

# Department of Mathematics: Examination Conventions 2011–12

Final Honour Schools of Mathematics and  
Mathematics papers within the Joint Schools - Part A

## 1 Introduction

This document sets out the examination conventions for **Part A Examinations** in Mathematics. The first part of this document is written explicitly for candidates; the second part of the document contains additional information for assessors and examiners but will also be of interest to candidates. The Mathematics Teaching Committee directs that the Part A Examinations are in accordance with these conventions. The Board of Examiners may only make minor deviations from these conventions in exceptional circumstances and only after the consent of the Mathematics Teaching Committee or the Proctors. This document is in all ways subsidiary to the current:

- *Examination Regulations*
- *Notes for Guidance of Examiners and Chairmen of Examiners*
- *Notes of Guidance on Examinations and Assessment*

## 2 Examinations

To qualify for your BA in Mathematics or MMath you must pass a First and Second public examination. The first public examination in Mathematics is currently called Honour Moderations and is taken at the end of the first year.

The Second Public Examination has three parts: Part A taken at the end of the second year, Part B taken at the end of the third year and Part C taken at the end of the fourth year. Candidates who satisfy the examiners in Part A and Part B only qualify for the award of BA in Mathematics; candidates who satisfy the examiners for all three parts qualify for the award of the MMath. Only candidates who achieve an Upper Second Class or higher standard on Parts A and B together qualify to proceed to Part C.

## 3 Part A

Normally the number of questions on each paper is prescribed in the *Examination Regulations* or *Course Handbook* (including the *Lecture Synopses*).

There are four papers in Part A, all of three hour's duration. These are AC1, AC2, AO1 and AO2. Questions on AC1 and AO1 are shorter and will be marked out of 10, while questions on AC2 and AO2 are longer and will be marked out of 25. Papers AC1 and AO1 test for breadth of knowledge, papers AC2 and AO2 test for depth.

Altogether, these papers will include 1 short question and 1 longer question for each 8 hour lecture course; 2 short questions and 2 longer questions for each 16 hour lecture course; 3 short questions and 3 longer questions for each 24 hour lecture course.

### **Paper AC1 Algebra, Analysis and Differential Equations**

This paper will contain 9 short questions set on the CORE material (3 for each course), 3 on Algebra, 3 on Analysis and 3 on Differential Equations, attracting 10 marks each, all of which should be answered.

### **Paper AC2 Algebra, Analysis and Differential Equations**

The paper AC2 contains 9 questions in total (3 questions for each course), 3 on Algebra, 3 on Analysis and 3 on Differential Equations. Candidates may submit answers to as many questions as they wish. The best 4 questions, with at least 1 from each section, will count towards the total mark for this paper, that is, the best answer from each section together with the next best answer will count towards the total mark for this paper.

### **Paper AO1 Options**

This paper will contain 19 short questions set on the OPTIONAL material, attracting 10 marks each. Candidates may submit answers to any number of questions. The best 9 answers will count towards the total mark for this paper.

### **Paper AO2 Options**

This paper will contain 19 longer questions set on the OPTIONAL material, attracting 25 marks each. Candidates may submit answers to any number of questions. The best 4 answers will count towards the total mark for this paper.

## **4 University Standardised Marks**

Marks for each individual examination paper will be reported as University Standardised Marks (USMs). The object of the USMs is to allow direct comparison between the results of examination in different subjects. Raw marks are turned into USMs by scaling, sometimes necessary to ensure that all papers are fairly and equally rewarded. The correspondence between the USM ranges and classes is as follows:

- 70-100: First Class
- 60-69: Upper Second Class
- 50-59: Lower Second Class
- 40-49: Third Class
- 30-39: Pass
- 0-29: Fail

These marks reflect the qualitative descriptors given in appendix N.

## 5 Analysis of marks

### 5.1 Part A

At the end of the Part A examination, a candidate will be awarded a University Standardised Mark (USM) for each of the four papers. The Examiners aim to ensure that all papers are fairly and equally rewarded and may take into account relative difficulty of papers when assigning USMs. The Examiners may recalibrate the raw marks to arrive at the USMs reported to candidates. In arriving at any recalibration, the examiners will principally take into account the total sum of the marks for all questions on a paper, subject to the rules above on numbers of questions answered.

The USMs awarded to a candidate for papers in Part A will be carried forward into a classification as described below: **Part A is not classified separately.**

### 5.2 Aggregation of marks for the award of the classification on the successful completion of Parts A and B

All successful candidates will be awarded a classification after the Part B examination. This classification will be based on the following rules (agreed by the Mathematics Teaching Committee).

A *Strong Paper Rule* is used for classification.

#### Strong Paper Rule

A candidate will have satisfied the First Class, resp., Upper Second Class, resp., Lower Second Class strong paper rule if at least 3 papers from Parts A and B lie in that class (or better) and include at least one of them in Part B.

To give an example, a candidate will have satisfied the Upper Second Class strong paper rule if (the equivalent of) at least 3 of their whole unit paper USMs have at least Upper Second Class marks with (the equivalent of) at least one Upper Second Class whole unit at Part B level. Students may take half unit papers for Part B and for two half units (not making up a whole unit paper) to count as the equivalent of a whole unit of at least Upper Second Class, both half units must be of at least Upper Second Class.

The Part A USMs are given a weighting of 2, and the Part B USMs a weighting of 3 for a whole unit and 1.5 for a half unit.

In the following  $Av\ USM = \text{Average weighted USM for Parts A and B together}$  (symmetrically rounded [62.49 will be rounded down and 62.50 will be rounded up]);

- First Class:  $Av\ USM \geq 70$  and the First Class Strong Paper Rule satisfied.
- Upper Second Class:  $Av\ USM \geq 70$  and the First Class Strong Paper Rule not satisfied **OR**  $70 > Av\ USM \geq 60$  and the Upper Second Class Strong Paper Rule satisfied.
- Lower Second Class:  $70 > Av\ USM \geq 60$  and the Upper Second Class Strong Paper Rule not satisfied **OR**  $60 > Av\ USM \geq 50$  and the Lower Second Class Strong Paper Rule satisfied.
- Third Class:  $50 > Av\ USM \geq 40$  **OR**  $60 > Av\ USM \geq 50$  and the Lower Second Class Strong Paper Rule not satisfied.
- Pass:  $40 > Av\ USM \geq 30$ .
- Fail:  $Av\ USM < 30$ .

#### BA in Mathematics

Any candidate who satisfies the Examiners for Parts A and B (and who does not subsequently enter for and achieve Honours for Part C) may supplicate for the Honours degree of the Bachelor of Arts in Mathematics with the classification as described above, provided that they have fulfilled all the conditions for admission to a degree of the university.

### **MMath in Mathematics**

In order to proceed to Part C, a candidate must achieve a Lower Second Class standard or better in Parts A and B together.

Candidates successfully completing Part C will receive a separate classification based on their University Standardised Marks in Part C papers.

Note that successful candidates may only supplicate for one degree - either a BA or an MMath. The MMath. has two classifications associated with it but a successful candidate will only be awarded an MMath. degree.

## **6 Examination Conduct**

You will receive advice from the Examiners before each part of your finals examination, giving more information. Notices from Examiners in previous years can be found on the Mathematical Institute website.

## **7 Special Needs Candidates**

A candidate in any University Examination with special examination needs may apply to the Proctors through the Senior Tutor of his or her college

- (1) for special examination arrangements relating to his or her condition and
- (2) for the condition to be taken into account by the examiners as a special factor that may affect his or her performance in examinations.

For further details on the general rules for candidates with special candidates examination needs refer to the University's Examination Regulations.

# **Appendices**

## **Further Information for Examiners**

### **A Chairman of Examiners**

'*Regulations for the conduct of examinations, Part 6*', in the *Examination Regulations* covers the appointment of the Chairman. The Committee for the Nomination of Examiners will usually appoint a Chairman in Trinity Term of the preceding year.

## B Paperwork

### B.1 Internal Examiners

Internal Examiners should ensure that they are equipped with the following documents which will be provided by the Maths Institute's administration, either in hard copy or in electronic copy.

- The *Examination Regulations*.
- The *Notes for the Guidance of Examiners and Chairmen of Examiners* (produced by the Proctors' Office and sent by that office to Examiners).
- The Education Committee *Notes of Guidance on Examinations and Assessment*.
- The *Aims and Objectives* of the mathematics courses, as agreed by the Teaching Committee.
- The *Course Handbook*, including the *Lecture Synopses*.
- The examination papers from the preceding two years.
- The Examiners' Reports on these examinations.
- The External Examiners' reports for the previous year.
- Any responses to these agreed by the Teaching Committee on behalf of the Faculty, and any additional decisions of the Teaching Committee.
- Reports to the Teaching Committee on individual papers where appropriate.
- The published tables of *Class Percentage Figures* for the last two years (as published in the Examiners' Reports) and following guidelines from the Education Committee and the Mathematics Teaching Committee.
- Guidance on the method of Calibration of Examination marks in Mathematics on behalf of examiners.

When there are new examinations, material from previous years will not be directly applicable, but there may be specimen examination papers produced by the Teaching Committee.

### B.2 External Examiners

The Director of Undergraduate Studies will ensure that the External Examiners are (where appropriate) also provided with copies of these documents.

## C Target Marks

Examiners should follow any guidance in the *Course Handbook* on the profile of marks they are aiming for the candidates to achieve. Examination marks will be reported to candidates in the form of University Standardised Marks. Examiners may recalibrate raw marks but, in setting the papers, should aim to minimise the need for recalibration.

## D Checklist for Setters and Checkers

The Examiners should provide those who are asked to supply draft questions with a checklist of important considerations.

1. Is the question on the syllabus (as in the *Exam Regulations* or *Course Handbook* (including the *Lecture Synopses*))?
2. Is the mathematics correct?
3. 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.)
4. Is the question unambiguous? Is it clear what may be assumed, what detail is required, and what would constitute a complete answer?
5. Is the form of presentation familiar/inviting/readable?
6. Does each question have an easy start, worth at least 10 marks, which examines material explicitly covered in the course?
7. Is each question, together with its mark scheme, such that a II(i)/II(ii) borderline candidate should be able to clock up 15/25 marks (where relevant) ?
8. Is each question overall of a straightforward character?
9. Are the questions as a whole fairly spread across the syllabus?
10. Are the questions as a whole of a similar general nature to questions in previous years?
11. Are the questions as a whole of comparable standard to other questions this year?
12. Is the question formatted using the `oxmath.sty` file?

For papers AC1 and AO1, all questions should be relatively easy and very straightforward and at a level that a lower second/third class student who knows the material can be expected to give an almost complete answer in no more than 12 minutes under examination conditions. It should be possible to write a complete answer in not much more than half a page.

For papers AC2 and AO2, the general structure of questions should be similar to those in previous years or of Section A before 2004, with an an easy start, and be such that a II(i)/II(ii) borderline student should be able to gain at least half of the marks. A complete answer should take 30 - 35 minutes to write under examination conditions. However, the hardest part of the question should be sufficiently demanding to be only accessible to those candidates who meet the criteria for a First. **As students will be sitting these papers at the end of the second year of their studies, questions should be significantly more straight forward than those set for Part B.**

## E Protocols

- For Papers AC1 and AC2, the questions should be set by one Examiner and checked by another, or an Assessor. The final drafts of papers must be reviewed and approved by the whole Examining Board.
- After the Michaelmas Term lecture courses have finished for AC1 and AC2 course lecturers are invited to comment on the papers.

- For Papers AO1 and AO2 questions should be drafted by appropriate Lecturers and checked by the Examiners (or Assessors if the Examiners do not possess appropriate expertise.) The final drafts of papers must be reviewed and approved by the Examining Board. The expectation is that scripts will be marked by the appropriate Lecturer.
- Letters to Course Lecturers from previous years are commended as good practice.
- Examiners are reminded of the need for security when dealing with examination papers. All papers must be kept in a “By Hand Only” folder and it must be passed via the Academic Administration Office in person and by hand only.

## F Marking Schemes

### F.1 Model Solutions

Those setting questions are asked to provide **complete model solutions** worthy of full marks, carefully annotated so as to indicate what is considered bookwork, what has been seen before on problem sheets and what is considered to be new and unseen, and with a draft Marking Scheme for the approval of the Examiners; the solution, with additional comments, should also make clear how much of the question is accessible to less strong candidates. Where material has been seen before on a problem sheet, please give the precise reference.

### F.2 Aims of Marking Schemes

#### Papers AC1 and AO1

Candidates should attempt all nine questions on paper AC1, and also nine questions on paper AO1. All questions are marked out of 10.

**9–10 marks** A completely or almost completely correct answer showing good understanding of the concepts and skill in carrying through arguments and calculations; minor slips or omissions only.

**5–8 marks** A good though not complete answer, showing understanding of the concepts and competence in handling the arguments and calculations.

Papers AC1 and AO1 are marked out of 90 and recorded in the marks database out of 90. The raw marks presented to examiners should be as percentages and are then recalibrated to give the USMs.

#### Papers AC2 and AO2

Marking schemes for the questions 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. 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.

This should be regarded as a guide conveying the intentions of the examiners.

### F.3 Approval of Marking Schemes

The Marking Schemes are approved by the examiners alongside the papers. Minor edits may be made during the setting and checking process in consultation with the setter.

### F.4 Review by External Examiners

The external examiners should be consulted according to the agreed timetable, and provided with stable draft papers; they should be provided with full annotated solutions indicating what is book-work, and with the proposed Marking Scheme. Comments from the external examiners on each paper will be sent to the relevant setters. The examiners should not finalise any paper without taking into account the comments of the external examiners. The External Examiners should be kept informed of any action taken as a result of their suggestion.

## G Invigilation

The Examination Schools should inform a candidate's college if an incident occurs during the sitting of the papers, which is recorded in the log sheet, so that, for example, a medical certificate if necessary, can be sent to the Chairman of Examiners.

## H Marking and Checking

### H.1 Marking

The Examiners should provide each Marker with the Marking Scheme approved by the Examining Board. Note that minor edits may have been made by examiners during the setting and checking process in consultation with the setter/marker. Letters to Markers in previous years are commended; the following points must be made:

**Marking Schemes** The Examiners have seen and approved the Marks Schemes; it is the responsibility of Markers to use the approved Marks Scheme discarding earlier drafts. Markers should apply the schemes consistently. However, it may become clear while marking that the allocation of marks should be changed. If such a change is made, markers are asked to ensure that this done so consistently, and to inform the Examiners of the change.

**Mark Ranges in FHS papers** In papers AC1 and AO1 all questions will be marked out of 10; in paper AC2 and AO2 all questions will be marked out of 25 and for these papers only the best four answers will count. For AC2 the best question from each of the three sections will count plus the best remaining question.

**Marking** The Examiners will want to review at least some of the scripts during the classification process. They will not want to re-mark (since they cannot do so consistently across all candidates). They need to see quickly where marks have been gained. They will also want to be sure that a candidate's work has been taken into consideration. Markers are therefore asked:

- to indicate the marks given for each part of a question, by writing, e.g.,  $\frac{3}{5}$ ;
- to show the total mark in some distinctive way, e.g.,  $\boxed{18}$ ;
- to leave some trace that each page has been marked; pages on which no individual marks have been shown should not be ticked, but marked “\”;
- to copy the total mark for each question on to the cover sheet;

- to use some colour of ink not used by the candidates;
- not to write comments on the scripts, but, if necessary write on the mark sheets provided. (Markers may indicate briefly to the Examiners where arguments are flawed.)

**Mark Sheets** Pre-printed marks sheets will be supplied.

In entering into the pre-printed mark sheets the integral numerical mark for each question care must be taken to distinguish between 0 marks for an attempt and – for a non-attempt.

Assessors are asked to compute a check-sum for each candidate: which is the candidate number(mod 100) plus the sum of raw marks.

Before sending in the marks sheets markers should take a photocopy.

**Reports** Assessors will provide the examiners with a brief report on the performance of the candidates on each paper (or part-paper) to assist them in their deliberation on calibration; in particular assessors are invited to suggest where class boundaries could be drawn. Model examples of helpful reports are available.

## I Checking the Marks

The Examiners should ensure that their procedures allow for:

- an independent arithmetic check of the correctness of the addition of the partial marks for each question;
- an independent check of the marks entered into the marks database for each candidate;
- an audit trail for these checks.

In recent years graduate research students have been employed to carry out such checks. The standard document ‘Instructions for Graduate Checkers’ is kept in the Academic Office, and gives details.

### I.1 Logging Scripts

The Examiners should ensure that a central log is kept of the whereabouts of all scripts; and should instruct all Markers to return ‘sporadic’ scripts or answers to the central contact with a note of explanation.

### I.2 Availability of Assessors

The Chairman must ensure that those appointed as Assessors are informed of the Examiners’ timetables, and are made aware that they must be available for consultation by the Examiners until the signing of the Class List, particularly during the input and checking of the marks. Assessors must be available during the examination of their subject in case of candidate queries.

## J Practical Work

Examiners should bear in mind that there are general provisions about what is to be done in the case of candidates who, through taking a year out, are offering course-work from an abnormal year.

## K Extended Essays

Not applicable to Part A

## L Recalibration of Marks

On each paper, any recalibration of marks should be done without disturbing the order of candidates. In order to ensure fair treatment, Examiners are reminded that they may exercise individual consideration in assigning USMs for candidates whose marks lie outside the standard pattern.

Examiners should take note of the distribution of USMs above 60 and above 70 in the Examination in a normal year and not depart from it without good reason. Information about the distribution of USMs in the Examination for recent matriculation years can be obtained from the Academic Administrator.

The object of the USM is to allow direct comparison between the results of examination in different subjects. This means that the USM will not necessarily be equal to the raw mark.

USMs on each paper should be symmetrically rounded.

## M Medical Certificates

Proctorial guidance is that medical certificates should be kept if students are taking an examination with different Parts in different years, in case the final Board of Examiners wants to refer to them at classification stage.

For Mathematics, this guidance is relevant to Part A and Part B Examiners.

If Part A examiners are presented with medical evidence affecting one paper they can take it into account and modify the USM for that paper accordingly.

If Part A Examiners are presented with medical evidence affecting more than one paper and feel unable to modify USMs accordingly they should pass this information, along with the medical evidence, to the Board of Examiners in Part B the following year. The Part B Examiners can then take this evidence into account before making a classification. Once USMs have been issued to colleges at the end of Part A they cannot be altered, so in order to take such evidence into account Part B examiners may have to suspend the examining conventions in awarding a classification.

## N Classification of Candidates

The average USM ranges used in the classifications reflect the following general **Qualitative Class Descriptors** agreed by the Teaching Committee:

**First Class:** the candidate shows excellent skills in reasoning, deductive logic and problem-solving. He/she demonstrates an excellent knowledge of the material, and is able to use that in unfamiliar contexts.

**Upper Second Class:** the candidate shows good or very good skills in reasoning, deductive logic and problem-solving. He/she demonstrates a good or very good knowledge of much of the material.

**Lower Second Class:** the candidate shows adequate basic skills in reasoning, deductive logic and problem-solving. He/she demonstrates a sound knowledge of much of the material.

**Third Class:** the candidate shows reasonable understanding of at least part of the basic material and some skills in reasoning, deductive logic and problem-solving.

**Pass:** the candidate shows some limited grasp of at least part of the basic material.

[Note that the aggregation rules in some circumstances allow a stronger performance on some papers to compensate for a weaker performance on others.]

**Fail:** little evidence of competence in the topics examined; the work is likely to show major misunderstanding and confusion, coupled with inaccurate calculations; the answers to questions attempted are likely to be fragmentary only.

## O Post Examination

Examiners should ensure that the following are deposited with the Academic Administrator (or deputy), Mathematical Institute:

- a definitive record of individual USMs, signed off by one of the Examiners (to be kept on file at the Institute for reference and for use in later examinations);
- all records of the Examination not otherwise destroyed and declarations relating to the destruction of examination material (as requested by the Proctors);
- full marking schemes, including any subsequent amendments;
- LaTeX source files for the papers incorporating any corrections (which will be passed to the computing officers for the electronic archive).

Chairman  
on behalf of the Teaching Committee.