



External Assessment Report 2014

Subject(s)	Applied Mathematics
Level(s)	Advanced Higher

The statistics used in this report are prior to the outcome of any Post Results Services requests

This report provides information on the performance of candidates which it is hoped will be useful to teachers/lecturers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding. It would be helpful to read this report in conjunction with the published question papers and marking instructions for the examination.

Comments on candidate performance

General comments

The papers for both the Statistics and the Mechanics options consist of written response questions with a total maximum possible mark of 100.

The Mechanics paper has: Section A comprising only Mechanics questions, with a maximum possible mark of 68; Section B comprising questions from the Mathematics for Applied Mathematics Unit, with a maximum possible mark of 32.

The Statistics paper has: Section A comprising only Statistics questions, with a maximum possible mark of 68; Section B comprising questions from the Mathematics for Applied Mathematics unit with a maximum possible mark of 32.

Most candidates were able to access at least part of all of the questions. There were many good performances. The performance of candidates undertaking Statistics was suitably comparable to that of those choosing Mechanics.

The average (mean) mark for the paper was 65.8. This compares with: 51.8 (2013), 61.8 (2012), 63.6 (2011).

Mechanics

This proved to be a very accessible paper with most candidates making a good attempt at the questions. Presentation and explanation continue to improve and, in particular, rounding was generally more appropriate than in some previous papers. There appeared to be no ambiguity in wording.

Statistics

Routine questions, where the distribution or method was specified, were generally tackled very well. However, those questions calling for judgement or interpretation were less well done. Whilst this is to be expected, the steep fall off in marks was disappointing.

Mathematics for Applied Mathematics (Section B)

Nearly all candidates attempted all questions.

Candidates answered less well on question B6, but no questions were tackled poorly by all.

Areas in which candidates performed well

Mechanics

Q1, Q2 and Q4 were well attempted, although many candidates did not know the formula for finding displacement in Simple Harmonic Motion (Q2).

Q5: most candidates identified a method of solution but some were careless in indicating the direction of motion.

Q6: Those candidates who took the formal route of using vectors in the solution found the solution demanding whereas those who chose a relative velocity triangle method found an easier method of solution

Q8 and Q9: These were generally well attempted, although some candidates could have demonstrated greater rigour in proof and calculation.

Statistics

Q1, 5 & 7 were well done, although misinterpretation of question 7 prevented still better results. The more routine, early parts of Q4 & 6 were also dealt with competently.

Mathematics for Applied Mathematics (Section B)

Questions B1 and B2 were done very well by the majority. Some statistics candidates had difficulty with basic integration and indices, but responses were still good, overall, in B3–5.

Areas which candidates found demanding

Mechanics

Q3: Many candidates are still unfamiliar with questions where displacement/time are variable and calculus should be used.

Q7: This was the question that proved most demanding for candidates. If tackled as relative acceleration and calculus was then used, the correct solution was achieved. Many candidates, however, used equations of motion under constant acceleration but ignored any relative motion.

Q10: This showed again that those questions where calculus is required in solution are often not well attempted.

Statistics

Q2 Answers were generally lacking in precise detail. There was confusion, as is commonly the case, between stratified and cluster samples.

Q3 Many candidates overlooked the fact that if the O_i total was 467, then so must the E_i total be. Alternatively, if using %, the value of x^2 should be multiplied by 4.67.

Q4 Mann-Whitney is the only available non-parametric test for independent samples, and a normal approximation should not be used for samples of 8 and 8, especially without a continuity correction.

Q6 Candidates needed to use a t-test and some did not, so losing marks. Many responses were too vague in part (b).

Q7a) Many did not read the question and thought that, for example, [10, 50] was mean and variance whereas these represent a and b .

- b) A large number could not relate this to part (a) and substitute in the values, eg $k = 60$.
- c) Further lack of precision again cost marks in many cases.

Q8a) The kernel of the question was to test the ability to use a normal approximation, so exact answers were not well rewarded.

- b) This question asked candidates to 'estimate' not 'calculate'.
- c) Once again, more precise interpretation was required.

Q9 A huge amount of interpretation and comment was required here. Less able candidates did not do well this well.

Mathematics for Applied Mathematics (Section B)

Candidates found the questions in this section progressively more difficult. Responses to the final part of the final question, B6, were generally quite limited.

The main areas of weakness, however, were centred on calculus skills. In most cases a more secure knowledge of standard derivatives and integrals, coupled with a robust understanding of the techniques associated with differential equations, would have been of significant benefit.

Advice to centres for preparation of future candidates

Mechanics

A greater exposure to non-routine and/or contextualised questions would, as ever, enhance candidates' understanding of the concepts involved and better prepare them for the more demanding examination questions. That said, on the evidence of the 2014 paper, there has been progress in this area.

Statistics

As remarked upon in previous years, a greater emphasis on the interpretation of results, and an ability to comment perceptively when asked to do so, would be of enormous overall benefit to candidates.

Similarly, more care in the statement of hypotheses and an accurate communication of the acceptance or rejection of H_0 would also result in improved performance.

Mathematics for Applied Mathematics (Section B)

There have clearly been areas of the syllabus which, in some centres, have not received as much attention as would be desirable. Where possible, within the time constraints of the course, thorough coverage of all areas would enable candidates to access all questions with greater confidence.

The level of achievement in Higher Mathematics of candidates undertaking the AH Applied Mathematics course is, overall, very high. In some centres, the application of greater emphasis on the teaching approaches and methods used for Higher would quite likely lead to greater success in this section.

Statistical information: update on Courses

Number of resulted entries in 2013	3314
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Number of resulted entries in 2014	3443
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Statistical information: Performance of candidates

Distribution of Course awards including grade boundaries

Distribution of Course awards	%	Cum. %	Number of candidates	Lowest mark
Maximum Mark 100				
A	25.4%	25.4%	873	66
B	22.4%	47.8%	772	54
C	22.3%	70.1%	769	43
D	9.7%	79.8%	333	37
No award	20.2%	-	696	-

General commentary on grade boundaries

- ◆ While SQA aims to set examinations and create marking instructions which will allow a competent candidate to score a minimum of 50% of the available marks (the notional C boundary) and a well prepared, very competent candidate to score at least 70% of the available marks (the notional A boundary), it is very challenging to get the standard on target every year, in every subject at every level.
- ◆ Each year, SQA therefore holds a grade boundary meeting for each subject at each level where it brings together all the information available (statistical and judgemental). The Principal Assessor and SQA Qualifications Manager meet with the relevant SQA Business Manager and Statistician to discuss the evidence and make decisions. The meetings are chaired by members of the management team at SQA.
- ◆ The grade boundaries can be adjusted downwards if there is evidence that the exam is more challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- ◆ The grade boundaries can be adjusted upwards if there is evidence that the exam is less challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- ◆ Where standards are comparable to previous years, similar grade boundaries are maintained.
- ◆ An exam paper at a particular level in a subject in one year tends to have a marginally different set of grade boundaries from exam papers in that subject at that level in other years. This is because the particular questions, and the mix of questions, are different. This is also the case for exams set in centres. If SQA has already altered a boundary in a particular year in, say, Higher Chemistry, this does not mean that centres should necessarily alter boundaries in their prelim exam in Higher Chemistry. The two are not that closely related, as they do not contain identical questions.
- ◆ SQA's main aim is to be fair to candidates across all subjects and all levels and maintain comparable standards across the years, even as arrangements evolve and change.