

Recommended study for the Maths Applications and Interpretations Mock Exam 2020.

Note: the old book (Math Studies) is recommended for all sections except Voronoi diagrams and integration. All references to exercises are to the old book unless stated otherwise.

Unit 1. Numbers and Algebra 1.

Numbers (not very likely, but you have page 35 ex 2 b)

Approximation and error.

Knowing about significant figures and calculating the error and the percentage error. Page 18 ex 1 and 2. Page 21 1-4.

Standard form of expressing numbers. This will probably appear as a section inside an exercises about something else. Page 25 ex 3 and 4.

S.I. Units.

Advice: learn all the prefixes and be careful with square and cubic units. Pages 32-33 ex 7-9.

Unit 7. Numbers and Algebra 2.

This unit has many little things you have to know how to do, for example, the first part is sequences, and you have to be able to:

Identify if it's arithmetic or geometric, find the difference, find the sum, find the n^{th} term, find the sum of the first n terms, find the sum of the terms between n and m ... plus applications. So try to train them one by one.

Arithmetic sequences.

Finding the difference and the n^{th} term. Page 298-299 ex 1-10.

Finding the sum of the n first terms. Page 301-302 ex 1-8.

Applications of arithmetic sequences. Page 303-304 ex 1-6.

Geometric sequences.

Finding the ratio and the n^{th} term. Page 305-306 ex 1-8.

Finding the sum of the first n terms. Page 307-308 ex 1-6.

Applications of arithmetic sequences. Page 309 ex 3,4 and 6-8.

Currency conversions. There is a good chance one of these will pop up in the IB exam and in the mock.

You have to be able to:

Calculate the money after a conversion.

Calculate the money before a conversion given the money after it.

Calculate the conversion ratio.

Apply commission for the change.

Page 311 - 314 ex 1-5 and 8 are without commission. The rest are with commission and in 12 you have to calculate the commission percentage.

Compound interest.

Remember that you have the formulas in the formula sheet, but you have to use them fluently. I still recommend you learn them, it makes things easier.

Advice: it helps to remember that this is an application of geometric sequences. It is also useful to remember that an interest that is not applied annually is just a fraction of the interest applied several times a year.

Exercises are all mixed up in pages 318 and 319 ex 1-8.

Depreciation and inflation.

This is just applying geometric sequences with ratio slightly higher than one (inflation) or slightly lower (depreciation). Exercises in page 320 ex 1-8.

Unit 4. Models.

Functions.

What they are, the names of the input and the output. There are no exam-style questions about this, but this is essential stuff to understand the rest of the functions units, so I recommend all the exercises in p 132, 136 and 137.

Domain and range. (in the IB exam I have only seen domain restrictions due to the denominator becoming zero and square roots)

Graph of a function.

Here my recommendation is to graph many functions manually, but this would take a lot of time, so do it only if you can afford that. Do exercise 1 in p142 too.

Function notation.

Understand what they mean with $f(6)$. Also, make sure you handle functions that depend on t or other variables instead of x , this confuses sometimes. Exercises in p144 ex 4 and 145 ex 5.

Functions as models.

This is crucial, pretty much the central bit, so make sure you understand it. Many exercises, page 145 ex 1 and 146 2-4.

Linear models.

You should master this pretty well by now, so if you want you can do only even-numbered exercises.

Quadratic models.

I believe this is the most likely model to appear in the IB exam, so I recommend you do as many exercises as possible. Page 154 ex 4J, p155 ex 4K, p156 ex 4L, p158 ex 4M, all in page 161 and in page 165.

Exponential models.

You are supposed to be able to recognize them by their formula and also by their graph. Do p169 ex 4S and p170 ex 4T to practice, but the best way is to do pages 173 and 174 and if you don't know how to do something, check in the explanations in p166-172.

Other functions.

Sometimes cubic functions or function where x is in the denominator appear in the exam. Do p183 ex 4X and p188 ex 2-4, they are quite useful.

In this section I very much recommend you do all the exam-style questions in pages 190-195. They are a whole lot, but they will get you well trained.

Unit 6. Introduction to differential calculus.

Basic differentiation.

Remember that the “derivative” is not exactly the same as “the derivative function” and the same with the “gradient” and “gradient function”.

Be sure to learn how to differentiate basic functions and also those with x in the denominator. You have page 264 ex 1-4, p265 ex 1-2 and p266 ex 6C but you don't need to do ALL, odds or evens should be enough.

Gradient/slope/derivative at a given point.

Very important concept, you'll need it for the tangent line. You have three pages of this: 268, 269 and 270. The more you do, the better you'll get.

Finding the tangent and normal lines.

This is quite likely to come up in the IB exam, make sure you do p272 ex 1 and p273 ex 6G. You have additional ones in p274 ex 1-4 and 10 and p275 ex 15.

Line equidistant to two points and Voronoi diagrams.

It's pretty simple: given two points, find the line that is perpendicular to the one that goes through them AND passes through the middle point between them.

This bit is not in the old book, but you have examples in pages 196 and 197 of the new book.

Rates of change.

This section in the book is not only about rates of change, some other concepts are also dealt with and, surprisingly, the exercises in page 278 and 279 are a lot like IB exam questions, even the ones that are not marked as "exam-style questions".

Local maximum and minimums.

The most important concept to understand here is that when a function has a maximum or minimum, its derivative is 0.

Strangely, there doesn't seem to be many exam-style questions on this, even though it often pops up in IB exams. I recommend starting by p281 ex 6J and then p282-283 ex 6K.

Remember that you can always find the maximum or minimum with your calculator if you want to confirm your answer.

Optimization.

In these exercises you will have to establish a model that depends on two variables and then you will have a "condition" that makes one depend on the other and therefore your model can be turned into a model that depends on only one variable.

These exercises tend to be long, so sometimes it is best to do them several times.

Do the examples p285 example 17 and 287 example 18.

Then do as many as you can from pages 288, 289 and 290. If they are too difficult, try some from p286 first.

Integration. (In this section, all book references are to the new book).

Basic antidifferentiation.

You will only have to antidifferentiate polynomials with positive powers, but keep an eye on those that have fractions and negative numbers, such as $-3x^{2/5}$

You have a nice set of exercises to train yourselves in the new book p574 ex 1-5, p575 ex 6-8, p576 ex 1-8. Note: I remember finding some wrong solutions, if so, check with me.

Calculating areas.

Remember that sometimes you can calculate the area by sketching the function and using basic geometry, like the area of a rectangle, a triangle or a trapezoid, like in p 572 ex 9 a and b.

For **calculating areas with a definite integral**, remember: this is a skill that requires practice and care. If you don't manage right away due to "stupid" mistakes, don't despair, it takes time and effort.

Practice with p580 ex 3, p581 all exercises except 9 and 10. Also p582 ex 19, p583 ex 23-25 (hard).

Finding C.

You can calculate C if you are given the value of the primitive function for one given value of x.

Check p 576-577 example 15. You also have p578 ex 1-9 to practice this and p582 ex 20.

Trapezoid method.

One important thing to remember: the whole point of this method is to avoid finding the antiderivative. Use the original function.

You can practice with the exercises in p567 ex 1-7 and p568 ex 8. Also, you have p581 ex 9 and 10, p582 ex 17, 18, p583 ex 26.

Additional recommendations.

- When studying watching videos, keep in mind that it is by doing exercises that you will prove your skills. Don't consider the skill learned unless you can do the exercise in the video top to bottom entirely on your own.

- When dealing with functions, it is often wise to sketch using your calculator. It will help you find mistakes and/or confirm your answer.
- Repeat exercises. Sometimes it is a solid knowledge of the basics, rather than some familiarity with the more advanced, that will allow you to complete the more complicated exercises and, of course, by repeating the basics you will secure the basic points that are often lost due to mixups.
- Do exercises. They are the key. Each exercise you do counts, not only in the exercise's topic. It will settle past knowledge and make the next step easier.
- Use your time wisely. Preparing for the IB exam requires time for the knowledge to settle in your brain, and if you wait until the last four days, it is simply not possible to assimilate the subject matter. Do a smart start and let things start to settle today.
- If you don't know where to start or everything seems too difficult, fall back to the basic algebra and ask me for practice exercises.