IB DP MATHS AA · EXAM SPECIAL · AA AND AI · SL & HL · FROM THE 2024–25 SUBJECT REPORTS · ~8 MIN READ

IB Maths IA Guide: How to Score Highly on the Exploration (AA & AI)

A practical guide to the IB Maths exploration for AA and AI, SL and HL: what each criterion rewards, how to choose a topic with enough mathematics, a structure that works and the mistakes moderators flagged in the 2024–25 reports.

How the IA is marked · Criterion A–E · Choosing a topic · Topic ideas · Structure · Notation & technology · AI use & citing · Common mistakes

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No tag = **SL and HL** HL ONLY HL students only FORMULA BOOKLET given in the exam

M1 A1 how marks are awarded highlight = comes up again and again HANDY worth memorising

Test yourself at the end

IN 30 SECONDS

- **The exploration is 20% of your final grade** at both SL and HL, in AA and AI. It is marked out of 20 by your teacher and then moderated by the IB.
- **Moderators said the same things in almost every 2024–25 report:** reflection is the weakest criterion, personal engagement is often over-rewarded, and "complex" mathematics that the student doesn't understand scores lower than appropriate mathematics explained well.
- **A typical length is 12 to 20 pages,** double-spaced. Concise and focused beats long.

BY THE END YOU CAN

- Understand exactly what each of the five criteria rewards.
- Choose a topic that gives you enough mathematics to reach the top bands.
- Avoid the mistakes moderators see most often.

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1 How the exploration is marked

Criterion	What it rewards	Marks
A · Presentation	Organised, coherent and concise: a clear aim, a logical flow, a conclusion	4
B · Mathematical communication	Correct notation, symbols and terms; labelled graphs and tables; defined variables	4
C · Personal engagement	Your own thinking driving the work: your questions, choices and insights	3
D · Reflection	Critical comments on your methods and results, **throughout**, not only at the end	3
E · Use of mathematics	Relevant mathematics at the level of your course, correct and **understood**	6

- **Criterion E is assessed at the level of your course.** The HL descriptor expects more sophistication and rigour than the SL one.
- **Total: 20 marks.** In November 2024 and May 2025 a 7 needed **17/20 at HL and 18/20 at SL**; see the AA grade boundaries.

EXAM TIP

First assessment 2029: the new Maths guides keep the exploration at 20 marks but reorganise the assessment into **four criteria**. If you start the course for 2029 or later, check the new criteria with your teacher; the advice on this page about depth, reflection and communication still applies.

2 What moderators said, criterion by criterion

A · Presentation

- **State one clear aim** early, and keep the whole exploration focused on it. Explorations with a broad or vague aim lost the "coherent" mark.
- **Cut repetition.** Many explorations were too long because they repeated method steps or background.
- **Proofread the layout:** graphs or tables split across pages and headings stranded at the bottom of a page were flagged as careless.

B · Mathematical communication

- **No calculator notation.** Write x^2, 3×10^4 and $\sqrt{x}$ with an equation editor, not x^2, 3E4 or sqrt(x).
- **Define every variable** where it first appears, with its units.
- **Graphs:** readable text, labelled axes with units, and a title or caption. Faint screenshots from software lost marks.
- **Approximations:** use ≈ whenever you round, and keep a consistent accuracy (state it).
- **Tables:** large tables go in an appendix; a table in the text fits on one page.

C · Personal engagement

- **Saying why you like the topic is not engagement.** Moderators gave most explorations 1 or 2 out of 3 because the "personal" part was only the introduction.
- **What does count:** asking your own questions, collecting or creating your own data, trying an approach that didn't work and explaining why, extending the problem, making decisions and justifying them.
- **Show it throughout,** in your own voice ("I decided to...", "this surprised me because...").

D · Reflection

- **The weakest criterion in nearly every report.** Most students summarised results in the conclusion and called it reflection.
- **Critical reflection asks:** Is the result reasonable? What are the limitations of the method or model? What assumptions did I make, and how much do they matter? What would happen if I changed a parameter? How could the method be extended?
- **Put a short reflective comment after each major step,** not only at the end.

E · Use of mathematics

- **Appropriate, not complex.** Using mathematics you don't fully understand (often physics-style differential equations or matrices beyond the course) led to procedural work with little insight and lower marks.
- **Explain why you chose each technique.** Understanding is shown by the choice, not only by carrying it out.
- **SL content can score at HL,** but work that never goes beyond SL level usually can't reach the top band at HL.
- **Statistics explorations** often stopped at R^2 or a single test. Justify the model, check its conditions and interpret the result in context.

3 Choosing a topic

- **Start from a question, not a topic.** "How many shuffles randomise a deck of cards?" is a question; "card shuffling" is a topic.
- **Check the mathematics before you commit.** Write down 3–4 techniques you will use. If they're all from the first year of the course, the topic is probably too thin.
- **Personal but mathematical.** Data you collect yourself can help Criterion C, but the mathematics must be the focus.

Topic ideas with real depth

Question	Mathematics	Course
What is the best angle to shoot a basketball from the free-throw line?	Projectile models, optimisation, derivatives	AA
How does a spirograph pattern depend on its gear sizes?	Parametric equations, LCM, periodicity	AA HL
Can I model the shape of a hanging chain, and is it a parabola?	Curve fitting, catenary vs quadratic, least squares	AA/AI
How long until a rumour reaches everyone in my school?	Logistic model, differential equations, fitting data	AI HL
Where should a new metro station go to serve the most people?	Voronoi diagrams, distances, optimisation	AI
Do penalty-shootout results depend on kicking first?	χ^2 test, binomial model, conditions	AI
What is the volume of a vase or wine glass?	Volumes of revolution, curve fitting, error analysis	AA/AI HL
How fast does a cup of chai cool, and is Newton's law accurate?	Exponential models, linearising, residuals	AA/AI

COMMON MISTAKE

Topics moderators see too often: linear regression of two sports statistics, a TSP and Voronoi "template" exploration, the golden ratio described from websites. They can work, but only with your own data, questions and analysis.

4 A structure that works

- **Introduction:** your aim (one sentence), why it matters to you, and a short plan.
- **Development:** sections in a logical order; each one says what you're doing and why, shows the mathematics, and ends with a short reflection.
- **Conclusion:** answer the aim directly, then limitations and possible extensions.
- **Bibliography and appendices:** sources cited properly; large tables and code in the appendix.

5 Technology and AI tools

- **Software is welcome:** GeoGebra, Desmos, spreadsheets and Python can all help, but the exploration must not read like a computer-science project. Explain the mathematics behind what the software does.
- **Generative AI** must be used within the IB's academic integrity rules and **cited**. Moderators noted explorations that lost the student's own voice; work you can't explain doesn't help Criterion E.
- **Screenshots add little** unless you explain what they show.

6 Final checklist

- One clear aim, answered in the conclusion.
- Every variable defined; no calculator notation; ≈ used for rounded values.
- Reflection after each major step, plus limitations at the end.
- Each technique justified ("I used... because...").
- Graphs readable, labelled, and not split across pages.
- Sources and any AI use cited.

LINKING QUESTION

For the mathematics behind many of these ideas see Integration and kinematics, Differential equations and Maclaurin series and Chi-squared and t-tests.

Test yourself — cover the answers first

QUICK CHECK

1. How many marks is the Maths exploration out of?
2. Which criterion is weakest in most explorations?
3. Is saying why you chose a topic enough for personal engagement?
4. Should you use the most advanced mathematics you can find?
5. Where should a large data table go?

Show answers

1. 20
2. D, reflection
3. no; it must show in your own thinking throughout
4. no; use appropriate mathematics you understand and can explain
5. in an appendix

Stuck on a question?

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