration drafts

How to use it well:

Submit sections of your draft to this prompt iteratively to refine your work before the final submission deadline, addressing one criterion at a time.

Prompt 88: Exploration Error Analysis

Copy this prompt into your AI tool:

Present common pitfalls in IB Mathematical Explorations — such as describing rather than analysing, using mathematics below the expected level, or failing to cite sources — and ask me to identify which of these risks apply to my current draft. Then guide me to address each one. Then challenge me to review my own Exploration draft and identify which of these pitfalls apply, proposing specific revisions that would strengthen my mathematical analysis and personal engagement.

What this helps you practise:
Identifying and correcting common Exploration weaknesses
How to use it well:
Use this prompt as a final check before submission to catch issues that commonly cost students marks across the Exploration criteria.

Prompt 89: Conclusion and Extension Writing
Copy this prompt into your AI tool:
Ask me to write a conclusion for my Exploration that summarises findings, evaluates limitations, and suggests meaningful extensions. Assess whether my conclusion demonstrates the critical thinking and self-awareness that the IB values, or whether it merely restates results without analysis. Challenge me to ensure my conclusion directly addresses my research question with specific mathematical evidence, and evaluate whether my proposed extensions are genuinely feasible and mathematically interesting.
What this helps you practise:
Writing conclusions that demonstrate reflection and critical thinking
How to use it well:
Strong conclusions tie together the entire Exploration — use this prompt to ensure yours evaluates the process and considers what could be explored further.

Section 9

Exam Technique and Paper Strategy

Strong mathematical knowledge alone does not guarantee top marks in IB Mathematics AA examinations. Effective exam technique — including time management, command term interpretation, and strategic paper navigation — can significantly improve your performance under pressure.

Paper 1 (no calculator) demands algebraic fluency and clear working, while Paper 2 (GDC permitted) rewards efficient use of technology and contextual interpretation. HL Paper 3 requires sustained problem-solving across connected parts of an extended investigation.

These prompts develop the meta-skills of examination performance: reading questions strategically, allocating time effectively, showing working for maximum marks, and reviewing answers efficiently in the final minutes of each paper.

Prompt 90: Command Term Interpretation

Copy this prompt into your AI tool:

Present me with ten IB Mathematics command terms such as 'hence', 'show that', 'deduce', 'justify', and 'find'. For each, ask me to explain what the examiner expects and how my response should differ from other command terms. Test me with sample questions using each term. Ask me to interpret the mathematical result in the context of the original problem, using correct units and appropriate significant figures.

What this helps you practise:

Interpreting IB command terms to match examiner expectations

How to use it well:
Understanding command terms prevents the common error of providing too much or too little work — use this prompt to calibrate your responses precisely.

Prompt 91: Time Allocation Strategy
Copy this prompt into your AI tool:
Pose a mock Paper 1 or Paper 2 structure with mark allocations and ask me to create a time plan. Then pose scenarios such as getting stuck on a question or finishing early, and ask me to describe my strategy for each. Evaluate whether my plans are realistic. Then present a variation that changes one condition, requiring me to adapt my method and explain why the original approach must be modified.
What this helps you practise:
Planning time allocation for IB Mathematics papers
How to use it well:
Develop and refine your time plan before the exam so that on the day, time management is automatic rather than an additional cognitive burden.

Prompt 92: Mark Scheme Reading Practice
Copy this prompt into your AI tool:
Show me an IB-style question with a sample student response. Ask me to mark it using typical IB conventions including method marks (M), accuracy marks (A), and reasoning marks (R). Then reveal the actual mark allocation and discuss where our marking differs. Require me to sketch the relevant graph, labelling all key features including intercepts, asymptotes, and turning points with exact coordinates.
What this helps you practise:
Understanding IB mark scheme conventions and mark allocation

How to use it well:

Marking sample responses teaches you what examiners look for, helping you present your own solutions in the format most likely to earn full marks.

Prompt 93: Show That Question Strategy

Copy this prompt into your AI tool:

Give me three 'show that' questions of varying difficulty. After each attempt, evaluate whether I have provided sufficient working to earn full marks, given that the answer is already known. Identify any logical gaps that an examiner would penalise. Challenge me to extend this problem by considering a boundary case or limiting value, and discuss what the result reveals about the underlying mathematics.

What this helps you practise:

Constructing complete solutions for 'show that' questions

How to use it well:

'Show that' questions require every step to be justified since you cannot earn the final answer mark by writing the given result — practise showing complete reasoning.

Prompt 94: Paper 1 Calculator-Free Strategies

Copy this prompt into your AI tool:

Present five problems that are straightforward with a calculator but challenging without one. Ask me to solve each using only algebraic and mental arithmetic strategies. After each, suggest more efficient approaches I could have used. Focus on estimation and exact value techniques. Ask me to connect this concept to another area of the syllabus, explaining how the same mathematical structure appears in a different topic.

What this helps you practise:

Solving Paper 1 problems without a calculator

How to use it well:
Simulate Paper 1 conditions regularly to build the algebraic confidence and mental arithmetic speed that this paper demands.

Prompt 95: GDC Efficiency for Paper 2
Copy this prompt into your AI tool:
Quiz me on five types of Paper 2 questions where GDC use is essential — such as finding roots, regression, normal distribution probabilities, and numerical integration. For each, ask me to outline the GDC steps I would use and how I would present GDC-obtained results in my written solution. Then test whether I can solve the problem under timed conditions, showing all working as required by IB Paper 2 mark scheme conventions.
What this helps you practise:
Using the GDC efficiently and presenting technology-aided solutions
How to use it well:
Practise GDC workflows so that technology supports rather than slows your problem solving — knowing which buttons to press saves crucial exam minutes.

Prompt 96: Error Identification and Recovery
Copy this prompt into your AI tool:
Present a worked solution containing two deliberate errors — one arithmetic and one conceptual. Ask me to identify both errors, explain the mathematical principle that was violated, and correct the solution. Then discuss how follow-through marking would apply. Require me to express my solution using correct mathematical notation throughout, and penalise any ambiguous or informal expressions.
What this helps you practise:
Spotting and correcting errors in mathematical solutions

How to use it well:

Training your error-detection skills helps during the review phase of an exam and builds awareness of the mistakes you are most likely to make.

Prompt 97: Paper 3 Extended Problem Strategy

Copy this prompt into your AI tool:

Simulate an HL Paper 3 experience by presenting an unfamiliar mathematical scenario with guided questions that build from simple observations to complex analysis. Coach me on how to use earlier parts to inform later answers and how to manage the extended problem-solving process. Require me to justify each step using formal mathematical reasoning, identifying where I apply specific theorems or properties.

What this helps you practise:

Navigating extended investigation questions on HL Paper 3

How to use it well:

HL students should practise Paper 3 style problems to develop comfort with unfamiliar mathematics and the progressive reasoning these papers demand.

Prompt 98: Working and Communication Standards

Copy this prompt into your AI tool:

Give me a problem and ask me to solve it twice: once with minimal working and once with full, clear working showing all steps. Then compare the two versions and ask me to identify where marks would be lost in the minimal version. Discuss the IB expectation for showing working.

What this helps you practise:

Presenting mathematical working to IB examination standards

How to use it well:

This prompt demonstrates the mark cost of insufficient working, motivating you to develop the habit of clear, step-by-step presentation in every exam response.

Prompt 99: Full Paper Simulation and Review

Copy this prompt into your AI tool:

Create a mini paper with five questions covering different syllabus areas, assign a total time limit, and ask me to complete them under timed conditions. After I finish, review my responses for mathematical accuracy, working quality, and time management. Provide a projected IB grade boundary estimate. Then ask me to verify my solution using an alternative method and explain which approach is more efficient for examination conditions.

What this helps you practise:

Simulating complete exam papers under realistic conditions

How to use it well:

Use this as a capstone revision exercise in the weeks before the exam to identify remaining weaknesses and build confidence with the full exam experience.

Prompt 100: Post-Mock Exam Analysis

Copy this prompt into your AI tool:

I will share my results from a practice paper or mock exam. Help me analyse my performance by categorising errors as conceptual, procedural, or careless. Then create a targeted revision plan that prioritises the topics and skills where I lost the most marks. Challenge me to identify the most common student error in this type of problem and explain how the IB mark scheme would penalise it.

What this helps you practise:

Analysing exam performance to create targeted revision plans

How to use it well:

After every practice paper, run this prompt to convert your mistakes into actionable revision priorities rather than simply noting a score.

Final Closing Note

You have now worked through 100 prompts designed to help you think more clearly, revise more effectively, and prepare more confidently for your GCSE.

Remember: the goal was never to rely on AI for answers. The goal was to use it as a tool to test, challenge, and strengthen your own understanding.

The strongest students are not those who avoid difficulty, but those who engage with it deliberately. Each mistake you identified, each explanation you improved, and each gap you filled has strengthened your thinking.

As you continue your studies, aim to depend less on prompts and more on your own judgement. AI can support you — but your reasoning, clarity, and persistence are what earn marks.
Approach your exams calmly. Think carefully. Write clearly.
You are more prepared than you think.

Using AI Beyond This Book

The prompts in this book are starting points, not final forms.

As you grow more confident, begin modifying them:

- Add constraints (for example, “limit to three key points”).
- Increase difficulty gradually.
- Ask the AI to challenge your reasoning.
- Request alternative explanations.
- Ask it to critique your thinking rather than provide answers.

The most powerful use of AI is not asking it to tell you things — it is asking it to test and refine your thinking.

In the future, those who understand how to use tools intelligently will have an advantage. Treat AI as a tutor, not a shortcut. The skill of asking better questions will continue to matter long after your exams are over.

About the Author

James R. Martin holds an MSci in Physics from the University of Bristol and a PGCE with a Physics focus from the University of Oxford. He has over a decade of experience teaching and tutoring students aged 11–18 across a range of subjects, including Physics, Biology, Chemistry, Mathematics, Economics, and Electronics.

He has worked with multiple syllabi, including GCSE, A-Level, KS3, and the International Baccalaureate Diploma Programme (IBDP), supporting students of varying abilities to develop clarity, confidence, and exam success.

His work focuses on effective revision strategies, independent thinking, and the responsible use of artificial intelligence as a tool to strengthen — not replace — understanding.

Other Titles in This Series

The *100 AI Prompts for Smarter Revision* series supports students across GCSE, A-Level, and IBDP subjects.

GCSE
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• Mathematics
• Physics
• Biology
• Chemistry
• Geography
• History
• Computer Science
• Economics
• Business Studies
• Religious Studies
• Psychology
• French
• Spanish
• German

A-Level
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• Further Mathematics
• Physics
• Chemistry
• Biology
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• Computer Science

• Politics
• Business

IBDP

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• Mathematics: Applications & Interpretation
• Physics
• Chemistry
• Biology
• Economics
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