External Assessment Report 2015

Subject(s)	Mathematics
Level(s)	Advanced Higher

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, 2, 3, 4, 5, 7 and 8 were done well by the majority. Candidates answered less well on questions 11 and 18, but only question 13 was tackled poorly.

Candidates continue to appear confident and well-drilled on Vector Geometry, Differential Equations and other aspects of Calculus.

The average (mean) mark for the paper was 53·7.

Areas in which candidates performed well

Further progress has been made with most of the standard questions on the differentiation and integration techniques featured in questions 2, 4, 8, 10, 16 and 17.

Performance on the binomial theorem in question 1 was good overall, with only a few errors arising from lack of attention to detail.

Question 2 on basic differentiation was generally done well although the required simplification occasionally caused errors.

It was pleasing to note that the implicit differentiation required in question 4 was carried out with more success than in previous years.

The straightforward matrix manipulation required in question 5 was handled with ease by most.

Question 16, a challenging differential equation, was handled well overall, with most candidates getting a good start. However, few obtained full marks, frequently due to inadequate algebraic skills.

Areas which candidates found demanding

Many candidates correctly took logs in question 6, but differentiating the resulting expressions proved to be too much of a challenge.

Questions 9 and 12 revealed a tendency by a significant number of candidates to attempt proof by induction in unsuitable cases, such as these. Those taking a more direct approach generally did much better, with only the algebraic manipulation required in question 9 causing problems.

In question 13 only a small minority of candidates made progress beyond expanding z^2. The almost universally insurmountable hurdles were a lack of understanding of the modulus of a complex number and a failure to compare either real or imaginary coefficients.

Although question 14, where candidates choose to define odd and even functions algebraically, was intended to be challenging, the first three marks proved highly accessible. However, the final mark was very rarely obtained as most attempts contained insufficient justification for their assertions.

Overall, question 15 on vector geometry was attempted with reasonable success although few checked the point of intersection in (b) and very few indeed could write vector equations for the lines.

In question 17, a huge majority of candidates entirely failed to recognise the need to divide by the denominator prior to launching into partial fractions, losing three potential marks in the process. Whether dividing first or not, most struggled with the final integration.

Although most achieved partial marks for question 18, difficulty in interpreting what techniques to use proved a major barrier.

Advice to centres for preparation of future candidates

Mathematical results from earlier levels still seem to have been overlooked or forgotten by a number of candidates — factorising a quadratic, differentiation/integration of sin/cos nx and, particularly, $\sin^2 x$.

It is the case at all levels that candidates have the greatest difficulty in applying techniques from more than one area of mathematics in the same question. 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 course (odd and even functions, complex number equations, logarithmic differentiation, matrix transformations and direct proof). Centres should consider how best to cover and consolidate all areas, possibly also providing guidance to candidates as to where further examples and practice can be found. The proof area of the syllabus has been expanded slightly for the new CfE qualification being introduced in 2016, so increased attention should be focused here with, in particular, an emphasis on selection of the most appropriate method.

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

The SQA website contains the Marking Instructions for 2015 (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 2014	3443

Number of resulted entries in 2015	3641

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	26.1%	26.1%	951	70
B	25.3%	47.5%	780	56
C	21.0%	68.6%	765	43
D	9.1%	77.7%	333	36
No award	22.3%	-	812	-

For this course, the intention was to set an assessment with grade boundaries as close to the notional values of 45% for a Grade C and 75% for a Grade A. Overall, the course assessment proved to be more difficult than intended and the A and C boundaries were adjusted accordingly.

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.