

# Dr Oliver Mathematics

## Revision

### 1 My Revision Method

What follows is my (idiosyncratic) revision method. Now, you will think

- it is *best* thing since sliced bread and, if you do, feel free to adopt it,
- it is *worst* thing since sliced bread and, if you do, feel free to ignore it, and
- somewhere in between.

All I can say: it worked for *me* . . .

### 2 Experience of Revising

I *do* have experience of revising.

- Eight ‘O’ Grades (Arithmetic, Chemistry, Economics, English, German, History, Mathematics, and Physics) in S4, the Scottish equivalent of Year 11.
- Five Highers (Chemistry, English, German, Mathematics, and Physics) in S5, the Scottish equivalent of the Lower Sixth.
- Four Certificate of Sixth Year Studies, CSYS (Mathematics I, Mathematics II, Mathematics IV, and Physics) in S6, the Scottish equivalent of the Upper Sixth.
- B.Sc. in Mathematics from the University of Edinburgh (in the first two years there were three subjects; in the penultimate year, there were nine subjects; in the last year, there were eight subjects)
- M.Sc. in Mathematics from the University of Nottingham (four subjects and the dissertation)
- Ph.D. in Mathematics from the University of Edinburgh (“Matricial Norms for the Schatten Ideals”)

So I can, at least, speak from experience.

### 3 What You Will Need

- At least one refill pad of paper (something like 160 pages — but probably *more* than one refill pad . . . ),
- pens and pencils, and, most importantly,
- peace and quiet!

When I was doing my Ph.D., I was selected to be in a group of people to discuss the proposed new library. I was taken aback when the discussion got on to edibles and there was a huge discussion about the wisdom about snacks and the need for an open-plan sitting area! We were given paper and pens to write out things that the new library would to have and a percentage we would give it.

I was the *only* person who wrote “Peace and quiet!” and assigned that “50%.”

### 4 When To Start

Eight weeks before your first exam would be a good time to start. That means you will have the whole of your Easter holidays to get in to your revision.

### 5 The Length of Time

What is the length of your longest examination? Two hours? Three hours? I would recommend *at least as long* as my longest examination: after all, if you can’t bring yourself to concentrate what the stakes are low, what makes you think that you will be able to do it when the pressure is on?

### 6 Master List

For each individual subject, you want *two* master lists: one which has the specific term or theorem and one that has the definition of the specific term or the statement and proof of the theorem, important result, etc.

For example,

- GCSE Mathematics: one master list had Alternate Segment Theorem definition (do

you know it?<sup>1</sup> — I am not talking about the *picture* that generally accompanies this) and the second had the *three* proofs ( $0 < \alpha^\circ < 90$ ,  $\alpha^\circ = 90$ , and  $90 < \alpha^\circ < 180$ ) that you need to use.

- A Level Mathematics: one master list had “ $y = a^x$ : first derivate and what is the range of  $a$ ” and the second had the first derivate and what the conditions are.
- Mechanics: one master list had “Modelling Assumptions” and it was broken down (uniform body, lamina, rough surface, etc) and the second had the specific definition.
- Further Mathematics: one master list had “ $x = e^u$ : first and second derivates” and the second had the first and second derivatives worked out.

## 7 How I Study

How many subjects are you studying: ten? eleven? twelve or more?

Take your subjects and split them up into into manageable loads: either four, five, or six would be good. For example, Chemistry and Economics would be “Subject A,” English and Physics would be “Subject B,” and so on. Or, if you once that is particularly difficult, I would revise that one on its own.

Then I would apply the following (I have started with “four” subjects) but you get the idea.

	Subject A	Subject B	Subject C	Subject D
1	Learn $A_1$	Learn $B_1$ Revise $A_1$	Learn $C_1$ Revise $A_1, B_1$	Learn $D_1$ Revise $A_1, B_1, C_1$
2	Recap $A_1$ Revise $B_1, C_1, D_1$ Learn $A_2$	Recap $B_1$ Revise $C_1, D_1, A_2$ Learn $B_2$	Recap $C_1$ Revise $D_1, A_2, B_2$ Learn $C_2$	Recap $D_1$ Revise $A_2, B_2, C_2$ Learn $D_2$
3	Recap $A_1-A_2$ Revise $B_2, C_2, D_2$ Learn $A_3$	Recap $B_1-B_2$ Revise $C_2, D_2, A_3$ Learn $B_3$	Recap $C_1-C_2$ Revise $D_2, A_3, B_3$ Learn $C_3$	Recap $D_1-D_2$ Revise $A_3, B_3, C_3$ Learn $D_3$
4	Recap $A_1-A_3$ Revise $B_3, C_3, D_3$ Learn $A_4$	Recap $B_1-B_3$ Revise $C_3, D_3, A_4$ Learn $B_4$	Recap $C_1-C_3$ Revise $D_3, A_4, B_4$ Learn $C_4$	Recap $D_1-D_3$ Revise $A_4, B_4, C_4$ Learn $D_4$
...	...	...	...	...

<sup>1</sup>The angle between a tangent and a chord from the point of contact is equal to any angle in the alternate segment

So, in any given subject, I would do all the subject that I have covered up to that point *plus* the last three bits of revision that I had done in each of the last three subjects (I would write it out, intentionally vocalising the words).

## 8 Learn about a page of A4

Okay, you have got about page of A4 copied from your master notes. What's next?

- Memorize it all. I know: it can be tough, especially when you are starting out on your revision. I repeat: *memorize it all*.
- *Write it out*. All of it. I don't care whether or not you are sure or not: *write it out*.
- Then compare what you have on the master sheet with your attempt.
- If it is exact, then take a break for at least half an hour. Then repeat: write it out and compare. And so on: take a break for at least half an hour, write it out, compare.
- But, if it is not exact: compare what is in your attempt and the master sheet. Then memorize it. I think you know what's coming next, don't you? *Write it out* and the compare.

## 9 How

- **Definitions.** Do these first. And only once you know all of the definitions can you proceed.
- **Theorems.** (Also called *propositions, lemmas, corollaries*, etc.) When I was in the S5 (when I took my Highers), there were 23 theorems that I had to know and prove — and lots of theorems that I had to know (but not be able to prove). *Learn them*.
- **Important Results.** Easy facts — and difficult ones! — observations, points of interest, etc. *Learn them*.
- **Practice Problems** Well, [www.drolivermathematics.com](http://www.drolivermathematics.com) comes to mind ...

## 10 University

As an undergraduate at the University of Edinburgh (four years), I worked with

number of weeks that I had to revise = Year  $i$  + Term  $j + 1$ ;

i.e.,

	Term 1	Term 2	Term 3
Year 1	3	4	5
Year 2	4	5	6
Year 3	5	6	7
Year 4	6	7	8

As a postgraduate at the University of Nottingham, I revised for 12 weeks. Number Theory took the longest: it was approaching 5 hours until I had revised all of it — it was ‘only’ four hours on the other three — it was all *theorem, proof; lemma, proof; theorem, proof; corollary, proof*, and the occasional *example*.

I would be sitting at my desk at 7 am and start working. I would write out all of the definitions and then the theorems that I had on my master list and then check them. If there was not a problem, I would go down to lunch. But, if there was, I would remedy that *there and then*. After lunch, I would then begin on today’s list of A4. That took me about 2-3 hours — although there was a few times that it would go on and on . . .

## 11 Music: Yes or No?

Music is okay if you wish to recap on what you have learned in a particular subject. But *not* if you are learning the A4.

## 12 End of the Session

You’ve finished your session for the day. Rather than screwing up what you have done into a ball (or whatever), try setting these aside so, the longer you have been revising for, the old notes reach higher and higher, and think to yourself to you, “I’ve got all that revised now.”

## 13 I Can’t Remember Any Of It!

The exact same thing happened to me. I was doing my M.Sc. and it was the day of the Number Theory paper. I was well-prepared. (I remember one guy saying he had spent around four hours looking at his notes *in total!* “How long?!” said of the women. He just shrugged.) We all trooped in together (there were four of us), we got our pens, calculators, etc, out. When the invigilator said to start, I turned over the exam.

*And I could not do any of it.*

The *theorems* and *proofs* just vanished from my recollection and I just stared at it. I mean, I could read the questions but I had no idea how to answer them.

*What do I do now?*

Simple: I turned the question paper back over. Long, slow breaths. And I said to myself, *You can do it.* Long, slow breaths. *Don't think about the other students: you can do it.* Long, slow breaths. *You can do it.*

It felt like half an hour since the invigilator said to start — but it was ‘only’ two or three minutes had gone by.

*Now, when you turn it over, look for the kind of question that is only one or two marks. When you have got it, the answer that bit of the question. Okay?*

I turned over the exam. There, in the second or third question, was some part that I could (maybe?) do. So, I started working on that bit of the question. It took me a while — certainly more than the part of the question was worth — but I had an answer: brilliant!

*So, what else can you do?*

Well, there's a question on . . . : I think that's doable. So, I started on that.

And, pretty much, my memory started returning to me. I could do whole questions now!

Finally, the invigilator said stop. I looked up from my answers: not only had I completed the whole paper (*really?* Yes, really!) but I had sufficient time to go over my answers again and again.

Outside the exam hall, we had a post-exams inquest. (I don't usually: in a couple of days, I would have the last exam but I wondered what the experience was like for the other three. Plus, Number Theory was the only exam that I had with anyone else: the other three, I was the only candidate.) It seemed my re-starting the exam had gone unnoticed. “I couldn't do it,” said the guy who only spent four hours revising. We nodded thoughtfully: I mean, *four hours?* “I thought it was tough,” I said. The others agreed. “But doable?” one suggested. She had that weird quirk of making a statement that sounded like you were asked a question. “I *think* so,” I replied — and the others two nodded.

## 14 End of the Examinations

Take the old notes and put them out for the trash. *But* keep a hold on your exercise book, notes, etc right up until your results come through.

**Good luck!**