External Assessment Report 2012

Subject(s)	**Mathematics**
Level(s)	**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

On the whole, candidates seemed to be well prepared and performed as expected.

Areas in which candidates performed well

In general terms, candidates did better on routine questions.
Questions 1, 2, 3, 5, 11(a), 14(a) and 15(a) were particularly well done.

Areas which candidates found demanding

Candidates had difficulty with questions on topics which have been infrequently assessed.
Candidates found Questions 7(b), 9, 11(b), and 12 the most demanding.

Advice to centres for preparation of future candidates

General

Candidates should be encouraged to include all the relevant working, communicate their answers clearly and write legibly; this will increase the opportunity to be awarded all of the marks they are capable of accessing in each question.

Comments on individual questions:

1(a) This was a routine differentiation making use of the quotient rule and it was well done. Marks were for the initial process with no requirement to simplify.

1(b) This part of the question was more demanding as it involved a more complex function. The overwhelming majority of candidates used the product rule though some used logarithmic differentiation. Unlike on some previous occasions, the notation ‘exp’ did not present a problem. Some simplification was needed for the final mark.

2 It was disappointing that some attempts involved arithmetic rather than geometric sequences. Most candidates obtained the correct common ratio, by a variety of approaches.

In the second part, many used powers of $\frac{1}{2}$ (or of 2) successfully. Some candidates used decimal approximations and lost marks. Some candidates simply added up and, as long as the working was clear and accurate, this could be awarded full marks.

3 This question was intended to be fairly routine and was well done by the majority of candidates. The expected approach was to observe that the conjugate of the given root was also a root. From these, construct the corresponding quadratic factor and hence the linear factor.

The Argand diagram was done well, with opportunities for follow-through marks.

4 The first part of this binomial expansion question proved to be difficult for many candidates. Candidates sometimes obtained a basic version of the general term but

failed to fully simplify it. Errors with the minus sign were common. Candidates who simply expanded the expression were not awarded any of the first three marks. The final two marks were for identifying the correct power required for the term independent of x and for the numerical value.

5 Though this was a routine question of its type, not all candidates identified a correct strategy. The expected method was to work out vectors for two sides of the triangle PQR, evaluate the cross product to get the necessary coefficients and then use one point to finish the task. Errors were common, including the use of the dot product. The alternative method of substituting coordinates into a general linear equation in x, y, z was rare.

6 This should have been a straightforward question but many errors were made in both the calculus and the algebra. Most candidates obtained the first mark. A few attempts involving squaring were seen, but with limited success. The majority tried to use the derivative of $(1 + e^x)^2$ and the second and third derivatives were rarely obtained correctly.

7(a) Many candidates made a good attempt at this and correct answers were common.

7(b) This, as expected, proved to be a demanding question. Some candidates were unable to identify the correct strategy and some lost a mark by including the line from $(-2,1)$ to $(-2, -1)$.

8 Most candidates made a good attempt at this question. The derivative and the limits were generally correct (despite the appearance of degrees) but the simplification caused problems. It was disappointing to see that many candidates at this level thought that $\sqrt{(a^2 - b^2)}$ was $a - b$. Many candidates had forgotten the trigonometric identity from Higher Maths which would have enabled them to integrate $\cos^2\theta$.

9 This question was designed to test knowledge of matrix manipulation. It was expected to be quite demanding and so it turned out. Candidates who worked with two-by-two matrices gained no marks.

10 This question on the division algorithm and different bases proved to be demanding. The correct answer only gained full marks if a valid method was clearly and correctly used.

11(a) Part (a) was intended to guide candidates in part (b) and was nearly always done correctly.

11(b) This was a non-routine integral and many candidates failed to make the link to part (a).

12 Questions on rates of change usually prove to be demanding and candidates found this question to be the most demanding in the paper. Few candidates were able to identify and apply a correct strategy.

13 Most candidates were awarded the first 3 marks, for obtaining $\frac{dy}{dx}$ although few accessed the next two marks. Many candidates wasted time working out the stationary values and also marks were lost by using a nature table instead of the second derivative. Candidates who were able to communicate their working clearly were able to access the last two marks.

14(a) Many candidates gained full marks in this question, which required logical working and clear communication.

14(b) With only 1 mark available, all that was needed was a statement (with justification) that there were no solutions.

14(c) The working in part (c) was much more difficult if the answers in (a) had errors. Nevertheless, follow-through marks were awarded as appropriate.

15(a) It was intended that the first 4 marks should be accessible. There were some errors in the initial setting up and, subsequently, arithmetical errors were common.

15(b) This part was more challenging. Most knew what they should be doing but many made errors with the algebra. Sign errors in the integrating factor were common as were errors in the actual integration.

16(a) The last question involved more than one area of the syllabus. On the whole, the induction in (a) was done well. Most started well but, as in Question 8, the lack of knowledge from Higher Mathematics caused problems .

16(b) This final part made use of the result from (a). There were many valid methods and many candidates were able to access partial marks for appropriate working.

Statistical information: update on Courses

Number of resulted entries in 2011	3,098

Number of resulted entries in 2012	3,239

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	22.0%	22.0%	712	69
B	21.1%	43.1%	683	57
C	23.5%	66.6%	761	45
D	10.3%	76.8%	332	39
No award	23.2%	100.0%	751	-

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.