



External Assessment Report 2014

Subject(s)	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

Most candidates were able to access at least part of all of the questions. There were many solid performances.

The paper consists of written response questions with a total maximum possible mark of 100.

Nearly all candidates attempted all questions, with a further year on year reduction in the number of very weak or very underprepared candidates.

Questions 1, 3, 4, 5, 6, 8, 9, 12 & 15 were done well by the majority. Candidates answered less well on questions 10, 13, 14 & 16, but no questions were tackled poorly by all.

Candidates' performance in Proof by Induction is improving, but there is still room for more rigour. Candidates continue to appear confident and well-drilled on Vector Geometry, Differential Equations and other aspects of Calculus.

Areas in which candidates performed well

It was again welcome to note that most candidates coped well with standard questions on the differentiation and integration techniques featured in questions 1(a), 1(b), 4, 10 and 15(a).

Those candidates who chose to expand the binomial expression in question 2 did it well, and the majority also proceeded to correctly identify the required term. However, as the general term was not always obtained, this route was frequently only worth 2 of the 5 marks available.

Question 3 on Gaussian elimination was carried out well, including the algebraic manipulation that was required.

Question 8, a differential equation, was handled very competently. By failing to apply the product rule, however, a number of candidates did not differentiate the general solution correctly.

Although many chose the more arduous route of processing the whole function, marks for question 9, on Maclaurin series, were generally high.

In question 14, surprisingly, a significant minority of candidates encountered difficulty factorising $3r^2 - 5r + 2$. However, it was pleasing to note that the majority had identified the partial fractions element of the question — in many cases not even attempting most of the rest — and successfully implemented the correct technique.

Areas which candidates found demanding

In question 2, many candidates did not appear to be able to obtain the general term. Those who did, frequently made errors manipulating indices.

Weakness in the treatment of indices was again evident in question 7 on Proof by Induction. Of particular concern was the assertion by many candidates that $2 \cdot 2^k = 4^k$. This often led to the loss of two marks.

In question 13, only a minority of candidates considered the endpoints or obtained two solutions to their trigonometric equation.

In question 14, other than the statement of the sum to infinity in part (a) and partial fractions in part (b), few candidates made any headway. A lack of familiarity with polar form and its relationship to plotting numbers on an Argand diagram prevented many candidates from successfully implementing their knowledge of other techniques on complex numbers. In particular, many were unable to express -1 in polar form.

In question 15, many candidates were stymied by the circular nature of the Integration by Parts. It seems likely that most either failed to recall or were not aware of the technique required, ie recognising the appearance of the integrand on the right hand side.

Advice to centres for preparation of future candidates

Many skills from earlier levels seem to have been overlooked or forgotten by a significant proportion of the candidates. Factorising a quadratic, differentiation/integration of $\sin/\cos nx$, and sketching the graphs of the inverse of a function were skills which were needed at points during the paper.

Also, where more routine skills (such as product rule in question 8; $\sec^2 x = 1 + \tan^2 x$ in question 12; and algebraic manipulation in questions 2, 3, 6, 7, 9 & 10) were required, many candidates had great difficulty applying these in context.

Candidates often have great difficulty in applying, in the same question, techniques from more than one area of mathematics. More practice in this kind of question would benefit candidates' progress.

Some candidates appeared to have been disadvantaged by not having covered all areas of the syllabus (Integration by Parts, Properties of Functions, Trigonometric Identities). Centres should consider how best to cover and revise all areas, possibly also providing guidance to candidates as to where further examples and practice can be found.

Teachers should encourage arithmetical accuracy, particularly in the treatment of indices, and bring attention to unnecessary arithmetical errors when they occur.

A number of candidates would benefit from being given more guidance for proofs. They require more practice and advice about rigour and logical layout.

The SQA website contains the Marking Instructions for 2014 (as well as previous years). All those teaching Advanced Higher Mathematics, as well as candidates undertaking the course, may benefit from looking at these detailed Marking Instructions for further advice and guidance.

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.