SCOTTISH QUALIFICATIONS AUTHORITY

National Qualifications Course Report 2006: Mathematics

Standard Grade, Access 2, Access 3, Intermediate 1, Intermediate 2, Higher, Advanced Higher

Contents

Introduction

The purpose of this Course report is to give centres:

- all information on internal and external assessment for the subject in the one place
- an easier way of making a comparison across levels and years
- support in achieving consistency in national standards across levels for both internal and external assessment

We will provide a link on the SQA website from the contents page of the Course report to individual sections of the report to allow for easier navigation, in addition to having access to the complete report.

We encourage you to provide feedback about the usefulness of the Course report. Please contact Noel Donoghue, Qualifications Manager for NQ Mathematics, with your comments – 0845 213 5508 noel.donoghue@sqa.org.uk

Summary of Findings

General

The examinations were generally well received. Concern was expressed by some centres about the increased demand on candidates by the Advanced Higher paper. At all levels, performance was reported to be broadly similar to that of recent years, with standards generally maintained. The performance of many candidates was focused and robust.

The Principal Assessors recommend that further improvements would result from a better understanding of algebraic manipulation and precision by candidates.

Numbers of candidates increased at Access 3, Intermediate 1, Intermediate 2 and Advanced Higher, and decreased at Standard Grade, Higher and Applied Mathematics Advanced Higher.

Entries and Awards — Standard Grade

Year	Entries
2006	53,776
2005	53,835
2004	56,767

Grade boundaries for each assessable element

Grade Boundaries 2006

Assessable Element	Credit	Grade Boundaries		General	Grade Boundaries		Foundation	Grade Boundaries	
	Max Mark	1	2	Max Mark	3	4	Max Mark	5	6
K & U	45	36	26	40	30	21	40	27	19
R & E	45	29	18	40	31	23	40	25	18

Grade Boundaries 2005

Assessable Element	Credit	Grade Boundaries		General	Grade Boundaries		Foundation	Grade Boundaries	
	Max Mark	1	2	Max Mark	3	4	Max Mark	5	6
K & U	45	33	22	40	29	21	40	27	18
R & E	45	23	14	40	28	19	40	25	17

Grade Boundaries 2004

Assessable Element	Credit	Grade Boundaries		General	Grade Boundaries		Foundation	Grade Boundaries	
	Max Mark	1	2	Max Mark	3	4	Max Mark	5	6
K & U	45	31	20	38	27	20	39	25	17
R & E	45	32	21	42	31	22	41	28	18

Distribution of awards

	Entries	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	No Award
2006	53,776	18.7%	13.3%	22.1%	16.8%	20.1%	7.3%	1.6%	0.1%
2005	53,835	17.4%	14.2%	22.1%	16.4%	19.6%	7.9%	2.3%	0.1%
2004	56,767	18.0%	14.0%	21.4%	16.8%	19.7%	7.9%	2.2%	0.1%

Entries and Awards — National Qualification Clusters

Access 2

	Entries	Awards
2006	445	305
2005	479	375
2004	441	304

Access 3

	Entries	Awards
2006	7,111	5,953
2005	4,838	3,896
2004	3,748	3,021

Entries and Awards — Intermediate 1

Year	Entries
2006	10,284
2005	7,797
2004	6,233

Grade Boundaries

Year	Max Mark	A	B	C	D
2006	80	56	48	40	36
2005	80	57	47	38	33
2004	80	57	47	38	33

Distribution of awards

	Entries	A	B	C	Pass	D	No Award
2006	10,284	30.7%	13.7%	15.8%	60.2%	7.1%	32.8%
2005	7,797	22.9%	16.8%	17.9%	57.6%	8.8%	33.6%
2004	6,233	15.6%	17.6%	19.0%	52.2%	9.8%	38.0%

Entries and Awards — Intermediate 2

Year	Entries
2006	16,695
2005	15,163
2004	13,723

Grade Boundaries

Year	Max Mark	A	B	C	D
2006	80	54	45	36	31
2005	80	56	48	40	36
2004	80	62	52	43	38

Distribution of awards

	Entries	A	B	C	Pass	D	No Award
2006	16,695	23.9%	17.2%	20.0%	61.1%	10.4%	28.5%
2005	15,163	32.1%	16.1%	17.0%	65.1%	6.6%	28.3%
2004	13,723	27.3%	22.1%	18.8%	68.2%	7.9%	23.9%

Entries and Awards — Higher

Year	Entries
2006	18,533
2005	19,173
2004	19,385

Grade Boundaries

Year	Max Mark	A	B	C	D
2006	130	101	83	66	57
2005	130	98	80	63	54
2004	130	102	82	62	52

Distribution of awards

	Entries	A	B	C	Pass	D	No Award
2006	18,533	24.0%	23.2%	21.3%	68.6%	8.7%	22.7%
2005	19,173	22.5%	22.0%	23.3%	67.8%	9.2%	23.0%
2004	19,385	22.8%	20.4%	24.6%	67.8%	9.5%	22.7%

Entries and Awards — Advanced Higher

Year	Entries
2006	2,598
2005	2,318
2004	2,416

Grade Boundaries

Year	Max Mark	A	B	C	D
2006	100	63	50	37	30
2005	100	73	60	47	40
2004	100	75	62	50	44

Distribution of awards

	Entries	A	B	C	Pass	D	No Award
2006	2,598	24.1%	17.9%	21.5%	63.5%	11.3%	25.2%
2005	2,318	23.4%	16.8%	22.7%	62.9%	11.6%	25.5%
2004	2,416	23.2%	21.1%	20.9%	65.2%	8.5%	26.2%

Entries and Awards —Advanced Higher Applied Mathematics

Year	Entries
2006	280
2005	314
2004	234

Grade Boundaries

Year	Max Mark	A	B	C	D
2006	100	69	58	47	41
2005	100	71	60	50	45
2004	100	69	57	45	39

Distribution of awards

	Entries	A	B	C	Pass	D	No Award
2006	280	35.4%	12.9%	17.1%	65.4%	10.4%	24.3%
2005	314	37.3%	18.8%	16.6%	72.6%	6.1%	21.3%
2004	234	33.8%	17.9%	16.2%	67.9%	5.6%	26.5%

Comments on Moderation: Units which make up Courses

Titles/Levels of National Units Moderated:

ACCESS 3 – D559, D560, D561

HIGHER – D321, D322

ADVANCED HIGHER – DE8Y

Feedback to Centres

General comments

- Materials submitted by centres were, in general, in order and well presented.
- Most candidate evidence was of a high standard and marking schemes had been applied correctly for the majority of questions.
- Centres should indicate on Sample Form the NAB/s used.
- A copy of each NAB used for initial and further assessment should be submitted with materials, several centres still failed to comply with this request.
- Some centres had failed to include all candidate evidence with only successful evidence included in submission. Please submit all candidate evidence, including that of failed outcomes, in any future moderation.
- In correcting candidate work we must again stress the importance of showing exactly what marks have been awarded. Please note that a line of ticks is not an acceptable way of correcting candidate evidence. A clear indication of marks awarded at each stage of candidate answer is beneficial to student and essential for both internal and external moderation.
- Each outcome may be marked holistically. It is correct to penalise a candidate only once within an outcome for a specific error, e.g. omitting the constant of integration. However, it is incorrect not to deduct for the same error in another outcome.
- There was some evidence of candidates completing unit assessment without the use of a calculator. Please be advised that calculators should be made available for all pupils completing unit assessments.
- At Access 3, D560, we observed that for outcome 4, Q. 5 some candidates may have had their answers recorded for them on their scripts during this practical exercise. We advise that, while this is in order, it should be recorded.
- At Higher, D322, we observed on 2 occasions that for outcome 3 a candidate had failed this outcome at the first attempt and then awarded a pass for correctly completing the same group of questions. To be acceptable, it is essential in mathematics that any resit uses different assessment questions.

Areas of good practice and areas for further development

- Some centres had provided candidate summary sheets. This was very helpful and recommended as good practice.
- In centres where there was evidence of a rigorous internal moderation system, external moderation was straightforward. This highlights the advantages to all centres of implementing rigorous internal moderation procedures. In some centres there was evidence of obvious differences in interpretation by markers in the application of certain marks. It is imperative that standards are applied to all candidates equally.
- In many centres is would be advisable to involve all involved staff in training for assessment and moderation of candidate evidence as valuable exercise. This would assist in ensuring uniformity of standards within centre.
- A lack of sharpness in marking and differences in interpretation within centres reinforces the recommendation for a robust internal verification to be prioritized and put in place by centres with the following particular recommendation-
    - Internal moderation evidence should be recorded on candidate script.

- **At Higher, D321, it should be noted that differences in marks awarded for Q.7 were observed. This difficulty, to some extent, has arisen because only NAB001 has omitted to include y = in the question. This will be addressed in a new version of the NAB and centres are asked to ensure that no candidate is disadvantaged. It is also worth noting that in responding to this question candidates should be instructed to ensure that the 10 clearly appears as a subscript.**

Course Assessment: Standard Grade

In Standard Grade Mathematics, the Course assessment consists of 2 Question Papers.

Feedback to centres on candidate performance

General comments

Foundation:
Examiners and markers perceived this paper to be accessible to Foundation candidates. The paper covered a wide range of familiar topics and candidates' responses were judged as 'good' to 'very good' by markers.
Candidates continue to show working, thus accessing partial marks when responses are not fully correct. KU questions continue to perform slightly better than RE but most candidates attempted every question.
Paper 1 was seen as a very good start to the examination, enabling candidates to go into Paper 2 with perhaps increased confidence.
There was an increase in the percentage of candidates gaining Grade 5 and a reduction in the percentage gaining Grade 7.

General:
Again the standard of responses ranged from 'good' to 'very good'.
Ongoing efforts to ensure questions are set in current contexts allowed candidates to display both their KU and RE skills. The KU element was slightly improved on 2005 whilst the RE remained consistent with last year.
Some markers noted a reduction in the number of extremely poor responses.
There was an increase in the percentage of successful candidates at both Grades 3 and 4.

Credit:
Examiners and markers found there were more 'appropriately prepared' Credit candidates who were able to engage with the questions, thus accessing more partial marks throughout the paper.
This resulted in a higher percentage of the cohort achieving a Credit award this year than during any of the previous four years. Further, the percentage of Grade 1 candidates increased with a slight reduction in the percentage of Grade 2 candidates.
There were improvements in both the KU and RE elements.

Areas in which candidates performed well

Foundation:
Paper 1 was particularly well done with all questions proving accessible.
Questions 1,2,5 and 7 were extremely well done
In Paper 2, questions 1,2,6(b), 8,9 and 11were well done.

General:
In Paper 1, questions 1(d), 4, 6 and 8 were very well done.
In Paper 2, questions 1, 2, 3, 5 and 10(a) were well done. Questions 6(b) and 7 were fairly well done.
Money and statistics questions continue to score highly.

Credit:
In Paper1, questions 1, 2, 3, 4, 8 and 9 were well done.
In Paper 2, questions 1, 2, 5 and 9(a) were well done.

Areas which candidates found demanding

Foundation
Paper 1:
Question 6(a) – counting the number of days between two dates – was not well done. Less able candidates who tallied the days were most successful here.
Paper 2:
Question 7 and question 13(b) - area of a triangle and perimeter of a rectangle – highlighted confusion over the meaning of area and perimeter.
Question 14 – volume – lack of understanding of the concept of volume was evident here.

General
Paper 1:
Questions 5 and 9 – gradient and properties of circles and triangles – were most challenging.
Paper 2:
Question 9(a) – area of a quarter circle – problems included lack of understanding that given measurement was the radius and forgetting to divide calculated area by four.
Question 11 – plotting two bearings – indicated a lack of understanding of the concept together with ineffective use of a protractor.
Question 12 – insurance – some candidates found the processing of two different types of mathematical calculations (fraction and percentage) within one question to be challenging.

Credit
Paper 1:
Question 7 – volume through similarity – exposed a lack of knowledge of this concept.
Paper 2:
Question 3 – ‘reverse’ percentage – is a basic Credit question which often appears in the paper, yet too many Credit candidates lack understanding of percentage work at Credit and do a (wrong) percentage calculation followed by a subtraction.
Question 7 – volume – led to confusion over units when calculating area or volume and unsuccessful attempts to do conversion of units.
Question 10(b) – trigonometric equation – indicated that many candidates had insufficient practice in this topic.
Question 11(b) – mathematical proof – continues to be one of the more challenging questions.

Advice to centres for preparation of future candidates

Centres should firstly be commended for the presentation of an increased percentage of successful candidates at the upper grade in each level. Non calculator skills are evidently well practised in schools and continuing attention to this area of the course is necessary.

At Foundation level, area, perimeter and volume need to be not simply revisited but perhaps re-taught to support candidates in fully understanding these concepts. Many candidates can do the ‘process’ of an area or perimeter question but are less sure on which process should be applied. Further work on time duration is required.

At General level, work on triangle and circle properties is required
Further to the comments on the bearings question, time spent on the more practical areas of the General course would be beneficial.

The continuing problem of, albeit a small number of candidates, being disadvantaged by lack of access to calculators in Paper 2 (at Foundation and General levels) should be addressed by centres.

At Credit level, similar shapes, reverse percentage work, quadratic equations, trigonometric equations and mathematical proofs require further work. Candidates should be encouraged to employ standard mathematical methods when solving quadratic or trigonometric equations. A minority of candidates who resort to trial and improvement rarely achieve a full solution and clearly do not have the skills required for their ongoing mathematical studies.

Course Assessment: Intermediate 1

In Intermediate 1 Mathematics, the Course assessment consists of 2 Question Papers.

Feedback to centres on candidate performance

General Comments

Mean marks (out of 80)

	2005	2006
Mathematics 1, 2 and 3	43.1	46.0
Mathematics 1, 2 and Applications	33.7	38.2

80% of candidates sat Mathematics 1, 2 and 3.
20% of candidates sat Mathematics 1, 2 and Applications.

Percentage of Candidates by Stage

Year	Entries	S2	S3	S4	S5	S6	Other
2005	7885	0.0%	13.6%	27.2%	52.0%	4.2%	3.0%
2006	10290	2.4%	22.2%	30.1%	39.2%	3.4%	2.7%

Candidates below S4 stage performed significantly better than other candidates.

[Statistics quoted are those at Passmark stage.]

Areas in which candidates performed well

Mathematics 1, 2 and 3
Paper 2 – Questions 4, 5(a) and 8(b).

Mathematics 1, 2 and Applications
Paper 1 – Questions 6(a) and 7(a).
Paper 2 – Questions 4, 5(a) and 7(b).

Areas which candidates found demanding

<u>Mathematics 1, 2 and 3 Paper 1</u>

1. Disappointing number of candidates could not calculate 5.42 − 1.8.
   5.42 − 1.08 = 4.34 was a common answer.

2. Most candidates gained the first mark but few were able to multiply 11 × 12 correctly.

3. Most candidates gained the first two marks but very few could then convert 250 seconds to 4 minutes 10 seconds.

4. Disappointing number of candidates seemed to think that USA was in Europe.

5. Disappointing number of candidates could not divide by 9 correctly.

7. Many candidates were unable to complete the table in part (a) correctly.
   A significant number of candidates drew a straight line in part (b) then seemed to go back to fill the corresponding values into the table in part (a) to fit their line.

9. Many candidates had problems dealing with the square root sign.
   Some calculated √36 incorrectly, others stopped after getting to 36.

10. Very few candidates experimented in part (c).
    Most seemed content to settle for the first answer that they wrote down.

<u>Questions appearing only in Mathematics 1, 2 and Applications Paper 1</u>

7. Many candidates gave an answer of £43.07 + £18.94 = £60.21 for part (b) and then went on to get either the correct answer or £90.22 for part (c).

9. Many candidates did not use the correct formula despite it being given in the formula list.

<u>Mathematics 1, 2 and 3 Paper 2</u>

1. Many candidates were unable to round to the nearest ten correctly.

5(c). Although more candidates were able to do this question correctly than in previous years, most still did not know how to calculate the mean from a frequency table.
Most candidates were able to complete the table correctly but then stopped or continued incorrectly. A significant number proceeded to calculate 652÷7 or 119÷7.

6. Many candidates did not convert 1.2 metres into centimetres.

$50 \times 1.2 \times 40 = 2400 = 2.4$ was a common answer.

7(a). Most candidates expanded the brackets but few were able to gather the like terms correctly. $3y + 2x - 8y = 2x + 11y$ was a common answer.

8(c). Many candidates understood the significance of the median but hardly any were able to interpret the meaning of the range.

11. Many candidates were able to calculate the annual interest but then simply multiplied by 8.

12. A significant number of candidates interpreted the base of the triangle as 20 but were able to gain the remaining available marks.
Many candidates interpreted the triangle correctly but did not know how to proceed from there.

13. Few candidates scored full marks. A wide variety of incorrect methods were used.

14. A variety of incorrect methods were used. These included using $\frac{1}{2}\pi r^2$ with the wrong radius, πr^2, πd or $\frac{1}{2}\pi d$ for the area of the semi-circle.

Questions appearing only in Mathematics 1, 2 and Applications Paper 2

2(a). Few candidates scored more than 1 mark for this question.

11(b). This question was done poorly. Most candidates worked out the correct discount but did not proceed correctly thereafter.

Advice to centres for preparation of future candidates

Centres should consider how best to maintain and practise number skills and mental strategies in preparation for the non-calculator paper in the external examination.

Centres should continue to consider how best to maintain and practise knowledge acquired at earlier stages in the course on a regular basis in an attempt to improve retention.

Centre should consider how best to practise interpreting calculated statistics.

Course Assessment: Intermediate 2

In Intermediate 2 Mathematics, the Course assessment consists of 2 Question Papers.

Feedback to centres on candidate performance

General comments

Feedback confirmed that the paper reflected the curriculum and was accessible to the vast majority of candidates.

There seemed to be few very poor candidates which suggests that candidates are being presented at the appropriate level.

S4 candidates seemed to perform better than S5/6 candidates.

Candidates sitting Units 1,2 and Applications continue to do less well than those candidates sitting Units 1, 2 and 3.

Areas in which candidates performed well

<u>Paper 1:</u>

Q3 (Units 1, 2, 3) and Q4 (Applications):	Dot plot, quartiles, probability.
Q7 (Units 1, 2, 3):	Parabola

<u>Paper 2:</u>

Q1 (both papers):	Percentages
Q2 (both papers):	Simultaneous equations
Q3 (Units 1, 2, 3) and Q8 (Applications):	Volume
Q5 (a) (both papers):	Mean and standard deviation
Q8 (b) (Units 1, 2, 3) and Q12 (b) (Apps):	Length of arc
Q4 (b) (Applications):	Calculating cell in spreadsheet

Areas which candidates found demanding

Paper 1

Q4 (Units 1, 2, 3) and Q7 (Applications):	Many substituted 2/3 for angle B instead of sin B.
Q5 (Units 1, 2, 3) and Q8 (Applications):	In part (a) – find gradient – candidates used a variety of methods but, generally, were unsuccessful.
Q6 (Units 1, 2, 3) and Q9 (Applications):	Many thought the value of sine was proportional to the size of the angle.
Q8 (Units 1, 2, 3):	A common wrong answer here was 1.
Q9 (Units 1, 2, 3):	Most tried to work out 16 x ¾ instead of $16^{3/4}$

Paper 2

Q5(b) (both papers):	Most candidates did not seem to realise that a reason in this situation should contain an **explicit** comparison between the candidate's results and the data in the condition. For example, a correct response could be "Yes, because the mean is 20.5 which is between 19.4 and 20.6 **and** the standard deviation is 1.52 which is less than 2."
Q7 (Units 1, 2, 3):	Addition of fractions continues to confuse many candidates.
Q8 (Units 1, 2, 3) and Q12 (Applications):	In part (a) many failed to identify the right-angled triangle correctly.
Q9 (Units 1, 2, 3):	Candidates tended to omit the brackets in the final line and so lost the second mark. They wrote $x = b - a \times c$ instead of $x = (b - a) \times c$.
Q11 (Units 1, 2, 3):	In part (a) many candidates failed to realise what was expected and instead tried to solve the equation – thus answering part (b).
Q4 (Applications):	Candidates fail to appreciate that there is a standard way of writing formulae for spreadsheets, i.e. must start with =, use * instead of ×, etc.
Q9 (Applications):	Some still having problems with the third tier of tax but also, more worryingly, a significant number of

	candidates did not know how many weeks are in a year.
Q11 (Applications):	Most candidates identified the correct amount from the table but were unsure what to do with it.

Advice to centres for preparation of future candidates

Hopefully the details above will help teachers and candidates identify possible areas for reinforcement.

More generally:

Candidates should be discouraged from using Trial and Improvement as a strategy at this level and encouraged to focus on more efficient methods.

Centres should continue to remind candidates that when rounding is explicitly required, it is good practice to record their unrounded answer also and to round to the required accuracy at the **end** of the problem.

Course Assessment: Higher

In Higher Mathematics, the Course assessment consists of 2 Question Papers.

Feedback to centres on candidate performance

General comments

Overall candidates scored well in this examination with about half of the candidates scoring between 50% and 75%.
Work was presented in a neat and orderly fashion and candidates appeared to have benefited from the realigned difficulty gradient.
Some candidates still fold the page in half and work in both columns. This is to be avoided, as is also the use of coloured pens and highlighters.

Areas in which candidates performed well

In Paper 1: straight line (1/1), circle (1/2), composition of functions (1/3) and stationary point requirements (1/5) continue to be done well. Improvements were noted in area under the curve (1/6) and there were good responses to the question (1/9) combining vectors and polynomials.

In Paper 2: there were good responses to the parabola question (2/2), related graphs (2/7) and the use of the chain rule (2/9). There was a noted improvement in the requirements for a proof at the beginning of 2/12.

Areas which candidates found demanding

In 1/3 failure to simplify the expressions from (a) led to some awkward algebra and failure to interpret the expression $16x^2 - 9$ was fairly common.
In 1/4 about half the candidates did not know the required condition and the arithmetic in (b) left a lot to be desired.
In 1/5 it was not uncommon to see $10(2x - 1)^4 = 0$ expanded (wrongly) and then attempts made to factorise.
In 1/7 many candidates failed to take out the common factor and followed this with only one solution so losing most of the marks.
In 1/8 many candidates failed to get past a factor of 2 appearing outside the bracket.

There were few correct solution to 1/10. Most candidates who attempted this question tried to equate $y = 3$ rather than $\log_4 y = 3$ which would give $y = 4^3 = 64$. Hence $64 = a^6$ giving $a = 2$.

In 2/2 the most common error was the failure to take out a common factor (of k).
In 2/4 careless application of the formula for the radius of a circle led to an unnecessary loss of marks given that this formula is quoted at the beginning of the examination paper.
In 2/5 most candidates knew to integrate but the inclusion of a constant and the subsequent evaluation was not common.
In 2/6(c) the term unit vector seemed to be unknown by all but a small number of candidates.
In 2/8 the inability to use Pythagoras correctly was disturbing, leading in many cases to a great loss of marks as many of the ratios turned out to be greater than 1. It was disappointing to see so many wrong expansions for the double angles, the formulae for which are given at the front of the examination paper.
In 2/10 it was disappointing to see to slippage in the requirements for (a). The published marking schemes are quite clear about the necessary working that is to be shown. There is a tendency to work in degrees, whatever units the question is given in. Many candidates seem to unaware of the issues of differentiating a trigonometric function expressed in degrees.
2/11 was poorly attempted with most candidates unable to translate the question into $0.88A_0 = A_0 e^{-0.000124t}$. If this was achieved then the question was generally completed correctly.
2/12 was quite well done except for the final part which required candidates to consider the end points.

Advice to centres for preparation of future candidates

Apart from the details shown in the previous section, some emphasis should be made on the formulae which are quoted at the front of the examination paper, in particular the formulae for the trigonometric expansions and the double angle formulae. It is difficult to accord much credit to a piece of work which starts off by an erroneous rule (e.g. "$\sin 2a = 2\sin a$").
Similarly, the above comments apply to using the formulae for circle calculations.
Whilst factorising a complete quadratic was competently handled, many candidates had forgotten how and when to take out a common factor. This technique should be revised at all appropriate stages.
For candidates who find "completing the square" difficult, some consideration should be given to the method of expanding (e.g. $a(x+b)^2 + c = ax^2 + 2abx + ab^2 + c$) and comparing coefficients.

Course Assessment: Advanced Higher

In Advanced Higher Mathematics, the Course assessment consists of 1 Question Paper.

Feedback to centres 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.

Course Assessment: Advanced Higher Applied Mathematics

In Advanced Higher Applied Mathematics, the Course assessment consists of 1 Question Paper.

Feedback to centres on candidate performance

General comments

In 2005, there were 314 candidates, this number fell to 280 in 2006. This is disappointing but is still 50 more than there were in 2004.
The breakdown across the three options was:

Statistics	145 (165 in 2005)
Mechanics	134 (138 in 2005)
Num. Anal.	1 (same as in 2005)

Taken overall, the performance was slightly poorer than in 2005 with the mean mark down by approximately 5%. There were fewer very high scorers. The figures below lend support to the conjecture that candidates (especially those doing the Statistics paper) found Section B (Maths) harder than in 2005.

Option	No. of candidates	Section A average	Section B average	Overall average
Mechanics	134	41.46	18.10	59.56%
Statistics	145	36.82	13.23	50.05%

Analysis of this data indicates that the Statistics candidates performed less well than the Mechanics candidates. (Note that the total marks available for Sections A and B were 68 and 32 respectively.)

In 2005, 50 centres presented candidates for Applied Mathematics. 16 of them did not present in 2006 but 8 centres (who had not presented in 2005 but might have done so in earlier years) had candidates.
[Statistics quoted are those at Passmark stage.]

Areas which candidates found demanding

As remarked above, the performance in Section B was poorer than in Section A. There is an argument that candidates taking the Mechanics paper are more likely to be using items covered in the Section B part of the course than those choosing the Statistics paper which makes no use of the mathematics part of their course.

Advice to centres for preparation of future candidates

It should be emphasised to candidates that they should pay greater attention to the material in Section B.