



Information for Assessors for Mathematics Part C 2017

Lecture Course: Elliptic Curves

Lecturer: Prof. Flynn

Checker: Prof. Lauder

Overseeing examiner: Prof. Douglas

Dear Prof. Flynn,

I am writing to provide you with information regarding the Part C examinations in Mathematics 2017. I expect that you already know that Part C lecturers are appointed as assessors for these examinations and asked to set and mark the examination for their lecture course. Your paper, on Elliptic Curves, will be checked by Prof. Lauder and you are asked to check Prof. Lauder's paper on C.6 Modular Forms.

A summary of the examination process is attached and this contains a schedule of important deadlines and dates. Detailed guidelines on the process for setting and checking questions are also attached. Please take very careful note of these guidelines.

There have been two recent changes to the guidance given to setters. Firstly, setters were asked to subdivide each question into parts and to include the mark for each part on the examination paper. It is suggested that each question be divided into 2–4 parts worth 5–15 marks each. Secondly, setters were advised that the standard bookwork in questions should be worth around 10 marks and that questions should contain some material which is bookwork with a variation and/or an unseen but easy problem, again worth around 10 marks. The final part of a question should be sufficiently testing so that it will discriminate between the first class students. Teaching Committee has issued revised guidelines incorporating these changes (see Section 4 of the attached guidelines) and setters are asked to pay particular attention to these.

I enclose a chart showing the quartiles of the raw marks (out of 50) on each 2016 paper. This chart does not take account of the quality of candidates taking the paper but it provides a rough comparison between the papers.

In addition to the general guidelines the following paper specific guidance is given both for your paper and the paper you are checking. The table below gives the average raw mark and corresponding assigned USM for 2016 for the papers.

Paper	No. of mathematics candidates	Average raw mark (out of 50)	Average USM
C3.7	19	33.84	69.11
C3.6	12	38.83	72.42

Please also note the marker's comments from 2016 which are appended to this letter.

If you foresee any difficulties, please let me know as soon as you can. The examiner overseeing your paper is named above; should you have any queries during the examination process, please contact that examiner or myself.

The examiners are very appreciative of your assistance with the examinations.

Yours sincerely,

Prof. Kobi Kremnitzer

Chairman of Part C Examiners

Part C 2017

Guidelines for the Setting of Questions

Further details may be found in the Examination Conventions Part C 2016–17 (<https://www.maths.ox.ac.uk/members/students/undergraduate-courses/examinations-assessments/examination-conventions>).

1. Practicalities

Typesetting

Please use the LaTeX files prepared by the Academic Office for typesetting your questions. These files will be emailed to you and can also be downloaded from the Mathematical Institute website (<https://www.maths.ox.ac.uk/teaching-staff/examinations/exam-sty-files>).

The files are as follows:

oxmathexam.cls: class file which provides the correct layout for papers and incorporates automatic provision for the appropriate numbering of parts and subparts within questions.

example_question.tex: an illustration of the use of the commands for enumeration.

standardmacros.sty: a file of standard macros.

template_guidelines.tex: a file indicating the use of the preferred macros and typesetting conventions.

Comment lines should be removed from the final draft and it is recommended that non-standard macros are not used as examination papers are supplied in various formats to candidates with additional needs.

Security

Examination questions and solutions should be delivered by hand to the checker or to the Academic Office for collection. Please do not leave your questions or solutions in unsecured pigeonholes or send them by email. If you do so, you are liable to be asked to set new questions.

Please note that questions should not be prepared on an unsecured machine, particularly one connected to the University network. The secure computers in S0.18 are available for use during office hours. Help is available for typesetting questions from Helen Lowe, S0.20 Mathematical Institute, if required. However, the setter and checker are responsible for proof-reading.

Submission

Your draft questions, as agreed with your checker, must be submitted to Helen Lowe in S0.20. Please provide at the same time full model solutions, marking scheme and the course problem sheets. Please submit both a paper copy of your questions and the LaTeX files.

2. Standard of Questions

The three questions should be fairly spread so that together they cover a good proportion of the syllabus, but it is not to be expected that all important topics will necessarily be represented in a given year. Specifically, each question should cover a substantial part of an amount of material comprising between one third and one quarter of the course. Students will be trying to produce full answers to 2 questions and so it should be possible to give a full answer to a question in 35–40 minutes.

We ask that in setting your questions, you should try to follow these guidelines

- (i) Each question should start with some very standard bookwork or similar material, but it should be possible for almost all candidates to complete such material within 15 minutes with most candidates taking less time.
- (ii) The question should include (probably in the middle parts) some material which is “bookwork with a variation” i.e. a candidate who has understood the bookwork should

- be able to adapt to answer the variation but a candidate who has merely memorised the bookwork will find it difficult, and/or one or more problems which are unseen (genuinely different from problem sheets) but easy.
- (iii) The question should include (probably in the final part) something sufficiently testing that a full solution requires truly excellent understanding and skill.

Each question should be divided into several parts (probably 2, 3 or 4 parts, each worth between 5 and 15 marks). When you prepare the draft questions, please indicate such a division of the questions and please include the mark for each part in the LaTeX file of the questions.

3. Model Solutions and Mark Scheme

Please provide complete model solutions indicating everything that you would expect a candidate to write to answer the question fully. The model solutions need to be sufficiently clear and comprehensive to be meaningful to the examiners. You are asked to write out bookwork in full so that the checker and the examiners can judge the difficulty and how long it will take to produce. You are encouraged to type your model solutions.

The model solution for each question should be accompanied by a mark scheme out of 25. This should be more detailed than the marks shown on the exam paper. It should aim to ensure that the following qualitative criteria hold:

20–25 marks A completely, or almost completely, correct answer, showing excellent understanding of the concepts and skill in carrying through the arguments and/or calculations; minor slips or omissions only.

13–19 marks A good though not complete answer, showing understanding of the concepts and competence in handling the arguments and/or calculations, and some evidence of problem-solving ability. Such an answer might consist of an excellent answer to a substantial part of the question, or a good answer to the whole question which nevertheless shows some flaws in calculation or in understanding or in both.

7–12 marks Standard material has been substantially and correctly answered with some possible minor progress on to other parts of the question.

0–6 marks Some progress has been made with elementary, accessible material.

Please align the subdivisions in the mark scheme with subdivisions in the questions; this assists at the stage when marked scripts are checked or reviewed. **Please classify each subdivision under one of the following headings:**

B: bookwork material explicitly seen before;

S: similar to material seen before, with a variation testing understanding, not just memory

N: new rider, demanding good command of concepts and/or methods.

Some of the new riders should be easy, and some should be tough (comments about difficulty would help the examiners). We suggest that at most 10 marks should be allocated to B, and around 10 to either S or easy new riders. Overall candidates of Upper Second Class standard should normally get marks in the range 13-19 out of 25.

4. Checklist

When setting your questions you should consider the following important points from the following checklist. This list comes from the Teaching Committee, and it is made available to candidates in an Appendix to the Examination Conventions.

- Is the question on the syllabus (as in the Examination Regulations or Course Handbook including the Lecture Synopses)?

- Is the mathematics correct?
- Is the notation and terminology standard/obvious/defined? (Standard usage from the course is acceptable without explanation but phrases such as 'as in the lectures' should be avoided.)
- Is the question unambiguous? Is it clear what may be assumed, what detail is required, and what would constitute a complete answer?
- Is the form of presentation familiar/inviting/readable?
- Does each question have an easy start, consisting of some standard bookwork or similar material, worth around 10 marks which might be readily and routinely completed? This should not wholly be testing memory of previous material explicitly seen.
- Is there material designed to differentiate at the class borderlines.
 - a) For the II(i)/II(ii) borderline is there a part that tests understanding of standard concepts/techniques (whilst still being rather straightforward) which tests whether a candidate can do any more than merely memorise the bookwork?
 - b) For the I/II(i) borderline is there a part for which a full solution requires truly excellent understanding and skill?
- Would a II(i)/II(ii) borderline candidate on average achieve around 13/25 marks for the question? Is a mark of 20+ unlikely to be achieved by a significant number of candidates who are not of first-class standard?
- Is it the case that only exceptional first-class students are capable of gaining full marks?
- Is each question overall of a straightforward character?
- Are the questions as a whole fairly spread across the syllabus?
- Are the questions of comparable difficulty to one another?
- Are the questions sufficiently different from those set in recent years?
- Is the question formatted using the oxmathexam.cls file?
- Does the question, adequately spaced, fit on a single page?

5. Checking Questions

It is the responsibility of the setter to liaise with the checker to arrange for the questions to be checked and an agreed version to be arrived at in advance of the submission deadline. We recommend that the setter should supply the questions at least 3 weeks (4 weeks for MT papers) before the deadline to allow time for the questions to be properly checked, and modified if necessary.

It is the responsibility of the setter and the checker jointly to take reasonable steps to ensure that the Checklist for Setters and Checkers provided above is fully complied with. In particular they should be fully satisfied that the version of the paper submitted for consideration by the examiners is correct and of an appropriate standard, and that the .pdf version has been carefully proofread.

The setter should make available to the checker solutions and mark-scheme along with the draft questions. Best practice requires the checker first to work through the questions without reference to the solutions to check for possible errors and to assess the length and level of difficulty, and then to review the setter's proposed solutions and mark-scheme. It is expected that the checking will be carried out in this way. Whenever the setter makes any substantial change to any question as a result of feedback from the checker, the revised version of the paper should always be approved by the checker before the setter submits the paper.

Some modifications may be made to a paper, in agreement with the setter, following consideration of the paper by the internal examiners or by the external examiners, or for typographical reasons. It is very important that the setter checks the proposed camera-ready copy version or the paper at the point at which this is made available in the office for the setter to sign it off as correct.

C3.7: Elliptic Curves

Q1 was well answered.

In Q2, few candidates spotted the points of order 4 in Q2(b), and in Q2(d) most candidates got the upper bound on $|y|$ but many had trouble with the upper bound on $|x|$.

In Q3, parts (a),(b) were well answered, but many candidates found part (c) difficult.

C3.6: Modular Forms

Question 1

This was a challenging and quite long question, requiring a lot of original thinking in the later parts. It was done quite well, with several students getting full or nearly full marks.

Question 2

This question was a little more routine, involving a lot of bookwork in part (a) — the latter parts of (b) were original though and quite a nice application of the valence formula. Overall it was done well.

Question 3

Less than half of the candidates attempted this question, probably because it was on material on the later parts of the course. Most who attempted it did it well, and several got the final original part out.