Principal Assessor Report 2006

Assessment Panel:	**Mathematics**

Qualification area

Subject(s) and Level(s) Included in this report	**Mathematics: Advanced Higher.**

Comments on candidate performance

General comments

This paper put much greater demands on candidates with the mean mark being down by 8.9% compared with 2005. Far fewer candidates gained very high marks than is normally the case.

It is undeniable that the paper was hard but there were factors relating to the cohort which might well have contributed to the results. The number of candidates in 2006 was 2583, an increase of 280 on 2005. This increase represents a rise of 12% which, whilst welcome, is likely to have brought in more less able candidates. There was quite a large turnover of centres. In 2005 there were 332 centres and this increased by 10 to 342 in 2006. On the face of it, this may not seem large but in reality, 22 centres that presented in 2005 did not do so in 2006 and there were 32 centres that presented in 2006 but not in 2005.
[Statistics quoted are at Passmark stage.]

One disappointing aspect of the attempts of many candidates was the approach to algebra. Often brackets were incorrectly expanded, mistakes made in copying from one line to the next, and many other 'low level' errors were made. Such errors matter in themselves but very often prevent a candidate from proceeding to other parts of a question.

Please see remarks in the question-by-question analysis below.

Areas in which candidates performed well

See comments on individual questions.

Areas which candidates found demanding

See comments on individual questions.

Advice to centres for preparation of future candidates

Centres are advised to take notice of the comments below on the questions (and the comments on the 2005 paper provide at that time).

The following comments are best considered alongside the question paper and the marking instructions.
Question 1.
Many candidates seemed unprepared for this type of question. A few had no idea how to tackle it. There were the predictable mistakes in the elements of A^{-1} and a significant number did not appear to understand the condition for singularity.
Question 2(a)
The most common error was the failure to differentiate $\sqrt{1+x}$. Many candidates left the answer as $\frac{2}{2+x}$. Some misread the question and actually differentiated $(2\tan^{-1}x)\sqrt{1+x}$.
Question 2(b)
Most candidates knew how to do this part. However, due to careless algebra, writing $1-3(1+\ln x)$ as $1-3+3\ln x$, many obtained the negative of the correct answer.
Question 3.
This question triggered off a variety of methods, some of these were mathematically sound and carried through accurately. Only a minority used the expected method to arrive at $z=\frac{1}{2}-\frac{1}{2}i$. It was quite common to see candidates progressing to the final section even though the initial part was incorrect (or even incomplete).
Question 4.
The first part of this was generally tackled well but the second derivative, predictably, was more difficult.
Question 5.
This proved to be far more difficult than expected. Most candidates simply used a numerical approach whereas the question does ask for an algebraic method.
Question 6.
Few candidates recognised this function as one where the numerator was a multiple of the derivative of the denominator. The majority seemed to decide that as a polynomial quotient, it had to be done by partial fractions.
Question 7.
This was not done well. The setters expected that as it was similar in nature to one set recently that it would be much more accessible. Few candidates did (a) by factorisation, rather more tried to prove it by induction but only a few of these succeeded. Part (b) was relatively well done but statements such as 15 is prime did occur.
Question 8.
Most candidates knew roughly what they should be doing. A sizeable minority were unable to solve the auxiliary equation correctly, due to errors in applying the formula. Once the general solution was obtained, many candidates did complete the question correctly.
Question 9.
The early stages in this question were handled well but once the stage where the absence of a unique solution was reached, many gave up. However, some were able to obtain a correct solution.
Question 10.
Few candidates managed to give a complete and correct solution to this question. It was very disappointing to see candidates at this level listing values to establish a maximum. Few realised that the end points might be of relevance.
Question 11.
This was quite a difficult question and the outcomes were pretty well in line with expectations. There were a few, but not many, completely correct solutions.
Question 12.
Over recent years, it has become increasingly difficult to design curve sketching question which are equally testing to those with and those without a graphic calculator. This question seems to have worked well. Candidates who knew the main property of an even function (it's graph is symmetrical in the y-axis) did well and the marks for the asymptotes were often obtained.
Question 13.
Induction is always a challenge. Most candidates launched into this well but ran into problems when they needed to apply the matrix properties, which were given, in a convincing fashion.
Question 14.

Part (a) was set in an attempt to alert candidates to the fact that $x^2 \sin x$ is an odd function which implies that, over an interval symmetric about the origin, the areas above and below the x-axis would have equal magnitude. In the event, many candidates found it to be an unwelcome distraction.
Part (b) was done well.
Part (c) was beyond the capabilities of most candidates. Many attempted to use values such as $\sin \frac{\pi}{4} = 0.7071$ rather than $\frac{1}{\sqrt{2}}$ which lead to much needlessly complicated work and errors.
Question 15.
Most candidates were able to obtain the equation of the plane in the first section.
Most of these were then able to progress easily to the coordinates of Q.
Many then evaluated the distance PQ but few observed that this was the shortest distance because L was perpendicular to the plane.
Question 16.
This question exposed weaknesses in the algebraic skills of many candidates. It is likely that a question of this type which made use of numbers would have been done easily.
There were correct and acceptable answers to parts (a) and (b) but part (c) defeated all but the best.
Question 17.
This was a highly structured question which attempted to lead candidates to part (d). To some extent, it succeeded. Part (a) required no knowledge beyond the Higher syllabus. Part (b) was often tackled successfully. Although, like part (a), part (c) was essentially work from Higher maths, few candidates were able to use the double-angle method to solve this (although a number were able to apply integration by parts in one way or another). However, in part (d), relatively few candidates were able to link the ideas of parts (a), (b) and (c) correctly.

Statistical information: update on Courses

Number of resulted entries in 2005	2,318

Number of resulted entries in 2006	2,598

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	24.1	24.1	627	63
B	17.9	42.0	465	50
C	21.5	63.5	559	37
D	11.3	74.8	293	30
No award	25.2	100.0	654	-

General commentary on passmarks and grade boundaries

- While SQA aims to set examinations and create mark schemes which will allow a competent candidate to score a minimum 50% of the available marks (notional passmark) and a very well-prepared, very competent candidate to score at least 70%, it is almost impossible to get the standard absolutely on target every year, in every subject and level
- Each year we therefore hold a passmark meeting for each subject at each level where we bring together all the information available (statistical and judgmental). 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 senior management team at SQA
- We adjust the passmark downwards if there is evidence that we have set a slightly more demanding exam than usual, allowing the pass rate to be unaffected by this circumstance
- We adjust the passmark upwards if there is evidence that we have set a slightly less demanding exam than usual, allowing the pass rate to be unaffected by this circumstance
- Where the standard appears to be very similar to previous years, we maintain similar grade boundaries
- 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 are different. This is also the case for exams set in centres. And just because SQA has altered a boundary in a particular year in say Higher Chemistry 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
- Our main aim is to be fair to candidates across all subjects and all levels and maintain standards across the years, even as arrangements evolve and change.