



External Assessment Report 2011

Subject	Applied Mathematics
Level	Advanced Higher

The statistics used in this report are pre-appeal.

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

Overall, candidates were well prepared for this year's question paper and the majority of responses were of a good standard.

Once again, there were fewer candidates presented for the Statistics paper.

Areas in which candidates performed well

Most candidates performed well in Section B.

In Section A, candidates did best in Questions 2, 3, 4 and 5 of the Mechanics paper and in Questions 6 and 7 of the Statistics paper.

Areas which candidates found demanding

Candidates found Questions A9 (b) and A10 in the Mechanics paper to be the most demanding and Questions A1 (b), A2 (b), A8 (b) and A9 in the Statistics paper to be the most demanding.

Please take note of the comments on individual questions below.

Advice to centres for preparation of future candidates

Mechanics

Overall, candidates seemed to be well prepared and standards were good.

- A1 This short question was done well with most candidates getting full marks.
- A2 This question was set to test basic understanding of speed/time graphs. It provided a good test with most candidates succeeding.
- A3 This question assessed forces in the context of circular motion. Most candidates dealt very well with it.
- A4 Relative velocity questions are often found to be demanding but candidates coped well with this one. Explanations as to why the aircraft were going to collide were done well.
- A5 This was a standard SHM question and candidates dealt with it very successfully.
- A6 Although this question was set to assess motion described in vector terms, on the whole candidates dealt with it well and were able to demonstrate they could obtain the formula and then to evaluate the integral.
- A7 It was regrettable that this question needed a correction notice. There was no evidence that this caused any difficulty for candidates. However, some candidates were unsuccessful in their attempts showing uncertainty over what was required.
- A8 Although this question could have been tackled by using either equations of motion or energy principles, most candidates used the former. As a longer question, some candidates were unable to finish it completely.
- A9 This extended question proved to be quite demanding. Most candidates were able to manage part (a) but then many either gave up or lost their way.
- A10 The last of the Mechanics questions proved to be demanding, perhaps due to the context and the algebraic manipulation required. Only the most able candidates were completely successful.

Statistics

- A1 Most candidates did not understand the assumption and condition. Many tree diagrams were not sufficiently annotated and some made arithmetical errors calculating the probabilities.
- A2 (a) This part of the question was well done and a confidence interval approach was certainly acceptable.
- A2 (b) Only a few had the correct strategy here.
- A3 Many did well here but a significant number ignored the 1-tailed nature of the interval.
- A4 (a) Very few used the algebraic form of the laws of expectation and variance and, as a result, many got the variance wrong.
- (b) It was clearly acceptable to use the total of 1 000 000 instead of the average 27 778 with standard error 275.
- A5 This question was generally well done, but a significant number ignored the demand to use the normal approximation. Some stated hypotheses were incorrect.
- A6 Candidates did well, particularly in part (a). Many did not appreciate, however, that there is only 1 degree of freedom in a 2×2 table. Perhaps if one can reject at 1% then one should, but it is nonetheless acceptable here to use only 5%.
- A7 Candidates did very well in this question, again doing better in part (a) than in part (b).
- (a) A dotplot or stem-and-leaf was required to compare the two data sets.
- (b) The use of a normal approximation is unacceptable in part (b). Candidates were expected to use tables with interpolation for 12.5 or an explanation of why only 12 or 13 was used.
- A8 Many candidates made arithmetical errors early on, leading to the loss of marks. Many did not realise that $\bar{x} = 0$. Almost no-one realised that the last part was about the dangers of extrapolation.
- A9 Explanations of why there might have been only 2 degrees of freedom were too vague although some were spot-on. Many candidates thought wrongly that the expected number was the average of 137 and 187.

Section B Mathematics

The vast majority of candidates had little difficulty with the majority of these questions.

- B1 Both parts tested routine techniques of differentiation. Candidates scored very well.
- B2 The first part, getting the inverse of a 2 by 2 matrix was done well. The second part required rather more thought and a variety of methods were used, only some of which were successful.
- B3 This question which assessed parametric differentiation was done extremely well. Clearly, candidates were well prepared.
- B4 This question proved more difficult. It is possible that some candidates were not sufficiently fluent with the sigma notation. However, the majority scored highly.
- B5 Questions requiring substitution are often found to be difficult. However, this one was an exception with full marks being very common.
- B6 Longer questions tend to be found more demanding, but candidates coped very well with this one.

Statistical information: update on Courses

Number of resulted entries in 2010	263
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Number of resulted entries in 2011	279
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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	38.4%	38.4%	107	71
B	21.9%	60.2%	61	60
C	15.8%	76.0%	44	49
D	6.5%	82.4%	18	43
No award	17.6%	100.0%	49	-

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, therefore, SQA 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 Head of Service 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.