

EXTERNAL EXAMINER REPORT FORM 2017

External examiner name:	Professor Christopher Howls	
External examiner home institution:	University of Southampton	
Course examined:	Part C Mathematics, Mathematics and Statistics, Mathematics and Computer Science	
Level: (please delete as appropriate)	Level 7 Integrated Masters	

Please complete both Parts A and B.

Part A				
<i>Please (✓) as applicable*</i>		Yes	No	N/A / Other
A1.	Are the academic standards and the achievements of students comparable with those in other UK higher education institutions of which you have experience?	Y		
A2.	Do the threshold standards for the programme appropriately reflect the frameworks for higher education qualifications and any applicable subject benchmark statement? <i>[Please refer to paragraph 6 of the Guidelines for External Examiner Reports].</i>			The programme has introduced changes to comply with benchmarks on final year project work for the 2017-entry cohort.
A3.	Does the assessment process measure student achievement rigorously and fairly against the intended outcomes of the programme(s)?	Y		But see Part B for an issue with scaling.
A4.	Is the assessment process conducted in line with the University's policies and regulations?			See Part B for an issue with scaling.
A5.	Did you receive sufficient information and evidence in a timely manner to be able to carry out the role of External Examiner effectively?	Y		
A6.	Did you receive a written response to your previous report?	Y		
A7.	Are you satisfied that comments in your previous report have been properly considered, and where applicable,	Y		

	acted upon?			
<p>* If you answer “No” to any question, please provide further comments in Part B. Further comments may also be given in Part B, if desired, if you answer “Yes” or “N/A / Other”.</p>				

Part B

SEE ATTACHED PDF

B1. Academic standards

- How do academic standards achieved by the students compare with those achieved by students at other higher education institutions of which you have experience?*
- Please comment on student performance and achievement across the relevant programmes or parts of programmes (those examining in joint schools are particularly asked to comment on their subject in relation to the whole award).*

B2. Rigour and conduct of the assessment process

Please comment on the rigour and conduct of the assessment process, including whether it ensures equity of treatment for students, and whether it has been conducted fairly and within the University’s regulations and guidance.

B3. Issues


Are there any issues which you feel should be brought to the attention of supervising committees in the faculty/department, division or wider University?

B4. Good practice and enhancement opportunities

*Please comment/provide recommendations on any **good practice and innovation relating to learning, teaching and assessment**, and any **opportunities to enhance the quality of the learning opportunities** provided to students that should be noted and disseminated more widely as appropriate.*

B5. Any other comments

Please provide any other comments you may have about any aspect of the examination process. Please also use this space to address any issues specifically required by any applicable professional body. If your term of office is now concluded, please provide an overview here.

Signed:	
Date:	13/7/17

Please email your completed form to: external-examiners@admin.ox.ac.uk, and copy it to the applicable divisional contact set out in the guidelines.

The Vice-Chancellor,
University of Oxford,
c/o Catherine Whalley
July 13, 2017

Dear Vice-Chancellor,

**External examiner's report 2016/17:
Part C, Mathematics, Mathematics & Statistics, Mathematics & Computer Science**

I have pleasure in enclosing my report on the above examination.

B1. Academic Standards

- (a) The portfolio offered by Oxford Part C continues to be one of the most extensive and challenging in the UK in the areas of pure and applied mathematics and statistics. The academic standards achieved by the students continue to be at least as high as anywhere else in the UK.
- (b) Of special note is the performance on the project work. The projects I read were of extremely high standard and many were certainly publishable.

B2. Rigour and conduct of the assessment process

- (a) The examinations in part C are rigorous and all of (at least) a level 7 FHEQ standard.
- (b) The quality of preparation of the papers is extremely high, professionally produced and with minimal errors. I am very grateful to the examiners for their responses to my comments on their papers.
- (c) From the viewpoint of the external examiner, the administration process is extremely efficient. WebLearn provides an extremely streamlined and secure way to handle the scrutiny of the process. I again single out the dedication of the administrative staff for special praise.
- (d) I welcome the response from the Head of Policy on 16th March 2017 concerning the point I raised last year about the compliance of part C with QAA benchmark 5.5ix. I note from conversations I had at the exam board that compulsory Part C projects will now be introduced in 2020/21 for candidates entering in 2017/18.

B3. Issues

The only issues I wish to raise this year concern scaling.

Section 11.4 of the University Education Committee policy¹ states that it is appropriate to scale marks for a paper where it has been established that either:

- (a) a paper was more difficult or easy than in previous years, and/or*
- (b) an optional paper was more or less difficult than other optional papers taken by students in a particular year, and/or*
- (c) a paper has generated a spread of marks which are not a fair reflection of student performance on the University's standard scale for the expression of agreed final marks,*

¹<https://www.admin.ox.ac.uk/edc/policiesandguidance/pgexaminers/11scriptsmarkingadjudication/>

i.e. the marks do not reflect the qualitative marks descriptors.

It also states that

Scaling should not be used mechanistically to fit the spread of classes on a paper to historical norms (i.e. norm referencing).

I suggest that the mathematics scaling algorithm is reviewed by the Education Committee for compliance with the University Policy for the following reasons.

- (a) One of the stated aims of the mathematics scaling process is to balance the performance of the cohort on Part C papers against the same cohort's performance in previous years, with a view to approaching the percentages in each degree classification in part B².

The summary statistics for each paper presented at the examiners' meeting includes a "Fairness" scatter plot of the scores of the candidates taking the paper against their part B USM mean. This graph is used to compare whether the sub-cohort taking a paper is performing at a similar level at part C as it did at part B, which is then used to inform the scaling on a paper.

However this measure does not necessarily give any information as to the over/under-difficulty of a particular paper at part C level, either in relation to previous papers (policy 11.4 (a) above), or to other papers in the same year (policy 11.4 (b) above). Rather it gives a relationship with sub-cohort performance at part B, a level 6 component of the programme.

Due to this difference in FHEQ levels, it is difficult to argue that subsequent scaling is being done to reflect better the performance of candidates against level 7 descriptors (policy 11.4 (c) above). It would not be surprising if some of the candidates found level 7 material harder than level 6 material and so the overall performance of a cohort against the qualitative descriptors dropped in part C.

It could be argued that the use of the mathematics scaling algorithm to achieve comparable classes in the same cohort over their different years might be viewed as attempting to fit to "historical norms" (of the cohort) in contravention of the Education Committee policy cited above.

To alleviate this concern, a second scatter plot might be added to consider the performance of candidates taking the paper against their mean performance on other papers in Part C. This graphical insight could be used to allow the examiners to assess the relative difficulty of each paper against the others, the better to inform the scaling process on a paper in the same year, policy 11.4 (b) above.

A historical collection of these plots considered alongside corresponding "fairness" plots, could then inform the mathematics teaching committee as to whether there was any systematic issues with the difficulty of papers on a particular course, so better complying with policy 11.4 (a) above.

- (b) The scaling process, as implemented in 2016/17 for mathematics papers has fixed points at the origin of (Raw, USM) space and at (50,100) with internal corners set by examiners. The external examiners were told that this was the algorithm that had been decided by

²See, for example, the guidance on page 7 of the Guidance to Part C Examiners document.

the Mathematics Teaching Committee and not open to challenge.

The piecewise linear scaling to the internal corners in practice often introduces significant scaling gradients at the lower end of the raw marks distribution. In a significant proportion of the papers, this resulted in raw marks of around 14-18 being scaled to USM marks in the range between 40-55.

Candidates scoring in the raw mid-teens out of 50 will have probably only demonstrated that they have mastered either just the bookwork component, or some of the bookwork and partial parts of a calculation. I would not consider that such candidates had demonstrated “sound knowledge of much of the material” or “adequate basic skills in ... problem-solving”³, the Mathematics descriptor of a II.2 classification.

At my own institution, candidates performing at that raw level on a level 7 paper would certainly be failed.

If the high scaling gradients are repeated at Part B, then I am additionally concerned that the cumulative effect of this over successive years might be consistently to reward poor performance and to inflate artificially the percentages of 2iis.

There is a corresponding high-gradient issue in scaling down the USM performance at the I class end. This has the potential to penalise high-scoring candidates.

I would suggest that the scaling algorithm in Mathematics is reviewed to see whether it adequately meets the requirements of the Education Committee Policies and Guidelines 11.4 (c) that *the scaled marks should reflect the qualitative marks descriptor* throughout the range of the scaled marks.

- (c) I also wish to raise the consistency of scaling processes across joint courses.

At the Mathematics with Computer Science exam board a raw mark of 100% achieved by a candidate in a computer science paper was scaled (down) to 85 USM marks. When I questioned this, I was informed by the Computer Scientists that the reason for this was because the paper “must have been too easy” (and with no reference to the qualitative descriptors).

If this had been one of the mathematics papers taken by the candidate, because of the mathematics scaling fixed point at (Raw,USM)=(50,100), they would have received 100 USM for this performance.

Hence candidates taking Mathematics with Computer Science appear to be having different Raw to USM scaling processes being implemented for their papers, depending on whether the papers are from mathematics or computer science.

When I questioned this at the meeting, one of the Computer Scientists stated that Mathematics was not implementing University/Divisional policy. I should like a response as to whether this assertion is true or not.

There appears to be some latitude in the Education Committee Policy regarding the types of scaling algorithms that may be used. However, if both departments are implementing a scaling policy according to their own interpretation of the policy, then I would suggest

³Appendix K of the *Department of Mathematics Draft Examination Conventions*

that consideration is given to tightening the policy to ensure better cross-department consistency for mark mappings on joint degrees.

- (d) The external examiners were informed at the Mathematics Examiners' meeting that whereas written papers may be scaled, project marks could not be. The reason advanced for this was that the projects are not compulsory and so are self-selecting students. However the same argument could be applied to any of the written papers, especially those with small numbers taking them.

I should like a response as to whether the policy of not scaling the project marks is consistent with the Education Committee policy on scaling.

B4. Good practice and enhancement opportunities

The following items continue to be examples of good practice.

- I commend the extensive range of examination topics offered.
- I commend the care with which the examination papers were produced and administered
- I commend the high quality and challenging nature of the questions that have been set.
- I commend the comprehensive comments from the examiners based on examination performance.
- I commend the generally high level of achievement by the cohort of candidates.

Yours faithfully,



C.J.Howls
Professor of Mathematics