



External Assessment Report 2011

Subject	Mathematics
Level	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 performed as expected, with few really poor marks and five candidates scoring full marks. As in previous years, the examination was set to enable a candidate who is working at a grade C to demonstrate their knowledge and ability in Paper 1, whereas Paper 2 was set to enable candidates of all abilities to demonstrate the knowledge and skills at each of the levels A, B and C. Markers reported that the question papers were at an appropriate level of demand.

Paper 1 Section A: Objective type questions

Total mark possible: 40

Candidate performance was in line with the 2010 and 2009 examinations with an average mark of 27.13 (compared with 27.98 in 2010 and 27.27 in 2009). This section is set so that the first 16 or 17 questions are aimed at the candidate who is performing at C grade and are there to test routine mathematical skills. The final three or four questions are aimed at candidates working at A/B grades.

Paper 1 Section B: Written response questions

Total mark possible: 30

Candidates found a few parts of questions in this section to be demanding.

Paper 2: Written response questions

Total mark possible: 60

This paper was set to test the full range of abilities, from C through to A, of candidates sitting Higher Mathematics. The more demanding questions were set towards the end of the paper.

The average mark for Paper 1B and Paper 2 combined was 54.1 compared with 49.6 in 2010 and 46.2 in 2009.

Candidates seemed to have taken on board advice offered in previous external assessment reports and marking instructions with essential communication statements being evident in their responses.

In both papers, it was pleasing to note that the majority of candidates, at all levels, were making attempts at all of the questions. There were very few 'blanks' to any questions or parts of questions. The C-grade candidate was able to attempt and gain marks, in all questions, up to and including the final question in Paper 2.

Areas in which candidates performed well

Paper 1 Section A: Objective type questions

Candidates performed well in Questions 1 to 13, 15 and 18.

Paper 1 Section B: Written response questions

Question 21: Candidates performed very well in this question. However, in (c)(ii) many chose a rather inefficient, and in some instances a long winded, approach to show the result required.

Question 22 (b): On the whole, this question was very well done but candidates need to be careful when constructing their nature table with values which are so close together.

Question 23 (a): Candidates performed better in this question than in many trigonometry equations involving double angles in previous examinations. This was very pleasing to see.

Paper 2: Written response questions

Question 1: This was very well done by the vast majority of candidates, as was expected.

Question 2 (a): This was very well done by almost all candidates. Candidates do tend to attempt questions involving composite functions well at Higher level.

Question 2 (b): As with (a), a large proportion of candidates were able to show the result requested. This is a 'show that' question and so all working up to and including the final result must be shown.

Question 2 (c): This question was very well done and centres are asked to note the communication statement that is required for this type of question by looking at the marking instructions for the 2011 examination on SQA's website.

Question 2 (d) Although many candidates managed to solve this equation, some reverted to first principles to arrive at the answer, which they could have obtained from their working in (c).

Question 3 (a): This was, as expected, very well done by many candidates. It should be noted, however, that those candidates who lost the marks here did so by omitting the negative sign from either the sixteen or the half.

Question 3 (b): A large proportion of candidates obtained the correct response; however, a lack of 'working' for their solution lost some candidates one or two marks in this question. In a question worth three marks, the answer almost always has to be supported with some form of working for full marks to be available. Please refer to the marking instructions on SQA's website to see the acceptable working for this type of question.

Question 4: Many candidates knew that the area should be evaluated as two separate integrations; one to evaluate the area to the left of the y -axis, and the other the area to the right of the y -axis. It should be noted, however, that a substantial number of candidates still

omit the 'dx' within their integral and teachers/lecturers in centres should continue to emphasise the importance of this in candidates' working.

Question 6 (a): The phase angle was outside the first quadrant in this question but it did not appear to put candidates off. The difficulty that many candidates faced in this question was writing the angle in radian measure, with many leaving it in degrees.

Question 7: Finding the centre and radius of both circles, as well as the distance between them was well within the ability of many candidates and it was pleasing to see so many make a valid attempt at these first five marks.

Areas which candidates found demanding

Paper 1 Section A: Objective type questions

Question 14: Just over one-third of the candidates dealt with this question on the scalar product as a 'straightforward multiplication problem' and chose answer A. This was rather disappointing for this question.

Question 16: Candidates had difficulty writing the expression in integrable form, many choosing the answer that was obtained from

$$3x^{-4} \text{ rather than } \frac{1}{3}x^{-4}$$

This is a skill candidates should have acquired from a previous level of Mathematics. Less than half of the candidates answering this question found the correct answer.

Question 17: Candidates are still having difficulty with problems like that asked in this question, hence its position towards the end of the section A. Centres are asked to give candidates practice at as many questions of this nature as possible to better prepare them for the examination.

Questions 19 and 20 were aimed at the A/B candidate and many candidates failed to choose the correct responses.

Paper 1 Section B: Written response questions

Question 22 (a): Candidates had difficulty finding the axes intercepts, in particular, dealing with $x^2 + 1 = 0$, with many solving this to obtain $x = \pm 1$.

Question 22 (c): In this question, candidates' curve-sketching abilities were very poor. Many of the difficulties lay with the errors made in (a) and (b) and candidates trying to 'fit' their curve around these errors, with little success.

Question 23 (b): In this question, too many candidates failed to make the connection with (a). Although candidates made an attempt at answering this question, many responses were totally invalid and gained no marks.

Paper 2: Written response questions

Question 3 (c): It was disappointing to see so many candidates who thought that a sequence could not have a limit of 0. Many also calculated a 'limit' for a divergent sequence and did not appear to understand that this was not valid. Centres are advised to review the marking instructions (on SQA's website) for this question.

Question 5: This was a 'bookwork' question on logarithms. However, although there were very few candidates who did not attempt it, a large number failed to achieve any marks.

Question 6 (b): This question proved to be rather demanding for the C-grade candidate and again the use of degree measure, when dealing with trigonometry and calculus, caused some problems. The advice, again, to centres is to encourage candidates to work in radian measure when attempting any question involving both trigonometry and calculus.

Question 7: The final four marks of this question were aimed at the more able candidate and were quite demanding. This proved to be the case, with only the most able candidates getting to the last few marks. Candidates who drew what they visualised as the 'picture', described within the wording of this question, did tend to do slightly better. This is a mathematical skill expected of most candidates at Higher level.

Advice to centres for preparation of future candidates

Guidance on answering both types of question.

Paper 1 Section A: Objective type questions

There is no negative marking for wrong answers to these types of question and so candidates should not leave any of these first 20 questions blank. The analysis would indicate that there are some candidates leaving questions blank.

Paper 1 Section B and Paper 2: Written response questions

Candidates should be encouraged to make connections between parts of questions, particularly where there are three or four sections 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 further repeated work by candidates.

General guidance

Where a diagram is given on the question paper, and candidates wish to annotate this, the diagram should be copied to the candidate's answer booklet first before any annotations are made. It is clear, from what Markers are seeing on candidate scripts, that some candidates may be annotating the diagram on the question paper and not transferring this to their answer booklet. Thus essential working is missing from their solutions, which is costing candidates marks in the examination.

Communication is an important aspect of this examination and candidates should be encouraged to show all working. This is particularly important in questions which contain the words 'show that'. In this type of question, candidates must get to the result quoted; failure to do so will prevent the candidate gaining the final mark, at least, for that question or part of

question. The work leading to the result must be shown fully for marks to be awarded. (See Paper 2 Question 2 (b) of the 2011 paper and the corresponding marking instructions for this question.)

Centres should aim to ensure that, in integration questions, candidates use the correct notation; in particular, instead of writing

$$\int 3x^2$$

which a majority of candidates do, we wish to see

$$\int 3x^2 dx$$

Candidates must be careful when subtracting one expression from another. For example, in Paper 2 Question 4, it was clear that a number of candidates who wrote

$$x^3 - x^2 - 4x + 4 - (2x + 4)$$

applied the negative to the first term in the bracket only

$$\text{ie } x^3 - x^2 - 4x + 4 - 2x + 4$$

Candidates should get into the habit of simplifying expressions before doing any further work with them.

For example the expression $x^3 - x^2 - 4x + 4 - (2x + 4)$ should be simplified to $x^3 - x^2 - 6x$ before any further working is carried out using this expression. This should make all subsequent work easier for candidates.

It is important that candidates aiming for an A or B pass in Higher Mathematics should be exposed to non-routine problems as often as possible throughout the Course.

SQA's website contains the marking instructions for 2011 (as well as previous years). All those teaching Higher Mathematics, and candidates undertaking this Course, should ensure they look at these detailed marking instructions for further advice and guidelines.

Statistical information: update on Courses

Number of resulted entries in 2010	20,654
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Number of resulted entries in 2011	20,550
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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 130				
A	25.2%	25.2%	5,175	97
B	25.0%	50.2%	5,136	84
C	22.0%	72.2%	4,528	71
D	8.4%	80.6%	1,729	64
No award	19.4%	100.0%	3,982	-

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.