



External Assessment Report 2015

Subject(s)	Mathematics
Level(s)	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

Candidates made considerable effort in generating solutions but many responses required greater clarity in presentation, layout and communication. Candidates had clearly learned processes, but some fell short when it came to the use of equation solving and working with fractions, surds and indices. Candidates identified the strategies required, but their numeracy skills often prevented progress to a final solution being made.

Paper 1 Section A: Objective Type Questions: Total mark possible: 40

Candidates' performance was in line with past examinations, with an average mark of 25.4. The first 16 or 17 questions are aimed at candidates performing at C grade and are intended to test routine mathematical skills. The final three or four questions are designed for the A/B candidates.

Paper 1 Section B: Written response questions: Total mark possible: 30

The average mark was 14.88.

Paper 2: Written response questions: Total mark possible: 60

The average mark was 30.48.

Areas in which candidates performed well

Paper 1

Objective type questions

In questions 1-8 and 12 more than three-quarters of candidates chose the correct response.

Written response questions

Question 21a and b(i): Candidates communicated effectively in this question

Question 23: Candidates displayed a good understanding of how to apply the laws of logs.

Question 25: Candidates who used Pythagoras fared better than candidates who used the distance formula.

Question 25b: Where candidates recognised that they needed to use the chain rule attempts were well done. Most candidates made a communication

statement.

Paper 2

- Question 1a and b: This question was reasonably well executed by most candidates.
- Question 2: The candidates who proceeded to check their solution invariably gained full marks.
- Question 3: This question met expectations and was well done. It was encouraging to see candidates justifying the existence of a limit.
- Question 4: Candidates largely understood what was expected in this question and those who used the correct strategy generally performed well. In a few instances candidates provided succinct, elegant solutions.
- Question 5a: This was well done by the majority of candidates.
- Question 7: Candidates made good use of the formula sheet.
- Question 8: It was pleasing that a number of candidates who did not perform well in previous questions performed well in this question. The number of candidates who equated coefficients and worked in radians throughout was noticeably greater than in previous years.

Areas which candidates found demanding

Paper 1

Objective type questions

In questions 11, 17, 18, 19 and 20 less than two-fifths of candidates chose the correct response.

Written response questions

- Question 21bii: Too many candidates failed to make the link with question 21a and continued to try to solve their cubic. Candidates should be encouraged to look for connections between parts of questions to avoid repeating work.
- Question 22: The closed interval was not handled well. (Too many candidates failed to deal with a closed interval). Candidates who did try to deal with the end points were hindered by their numerical skills.
- Question 24: A number of candidates did not know the condition for real roots and therefore were unable to deal with the quadratic inequation. This needs to be reinforced.

Question 25: Where candidates used the distance formula they failed to make appropriate use of brackets.

Paper 2

Question 1c: Candidates' weak algebraic skills frequently lead to difficulty solving simultaneous equations. Attempts to eliminate a variable which required the subtraction of equations were less well done.

Question 2: A number of candidates did not appreciate the difference between an algebraic expression and an algebraic equation, and the rules that apply to both.

Question 4: A number of candidates did not know that integration was the correct strategy for this question. The omission of brackets and failure to simplify algebraic expressions and fractions often lead to difficulties. These skills need to be reinforced.

Question 5: Very few candidates made use of a sketch. Of those who did, too few understood the meaning of 'touch' or 'internal'.

Question 6c: This was intended as an A/B question. However, even the better candidates did not progress to part (c) as they encountered difficulties in parts (a) and (b). Candidates failed to acknowledge that the triangle was equilateral and struggled to link the directed line segment with the vector pathway found in part (b).

Question 7: Integration of the constant, misinterpretation of the brackets, and trig identities were not well handled. Many candidates did not remember basic trig identities. It is important that these are embedded at this level.

Question 8: For a number of candidates '+ 65' did not appear in their response and they failed to make the connection between their wave function and the original formula.

Algebraic manipulation continues to challenge a large number of candidates. In general, work involving fractions or negative signs seemed to present difficulties for many.

Advice to centres preparing candidates for the New Higher

Candidates should be encouraged to communicate their answers clearly. It is important that formulae are not just quoted; a formula should be linked to a diagram and/or context given in the question. Candidates should look for connections between parts of questions, particularly where there are three or four parts to a question. These are almost always linked and, in some instances, an earlier result in part (a) or (b) is needed and its use would avoid repeated work by candidates.

Candidates should experience topics in unfamiliar contexts. They should be given regular opportunities to carefully read and interpret problems and then apply their knowledge. Candidates will not be told in every question to 'show their working'. It would be advantageous if candidates were routinely reminded of the requirement for accuracy, for detail and for illustrating their understanding in their working.

Candidates should be encouraged to make use of diagrams and include them in their solutions. Where a diagram is given and a candidate wishes to annotate this, the diagram should be copied to the candidate's answer booklet first before any annotations are made. It is clear, from the working shown, that some candidates are annotating diagrams on the question paper and not copying these to the answer booklet, and so essential working is missing from their solutions.

Candidates should be encouraged to simplify expressions and to use concise and efficient methods where possible.

Candidates would benefit from practice in algebraic manipulation, manipulation of surds and indices, and consolidation of numeric skills. The correct use of brackets needs to be emphasised, particularly in cases where the meaning is altered, as this would lead to an incorrect solution or could make reaching a solution impossible. Candidates should be reminded that $\sqrt{(a^2 + b^2)} \neq a + b$ and $k\sqrt{a} \neq \sqrt{ka}$.

Candidates need to be aware of necessary rigour and use of the correct notation. Many skills, especially those initially introduced at a lower level, such as straight lines, vectors, completing the square and discriminant should be revisited and extended.

They should be exposed to and make use of correct mathematical terminology and vocabulary.

Communication is important in questions where standard results and formulae are used. It is insufficient simply to quote a result or formula: they need to be connected to the particular question. For example, when using trigonometric identities it is not sufficient to simply quote $\cos 2A = \cos^2 A - \sin^2 A$ — it should be used in the context of the question.

The SQA website contains the marking instructions for 2015 (as well as previous years). All those teaching Higher Mathematics, and candidates undertaking the course, should ensure that they look at these detailed marking Instructions for further guidance.

Statistical information: update on Courses

Number of resulted entries in 2014	21851
Number of resulted entries in 2015	10854

Statistical information: Performance of candidates

Distribution of Course awards including grade boundaries

Distribution of Course awards	%	Cum. %	Number of candidates	Lowest mark
Maximum Mark - 130				
A	25.0%	25.0%	2714	89
B	25.3%	50.3%	2744	72
C	22.8%	73.1%	2476	56
D	9.4%	82.5%	1023	48
No award	17.5%	-	1897	-

For this course, the intention was to set an assessment with grade boundaries at 59 for a C, 93 for an A and 109 for an upper A. Objective test item, question 19 in Paper 1, did not function as intended. 1 mark adjustment made across C, A and Upper A. Questions 21 – 25 in Paper 1 were intended to be discriminating questions – and worked as such. However 2 marks in questions 21- 25 were difficult to access by all candidates and a 2 mark adjustment made across C, A and Upper A. Questions 21-25 in Paper 1 proved to have additional unintended level of demand for A and Upper A candidates and as such a further 1 mark adjustment was made at A and a 2 mark adjustment at Upper A. Total adjustments made: 3 mark reductions at C, 4 mark reduction at A and 5 mark reduction at Upper A

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.