4. Top tips

Here are some tips that will help you throughout your exams. Some of them may be obvious, but these are sometimes the ones that students forget!

Before the exam

Be aware of what you can bring into the exam room

- Common tools: pencils, pens, eraser, sharpener, ruler.
- Your GDC and a spare set of batteries.
- Translation dictionary for non-native speakers of the exam language (cannot be electronic).
- Water, but no other food or drinks.
- You are NOT allowed any electronic devices that have wireless capability, QWERTY keyboard functions, or watches with calculator capabilities for paper 2.

In an effort to be fair to all, the GDC must have its memory reset

- The RAM memory must be reset or initialized on all calculators.
- The ROM memory must be reset or initialized on all calculators.

Be familiar with the layout of the information booklet

- Each search for a formula takes time, so you want to know exactly where to go in the booklet for a formula.
- Although it is nice that so much information is given in the booklet, use it as a resource when you really need it and not for every little thing.

Be familiar with IB mathematical notation

- Although there may be various forms of acceptable mathematical notation for any particular concept, only official IB notation will be used in the questions on the exam papers.
- Because this is an international exam, examiners will accept any appropriate and recognizable notation in your own working. For example, the seventh binomial coefficient in the expansion of $(a + b)^{10}$ would be written in the exam paper as $\binom{10}{6}$. But in your own working it is completely acceptable for you to write ${}_{10}C_6$ instead.
- Final answers given in calculator notation that is not mathematical notation will not be accepted. For example, if you obtain an answer in your GDC such as 3.20456E-3, you should write either 3.20×10^{-3} or 0.00320 as your answer.

During the exam

For each paper you get 90 minutes to complete 90 marks of work, so you should expect to spend about a minute of time per mark

- With your 5 minutes of reading time before the exam begins, you should glance through the questions and plan your strategy for which you will do first, which you may skip, and which you will save for the end.
- Although you may feel the pressure of time, try not to rush through the exam. Pace yourself, and try not to spend too long on any one question.

When questions have multiple parts, they are often "linked" in that an answer or concept in one part may be helpful in answering another part

- Section B questions are built around a common theme, so that what you do in the earlier parts of a question may be relevant in later parts.
- If you are stuck for an idea in a later part of a question, say part (c), look at what was asked in parts (a) and (b) for a clue to get you thinking.
- This is especially true in "show that" questions. If you do not know how to show the answer given in the question, don't give up! You can still use the given result in the remainder of the question.

When questions include a diagram, the words of the question will describe the information in the diagram

- Make sure that as you read the words of the question you check the diagram for any given information. Be clear about what information you have and about what you are asked.

It is always smart to check that your answers make sense

- If, for example, you work out a probability that is greater than one, you know something is wrong. It may be worth the effort to go back and find the error, as follow-through marks are not awarded for using unreasonable answers in later parts of a question.
- Other unreasonable answers to look out for include: negative probabilities, sine or cosine greater than one or less than negative one, common ratio of an infinite geometric series greater than one or less than negative one, and square roots of negative numbers. Although square roots of negative numbers do exist in mathematics, they are not examined in mathematics SL.

Cross out any working you do not wish the examiner to mark

- Examiners are instructed to ignore crossed-out working, so you should cross out any unwanted working clearly. A large "X" through the working is sufficient.
- Don't cross out working until you have replacement working. Working that may earn some marks is better than a blank that earns none.
- If the examiner is presented with two sets of working to the same problem, they are told to mark the first that is seen, so there is no advantage to leaving both in place in the hope the best one will be marked.

Paper 2

You are expected to be able to use the GDC to perform a variety of special operations, sometimes with functions unfamiliar to you

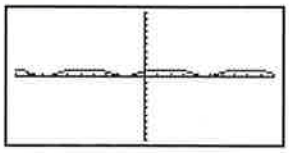
You should be able to:

- graph a variety of functions with appropriate windows
- find key features of a graph: y-values, zeros, maxima, minima, gradient, area under a curve, and so on
- solve equations, both graphically and using a solver
- find numerical derivatives and definite integrals
- perform matrix operations (add, subtract, multiply)
- find the determinant and inverse of a 3×3 matrix
- find statistical values for a list of data, with or without frequencies: mean, median, quartiles, standard deviation
- find binomial probabilities, including cumulative probabilities
- find normal probabilities and standardized values (z-scores).

An "appropriate window" is one in which you can see a clear shape of the graph that includes all of its key features. For example, set your GDC to radian mode and consider the graph of $y = \sin(1 + \sin x)$, $0 \le x \le 2\pi$. First see the graph in the standard viewing window, $-10 \le x \le 10$ and $-10 \le y \le 10$.

Texas Instruments

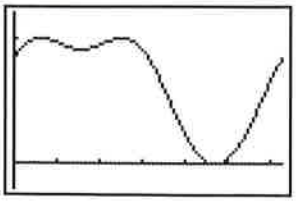
Casio



Between $x = 0$ and about $x = 6$, there appears to be only one minimum and one maximum.

Now look at this same graph using the window $0 \le x \le 2\pi$ and $-0.2 \le y \le 1.2$.

Texas Instruments



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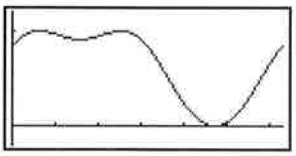

Here you can see how the graph **really** looks in the domain $0 \le x \le 2\pi$. There are clearly **two** minima and **two** maxima.

Remember that the GDC is an effective mathematical tool

- As questions for paper 2 are written with the GDC in mind, then unless it is a "show that" question, consider the GDC in your approach.
- For example, here is a question given on a recent paper 2:

  Solve the equation $e^x = 4\sin x$, for $0 \leq x \leq 2\pi$.

To solve this equation, input $y = e^x$ and $y = 4\sin x$ into the GDC and find the x-coordinates of the intersections on the graphing screen. On your paper give a quick sketch of the two graphs intersecting, and then write your answers. You could also use the solver feature of the GDC, but without a graph you might not see that there are **two** solutions in the given domain. You do **not** want to try to solve this equation with algebraic steps. It can't be done!