Mathematics Department – Information on Exams

Contents

For general guidance on our exam system, see White PYDC, Section 6. The information here is intended to be accessible to new lecturers, and I apologise to those who already know it all.

1 Exam secretaries

Presiding genius Fiona Walsh, fiona, Room 57, extn. 28983

1st year Oleg Zaboronski, olegz, Room 117, extn. 22676

2nd year Alan Robinson, car, Room 147, extn. 23488

3rd and 4th year Miles Reid, miles, Room 140, extn. 23491
(on leave in Term 1, please consult Fiona or AKM)

2 Setting exams

These instructions are intended to help you set exams on your lecture courses (modules). Setting exams sooner rather than later will improve the quality of life for you later, and will earn you the undying gratitude of Fiona and the exam secretaries. In any case, the *deadlines* for producing the paper given in 2.11 *must be obeyed.*

2.1 General remarks for new lecturers

If you are comparatively new to the British university system, you should be aware of certain points: the exam system is taken unusually seriously, and contains a number of features that are apparently crazy, but that we cannot afford to ignore. On a favourable interpretation, the students are evaluated according to objective criteria known in advance, the exam system is fair, the degree awarded reflects the candidate's ability, understanding and hard work, and the whole process is defensible in a law court. (If you buy me a drink I will provide a number of less favourable interpretations.)

As you know, for most lecture courses (modules), most of the credit comes from a single written exam taken in Apr or Jun. The exam must be set a long time in advance, with a full examiner's solution and marking scheme, and must be checked by an independent member of staff and (for finals papers) by one of the external examiners. Marking is anonymous to prevent discrimination, and any feature that may affect the marks (e.g., an error in a question) must be documented. At the end of the process, the exam board considers the student's performance as a whole in elaborate rituals that will be explained at a later stage. See White PYDC, Section 6 for some details of this. (You might like to know that students' scripts are carefully preserved for several years, presumably as evidence.)

This section contains some indications of what is required, and some general instructions and advice on preparing your exam paper.

2.2 Length of paper

Each question should be set so that a good student can do it in 30 mins. Each paper has $n + 1$ questions, of which n are to be answered. Thus you set

3 questions for a 1 hour paper

4 questions for a 1 1/2 hour paper

5 questions for a 2 hour paper

Note: MA3xx and MA4xx exams have 5 questions *as if* for a 2 hour paper. You must set questions that can fairly be done in 30 mins, although the students are allowed 3 hours to take the paper. This is a policy of the math department taken in response to a request from SSLC.

2.3 Required format

If you typeset your own paper, please use Latex2e and John Rawnsley's document class "exams", which will format your paper correctly (do \documentclass{exams} on the department Unix system). A sample exam file containing instructions (together with the file exams.cls if you need it) can be found at:

http://intra.maths.warwick.ac.uk/teaching/tex/exam.html
or ftp://ftp.maths.warwick.ac.uk/pub/tex/exams/sample-exam.tex
and ftp://ftp.maths.warwick.ac.uk/pub/tex/exams/exams.cls
or anonymous ftp ftp.maths.warwick.ac.uk and change to /pub/tex/exams
or mail request for help.

The traditional alternative is for the secretarial staff to type your paper from a manuscript. Please use the paperwork provided by Fiona, and get your paper to the secretaries for typing in plenty of time.

2.4 Marking scheme and comments

Your examiner's solution should contain a marking scheme adding up to 25 marks on each question: e.g.,

Part (a) 9 marks; (b) 5 marks; (c) 11 marks; with $9+5+11 = 25$.

You may declare the marking scheme on the exam paper if you wish (do \mark{9}). The solution should also make explicit the status of the material, e.g., "same as lectured material", "unseen" or "similar to material on the example sheet", to guide the marker or the external examiner. (Bear in mind that you might not be the marker, for example if you fall under a bus.)

2.5 Department covering sheet

Fiona will provide you with a covering sheet. You may use the pages provided here for your solution if convenient, but return the covering sheet with the information required on it *in any case*. Your comments and the checker's should be preserved for the use of the external examiner and the exam board.

2.6 Checker

Each exam paper set must be checked by an independent member of staff. The checker should be someone with experience of the material of your course (module) who has previously set Univ. of Warwick exams; the ideal checker is someone who set the same exam in previous years. The exam secretary for each year may ask you to suggest someone suitable, or may nominate his own choice of checker. (This is to avoid the "buddy" problem.)

2.7 Documenting comments

Please keep a systematic record of your comments on the exam, and those of the checker. Comments may include the general nature of the course and how students related to it; red-inked first drafts; why the exam is fair, although it looks too easy or too hard; for individual questions things like "a bit too easy, mark strictly", "a bit too long, but shortening it would make it harder", or "the bookwork part has been rephrased to shorten it". Comments of this nature may be useful for the external examiners and the exam secretaries in the run-up to the exam board.

2.8 Secrecy

It is your responsibility to make sure that your exam paper is kept secret. In other words, don't leave it in printer trays or unlocked offices; don't leave it up on the screen when you go out for tea. If you handle exam files on the Unix system, please make sure they are only readable by you; if you intend to leave exam files on the Unix system for longer than a day or two, please encrypt them. For advice on encryption and file security, see:

http://intra/computing/crypt.html

2.9 General advice on writing exam questions

The first thing to get clear is that, in addition to issues of teaching, setting reasonable standards and fairness to the students, an important purpose of the exam is to produce a spread of marks, with the bulk of the students reasonably distributed in the range $[40, 80]\%$ (and possibly a few outstanding specimens at either end).

If dozens of the students are in the range $[0, 25]\%$ then you have no evidence to evaluate or compare them, and the exam has failed in one of its purposes, however outstanding its intellectual content may be.

A second important point is that the wording of a question must specify *exactly* what the student is expected to do to get full marks. For example, you must distinguish carefully

> "state without proof …" versus "state and prove …";
>
> "assuming the Cohen–Stewart theorem, …" versus "working from first principles, …";
>
> "using this, calculate …" versus "hence or otherwise, calculate …"

The whole point of writing out the examiner's solution in detail is that it forces you and your checker to think through possible ambiguities in the question, and to watch out for sloppy wording that could cause a reasonably diligent student to waste time on an irrelevant digression.

Imagine how you would ask questions of a student at an oral exam, probably starting with familiar things so that even a poor student can get started. A good question might look like

> (a) give an easy definition; **[6]**
>
> (b) one of the theorems of the course is thus, state and prove an easy corollary of it; **[12]**
>
> (c) hence or otherwise, calculate the following special case. **[7]**
>
> $6 + 12 + 7 = 25.$

Several questions on your paper should have easy parts that everyone should get right. Don't be afraid to ask for short sections of standard bookwork or for a memorable worked example, even if you think it's too easy. Don't spend a lot of time devising a clever new example that would be more appropriate in a research publication. It is perfectly fair to use one or two questions from past years, suitably adapted. The argued true/false question (prove or give a counter-example to the following 5 assertions) can test lectured material very effectively, but you may want to state in advance that credit will be given for the argument rather than guessing true/false as multiple-choice.

2.10 Past papers

We can provide you with a collection of papers set for your course (module) in recent years, which may help you judge the level, or help your composition when inspiration turns lukewarm. If examiners' solutions to past papers are provided, please treat these as confidential.

2.11 Deadlines

The Department is obliged to produce exams by specified dates. Finals exams are checked by the external examiners, who are given 2 weeks to consider approx 30 papers. The externals judge the Department and report back to the V.C., and we *must not* mess them about with missed deadlines. Our secretaries also need some time to type papers (they typed more than a dozen last year). For these reasons, the following strict deadlines *must* be met.

Apr Finals exams Fri 2nd Feb (for camera-ready copy) or Fri 19th Jan (for papers that still require typing)

Jun Finals exams Fri 2nd Mar (ready copy) or Fri 16th Feb (for typing)

Apr 1st and 2nd year exams Fri 16th Feb (ready copy) or Fri 2nd Feb (for typing)

Jun 1st and 2nd year exams Fri 16th Mar, end of term (ready copy) or Fri 2nd Mar (for typing)

3 The exam session

3.1 The examiner's responsibility for the exam session

The examiner must be available to field queries during the course of each exam; if you can't do this for one of your exams, you must find a substitute. The examiner (or substitute) has the responsibility to be present for 10 minutes before the exam starts, to recheck that the exam paper is in order, to stay in or around the exam room for the first 10 minutes, and to be on call for the remainder of the exam period, in case candidates have any queries (if you invigilate your own exam session, these conditions are automatically satisfied). If you are not invigilating, leave a contact telephone number with the senior invigilator, keep a copy of the exam paper with you, and stay by your phone. The point of this requirement is to check for errors in the paper (a serious example would be completely the wrong paper, a less serious example would be a typo that might disadvantage a student); if any errors come to light, inform the senior invigilator, who may in some circumstances announce changes to the candidates (also leave a note with Fiona so that corrections can be done before the papers are printed for sale).

Some exams are paired, with two courses examined as Sections A and B of one paper; in this case, the rubric on the paper should instruct students that they must use separate answer books for each section. Please ask the senior invigilator to draw the students' attention to this.

Either collect your scripts at the end of the session (or ask one of the invigilators from Math to bring them up for you), or get them from Fiona the following day.

3.2 Invigilation

If you are listed as invigilator, the Academic Office sends you an information pack. Make sure that you can find the exam room by 15 minutes before the session starts. Please check up to see if you are "Senior Invigilator": if so, you have the responsibility to understand and implement all the rituals specified in the information pack.

4 Marking, processing and returning the marks

All marks returned should be out of 100

4.1 Return all the paperwork

After marking, return the scripts to Fiona, together with the exam paper, examiner's solutions, the seating plan and the mark sheet. The scripts are delivered to you in the order on the mark sheets, and should be returned in the same order, so that they can be found if needed. Absences or other discrepancies between the row of seat numbers and student numbers may lead to errors when marks are entered, and it is good practice to document these by inserting a note in the pile of scripts (e.g., "Desk 127, no script"). Exams scripts are referred to by the exam boards, and are kept as legal records.

4.2 Marking

Please do all the following things

Use *red* ink. Mark each question out of 25. Give marks for sections of a question as fractions 3/9, 11/12 etc., of the credit available under your marking scheme, and ring the total for each question. For 3rd and 4th year papers, record "alphas" as directed in 4.5. Every page with written work should have an indication that you have seen it, even if no credit is involved.

Please do all these things, whatever system you have been used to in previous jobs: the scripts will be checked during mark entry and referred to again in the run-up to the exam board, and deviations from a common format waste time and cause unnecessary stress.

4.3 Entering marks

Marks can be entered on a diskette in computer database format. Instructions for doing this will be prepared for those interested nearer the time.

The traditional alternative is as follows: you are supplied with a mark sheet, a spreadsheet with the candidates' student numbers (marking is anonymous) and lots of columns. All the computations leading from the marks for each question to the final mark on the course (module) must be documented, either on each script or on the mark sheet. Prepare a raw total for each script by summing the marks for the questions as in the rubric (for example, sum the best 3 questions to give a mark out of 75). If necessary, multiply this by a factor (say 4/3) to give the unscaled mark out of 100. Please take the greatest care in adding up the marks and in transferring them to the mark sheets.

4.4 Scaling

Departmental policy is that, for large classes, the average mark scored by B.Sc. students is expected to be between 55% and 60%. This is the norm, but there is no particular need to scale down if you think an average mark of 64.5% reflects the ability of the class. MMathers commonly score averages well over 75%, so that for 3rd and 4th year courses, *marks of MMath students should not be included* in calculating this average. If you think that scaling is required, you should produce a histogram (frequency plot, see 4.8) of marks before scaling, then invent a simple monotonic function (for example, add 10% to all marks up to 60%) to achieve the desired average and distribution of marks. If your course is taken by several groups of students (e.g., 4th year MMath and 3rd year Math/Phys students), you should arrange that the effect of your scaling is fair for each group. If in doubt about whether to scale, ask the exam secretary for the year. Record the calculation for each student on the script or the mark sheet.

The exam boards need to know how and why marks were scaled. If the scaling is substantial, please provided separate histogram of the marks before and after scaling, and add an explanation to justify the scaling.

4.5 Alphas

For 3rd and 4th year papers, you should award an "alpha" for an outstanding answer to a question, and record the alpha on the mark sheet (e.g., 19^{α}) and the alpha count in the total (e.g., $75^{\alpha\alpha}$). An alpha normally means a "substantially complete" answer, scoring $\geq 19/25$, but may apply to an answer which is not complete but shows unusual initiative or ability. If you deviate from the normal rule "$\alpha \iff \geq 19$", you must leave a note on the script to justify the decision.

For a course with an assessed component, the exam mark should still be returned as a mark out of 100. (The assessed mark is already in the database as a mark out of 100; blending the two in the right proportion is the computer's problem.)

For paired exams (two courses examined as sections of one paper) we require separate marks for Section A and B, and also an overall mark for the paper. First mark your section separately out of 100, scaling if necessary, then meet up with the other examiner to calculate the overall mark, also out of 100.

4.6 Deadlines for returning marks

1st year marks Return the mark sheet to Fiona for Oleg Zaboronski before Mon 18th Jun 2001 (or sooner if possible).

2nd year marks There is little time before the exam board because exams take place up to the end of Week 9. So do your marking without delay. Return the mark sheet to Fiona for Alan Robinson.

3rd and 4th year marks The Finals exam board requires a histogram for each set of marks; please fill in the blank histogram circulated to you, using the worked example as a model, or see 4.8. Return the mark sheet to Fiona for Miles Reid before Wed 9th May 2001 for April exams, and before Mon 18th Jun 2001 for Jun exams.

If you may have difficulty meeting these deadlines, please discuss it with the exam secretary.

4.7 Special plea

I implore your help in doing everything to get exam marks in as soon as possible. There are two aspects to this:

1. If your exam is early in the June session, please don't be complacent about the time scale. Even if there is no particular panic, you help us very much by getting it marked and the marks processed as soon as possible. Just a few hours off the average return time will help us very considerably. If you go away for a conference, whatever you do, don't delay handing in the marks until you get back.

2. Some exams take place in Week 9, including 2nd year exams taken by finalists from Math and other departments. In such cases, every hour is vital, especially for the one or two big exams. We will issue warnings in critical cases; the department can arrange delivery of the scripts to your marking desk, or will pay a taxi or provide other logistic help for this purpose. In these cases, *every hour is vital.*

We beg for your help. Remember that the sooner the marks are in, the better job we can do of analysing them and preparing for the exam board. We must leave a margin for error, since lots of problems always turn up at the last moment.

4.8 Instructions for making a histogram (frequency plot)

You should make a histogram to get a rough idea of the spread of marks. Any format that gives a reasonable overview of the marks is OK, including those produced by computer database or spreadsheet software. If you've never done it, I suggest the following easy method:

1. Starting with a clean sheet of paper or blackboard, draw the following blank diagram (omit the extreme ends of the graph when appropriate):

```
--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--
  5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90  95
```

2. Mark the unscaled marks that your students scored between the divisions as in the following worked example. Hypothetical actual marks (25 scripts): 22, 11, 38, 8, 11, 37, 18, 47, 42, 22, 26, 56, 4, 47, 9, 50, 61, 56, 8, 24, 57, 11, 1, 40, 50, giving:

```
       x
     x x       x             x      x x    x
xx  xx x     x x x x         xx x   x x    xx  x
--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--
  5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90  95
```

3. Draw appropriate statistical conclusions; in the present case: Average about 33. Only 12 students get honours or close to it. (God! even worse than last year!)

4. Scale as appropriate and redraw the plot. For example, in the present case: We probably don't want to fail that bunch of 4 students between 22 and 30. We can't do too much to help the guys with 10 or less. Thus we need a simple function that preserves the origin and takes 22 to 39, and introduces as little distortion as possible for marks above 22. One solution is to double marks up to 17, and add 17 to everyone over 17. This gives the scaled marks: 39, 28, 55, 16, 22, 54, 35, 64, 59, 39, 43, 73, 8, 64, 18, 67, 78, 73, 16, 41, 74, 28, 2, 57, 67 and the revised frequency plot:

```
            x         x        x                    x      x
x   x       xx  x     x    x   x xx         xx  xx   x xx   xx    x
--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--
  5  10  15  20  25  30  35  40  45  50  55  60  65  70  75  80  85  90  95
```

Discuss your scaling with the exam secretary for your year. Draw slight satisfaction that your scaling takes that pretty brunette/blonde/redhead who asked you questions after the first few lectures into the II.1s.

5. Together with your scripts, return a final version of your frequency plots and an explanation of any scaling for consumption by the external examiners.

5 Information on the exam boards

See White PYDC, 6.7 for the functions of the different exam boards. The exam boards consider and judge individual students using all available information. If you have taught a course or marked an exam, you should be at the meeting to comment on any special features, or set down your views in writing to the exam secretary.

Each student is represented at the exam board by his or her personal tutor. If one of your personal tutees may be on a borderline or in the pass/fail categories, you should be at the meeting, or express your views to the exam secretary, preferably in writing.

Exam marks must not be disclosed to students until the exam board concludes. Students will be told in advance that all information received from the department concerning their marks and degree classes are "subject to ratification by senate". As soon as the exam board is over, we post the class list in the department, marked "subject to ratification". Tutors should be available to give individual students a breakdown of their marks.

1st year The Subfaculty 1st year exam board meets on Thu 28th Jun 2001 in the morning, attended by Mark Roberts and Oleg Zaboronski. There is a departmental meeting in advance on Mon 25th Jun 2001 to consider 1st year results (but marks must not be disclosed until after the Subfaculty).

2nd year Fri 29th Jun 2001 at 10.00 am in Lecture Room 1.

3rd and 4th year Wed 27th June 2001 at 1.30 pm, in Lecture Room 1

6 The department's cumulative marking credit scheme

We keep a cumulative record of the exam work done by each member of the department. A questionnaire will be circulated asking how many essays you have read, how many exams you have set and marked etc.

Miles Reid, Exams secretary, Aug 2000