



# **National Qualifications**

## **Course Report 2008: Mathematics**

**Standard Grade**

**Access 2 and Access 3**

**Intermediate 1**

**Intermediate 2**

**Higher**

**Advanced Higher**

**Advanced Higher Applied Mathematics**



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# 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 Elaine Riley, Qualifications Manager for NQ Mathematics, with your comments – 0845 213 5508 <mailto:elaine.riley@sqa.org.uk>

# Summary of Findings

## General

The examinations were generally well received and considered to have provided a good coverage of the syllabus. Stakeholder feedback indicated that most papers were considered to be fair and acceptable and at an appropriate level of difficulty. Where questions proved to be more demanding than anticipated, this was taken into account when setting the Grade Boundaries.

Performance was reported to be broadly similar to recent years. Pass rates increased at almost all levels, with the biggest increase at Advanced Higher.

The Principal Assessors reported that candidates were being presented at an appropriate level and had been well prepared for the examinations. In most cases, working was well laid out; it was noted that, in these cases, this helped the candidates to avoid losing marks through careless mistakes. It was recommended that centres allow adequate time for practice and consolidation of topics from the early part of the courses and topics which are regularly tested in the examination. Centres are also encouraged to continue efforts to improve candidates' abilities in interpreting statistics and in problem solving. There was an increase in the number of candidates at all levels apart from Access 2 and Standard Grade, which both showed a decrease of around 6%.

# Entries and Awards

## Entries and Awards — Standard Grade Mathematics

Year	Entries
2008	50,974
2007	53,973
2006	53,776

### Grade boundaries for each assessable element

#### Grade Boundaries 2008

Assessable Element	Credit Max Mark	Grade Boundaries		General Max Mark	Grade Boundaries		Foundation Max Mark	Grade Boundaries	
		1	2		3	4		5	6
K & U	45	30	21	40	30	21	40	27	19
R & E	45	29	17	40	27	19	40	26	18

#### Grade Boundaries 2007

Assessable Element	Credit Max Mark	Grade Boundaries		General Max Mark	Grade Boundaries		Foundation Max Mark	Grade Boundaries	
		1	2		3	4		5	6
K & U	45	35	23	40	28	18	40	27	19
R & E	45	27	17	40	27	19	40	26	18

#### Grade Boundaries 2006

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

### Distribution of awards

	Entries	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	No Award
2008	50,974	16.6%	14.1%	24.6%	17.5%	20.0%	5.8%	1.2%	0.1%
2007	53,973	17.1%	12.4%	21.1%	16.3%	22.5%	8.0%	2.5%	0.1%
2006	53,776	18.7%	13.3%	22.1%	16.8%	20.1%	7.3%	1.6%	0.1%

## Entries and Awards — National Qualification Courses

### Access 2

	Entries	Awards
2008	477	328
2007	509	393
2006	445	305

### Access 3

	Entries	Awards
2008	10,296	9,639
2007	10,791	9,801
2006	7,111	5,953

## Entries and Awards — Intermediate 1 Mathematics

<b>Year</b>	<b>Entries</b>
<b>2008</b>	12,633
<b>2007</b>	11,434
<b>2006</b>	10,284

### Grade Boundaries

<b>Year</b>	<b>Max Mark</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>2008</b>	80	55	47	39	35
<b>2007</b>	80	56	48	40	36
<b>2006</b>	80	56	48	40	36

### Distribution of awards

	<b>Entries</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>Pass</b>	<b>D</b>	<b>No Award</b>
<b>2008</b>	12,633	23.7%	16.6%	17.5%	57.7%	7.5%	34.8%
<b>2007</b>	11,434	24.7%	16.7%	16.9%	58.3%	7.2%	34.5%
<b>2006</b>	10,284	30.7%	13.7%	15.8%	60.2%	7.1%	32.8%

## Entries and Awards — Intermediate 2 Mathematics

Year	Entries
2008	19,474
2007	18,987
2006	16,695

### Grade Boundaries

Year	Max Mark	A	B	C	D
2008	80	56	48	40	36
2007	80	56	48	40	36
2006	80	54	45	36	31

### Distribution of awards

	Entries	A	B	C	Pass	D	No Award
2008	19,474	39.2%	17.9%	14.8%	72.0%	6.1%	21.9%
2007	18,987	32.9%	18.4%	16.9%	68.2%	6.8%	25.0%
2006	16,695	23.9%	17.2%	20.0%	61.1%	10.4%	28.5%

## Entries and Awards — Higher

<b>Year</b>	<b>Entries</b>
<b>2008</b>	19,633
<b>2007</b>	18,786
<b>2006</b>	18,533

### Grade Boundaries

<b>Year</b>	<b>Max Mark</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
2008	130	101	84	67	58
2007	130	101	83	65	56
2006	130	101	83	66	57

### Distribution of awards

	<b>Entries</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>Pass</b>	<b>D</b>	<b>No Award</b>
2008	19,633	23.9%	24.2%	23.6%	71.6%	9.5%	18.8%
2007	18,786	24.0%	23.4%	22.7%	70.0%	8.9%	21.1%
2006	18,533	24.0%	23.2%	21.3%	68.6%	8.7%	22.7%

## Entries and Awards — Advanced Higher Mathematics

<b>Year</b>	<b>Entries</b>
<b>2008</b>	2,752
<b>2007</b>	2,484
<b>2006</b>	2,598

### Grade Boundaries

<b>Year</b>	<b>Max Mark</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>2008</b>	100	72	59	47	41
<b>2007</b>	100	68	55	42	35
<b>2006</b>	100	63	50	37	30

### Distribution of awards

	<b>Entries</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>Pass</b>	<b>D</b>	<b>No Award</b>
<b>2008</b>	2,752	23.3%	24.3%	21.4%	69.0%	8.5%	22.5%
<b>2007</b>	2,484	22.2%	20.2%	22.7%	65.1%	12.6%	22.3%
<b>2006</b>	2,598	24.1%	17.9%	21.5%	63.5%	11.3%	25.2%

## Entries and Awards —Advanced Higher Applied Mathematics

<b>Year</b>	<b>Entries</b>
<b>2008</b>	305
<b>2007</b>	285
<b>2006</b>	280

### Grade Boundaries

<b>Year</b>	<b>Max Mark</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>2008</b>	100	72	60	49	43
<b>2007</b>	100	73	60	48	42
<b>2006</b>	100	69	58	47	41

### Distribution of awards

	<b>Entries</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>Pass</b>	<b>D</b>	<b>No Award</b>
<b>2008</b>	305	36.7%	17.7%	21.0%	75.4%	9.5%	15.1%
<b>2007</b>	285	40.7%	16.1%	13.7%	70.5%	5.3%	24.2%
<b>2006</b>	280	35.4%	12.9%	17.1%	65.4%	10.4%	24.3%

# Comments on Verification: Units which make up Courses

## Titles/Levels of National Units Verified

D323 Mathematics 3 (Intermediate 1 – Advanced Higher)	(Central September 2007)
D561 Using Mathematics 3 (Access 3)	(Central September 2007)
D322 Mathematics 2 (Intermediate 1 – Advanced Higher)	(Central April 2008)

## Feedback to Centres

### General comments

- ◆ Materials submitted by centres were generally in order and well presented.
- ◆ Centres should indicate on the Sample Form the NAB(s) used.
- ◆ Centres, in the main, correctly applied the rules for substitution where candidate evidence was not available.

### Areas of good practice and areas for further development

The following specific notes are offered as advice and reminders to centres.

#### 1 Instruments of Assessment

Centres using NAB assessment materials should ensure that they are using the most current version of the NAB. They are also reminded that the recommended time for undertaking a NAB assessment is 45 minutes.

If a centre wishes to use any other assessment instrument, they must ensure that it meets all performance criteria listed within the Unit descriptor. It is advised that centres planning to use a non NAB assessment should seek prior moderation of their instrument of assessment before using it.

#### 2 Special Arrangements

Any candidate who receives special assessment arrangements in SQA examinations should also receive the same level of support in Unit Assessments. Any special arrangements that have been put in place, e.g. reader and scribe, should be clearly indicated on the candidate's script.

### 3 Marking

#### Marking Instructions

Centres should apply the marking scheme, supplied with the NAB assessment materials, and note that follow through marking is usually available to candidates subsequent to an error that does not substantially ease the remainder of the working or leads the candidate down the wrong solution path.

All working should be checked as there were instances where candidates had obtained the correct answer, from erroneous working, and had wrongly been awarded full marks for the question.

#### Marking Candidates' Work

A clear indication of what marks have been awarded and where marks have been deducted, due to an error, helps all the stages of the assessment process; from feedback to pupils to external verification. The following is offered as general advice to all markers:

- ◆ Where a mark is awarded indicate this on the candidate's script with a tick (✓)
- ◆ Where a mark has been lost, due to an error, underline this error and mark it with a cross (x)
- ◆ Where follow through marks have been awarded as a result of an error these should be marked with a cross tick (✓)

Within an outcome, a repeated error would not normally be penalised twice, however, the same 'error' in another outcome, within the same assessment, should be penalised again.

An error subsequent to a correct answer would not normally be penalised. The marking scheme clearly indicates what each mark is being awarded for. If there is clear evidence for the mark to be awarded then it must be awarded.

The mark awarded for each question and/or part of a question should be clearly indicated on candidates' scripts.

### 4 Internal Verification Process

In centres where there was clear evidence of a robust internal verification system, the external verification process was straightforward. Centres are advised that such a system inevitably picks up the concerns which have been raised throughout this report as well as helping standardisation procedures within centres.

### 5 Holistic approach to Unit Assessment

With the exception of Access 3 Mathematics, all candidates should attempt all outcomes within a Unit Assessment at a single sitting. Each outcome in the unit assessment has its own threshold of attainment and candidates who fail to achieve the threshold(s) of attainment need only be retested on the outcome(s) where the outcome threshold score has not been attained.

### 6 Resits

Centres are reminded that candidates should normally have one resit within any particular Unit, with a second resit available where there are exceptional circumstances.

## **7 External Verification**

The instrument of assessment and marking scheme should accompany candidate evidence. This should match the information intimated on the Verification Sample Form, completed by centres.

It also helps the verification process progress smoothly when centres provide a table of results, indicating NABs used, marks obtained and pass/fail decision for those candidates being sampled.

## **8 Intermediate 1**

The NAB assessment at this level is supplied as a write-on assessment, mainly due to the number of diagrams and graphs used. Candidates should be allowed to write their answers on these assessments and not be given blank paper to write down their answers.

## **9 Advice**

Centres are reminded that they can seek advice, via their SQA coordinator, should they have any specific concerns or issues with Unit Assessments in Mathematics.

# 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

This paper was perceived as accessible to the majority of candidates, with responses in both KU and RE judged by markers and examiners as ranging from 'good' to 'excellent'.

Paper 1 was particularly well done. Candidates continue to show working in both papers and there was also evidence of an improvement in communication.

There was an increase in the percentage of the cohort gaining a 5 or a 6, alongside a reduction in the percentage gaining a 7. Candidates were clearly well prepared.

#### General

This paper was well balanced and accessible. Questions were posed in clear, straightforward language appropriate for General candidates. Candidates were well prepared in the more mathematical questions covering Pythagoras' theorem and trigonometry. Performance was of a slightly increased standard to the previous year although a few areas, indicated below, do require some attention.

#### Credit

Both papers provided a good coverage of the GRC. There was an improvement in the responses in RE. It was felt that certain parts of Paper 1 proved challenging to candidates.

A number of candidates presented at Credit had limited knowledge of Algebra, Quadratics and Indices.

## Areas in which candidates performed well

#### Foundation

Paper 1, covering a variety of knowledge and skills, was extremely well done with the following worthy of special mention.

Question 1- Very good on basic numeracy.

Question 2- Extracting and communicating information from a table.

Question 4- Excellent responses for symmetry.

Question 5- Word shown in Braille.

Question 6- Use of a protractor.

Question 8(a)- Number machine.

The following were the most successful in Paper 2.

Question 4- Money calculations together with a reasoning task.

Question 6- Bank interest which has not always been very well attempted.

Question 10- A time problem. This topic was well done in the context of a school day.

Question 13- Extracting and using information from a graph.

## **General**

In Paper 1,

Question 1 (b), (d)- Decimal multiplication and fraction calculation.

Question 2- Choosing and using a percentage.

Question 5(a)- Four digit code.

Question 7- Extracting information from a table.

Question 8(a)- Probability.

In Paper 2,

Question 1- Calculation of pay.

Question 2- This was well done apart from the final time conversion to hours and minutes.

Question 5- Very good recognition and calculation of a Pythagoras calculation within an RE context.

Question 7- High degree of accuracy in the scale drawing.

Question 10- Completion of frequency table was excellent.

Question 12- Trigonometry question was very well done.

## **Credit**

In Paper 1,

Question 1- Decimal calculation was very well done.

Question 3- Change of subject of formula.

Question 4- Determining the equation of a line.

Question 7(a), (b) Arithmetic and algebraic mean calculations.

Question 10(b) - Substitution into an equation.

Question 13- Good attempts to find an equivalent fraction using a variety of methods.

In Paper 2,

Question 1- Appreciation continues to be well understood.

Question 2- Statistics.

Question 3- Reverse percentage was well done.

Question 6- Variation.

Question 7- Use of the cosine rule has been well practised.

Question 8(a)- Area of a triangle.

Question 10- Constructing a formula.

## Areas which candidates found demanding

### Foundation

In Paper 1,

Question 9- As in previous years, counting the number of days between two dates was not well done.

In Paper 2,

Question 2- There was confusion over 'tally' and 'frequency'. Mistakes included

- ◆ Frequency given in tally column and 'fx' in frequency column.
- ◆ Tallies correct but 'fx' in frequency column.

Questions 5,8,12- Ongoing confusion over volume, area and perimeter.

Question 10(a)- A significant number of candidates omitted pm from the 12 hour time answer.

Question 14- Lack of knowledge of the number of grams in a kilogram.

### General

In Paper 1,

Question 1(a)- Many candidates started with  $3.18 + 4.59$ , believing they were required to add before subtracting.

Question 5(b)- Many candidates did not know prime numbers. 1 was frequently stated as prime.

Question 6- Not enough care taken in this one. Instead of addition to make -10, numbers were subtracted to make +10 or -10, or added to make +10.

In Paper 2,

Question 6- This exposed a lack of knowledge of calculation of a percentage profit. A minority found the profit but could not proceed any further.

Question 10- Calculation of the mean from a frequency table was not well done, despite the total frequency being given in the table.

### Credit

In Paper 1,

Question 5- Simplification of algebraic fractions continues to prove challenging to many candidates, compounding the observed difficulties when working in arithmetical fractions.

Question 8- As in the 2007 paper, too many candidates do not recognise that the factorised expression can quickly lead them to finding the roots of a quadratic equation. Candidates were multiplying out brackets, trying to refactorise and errors were made along the way. Candidates should be more aware of the reason for factorisation as well as learning how to factorise.

Question 9- Indices work was very poor.

Question 10(a)- Again, a lack of understanding of indices.

Question 12- A wide variety of responses for the expansion of  $(x-a)^2$  leading to difficulties in equating coefficients.

In Paper 2,

Question 4- There was recognition of simultaneous equations but a lack of care in ensuring units were consistent, leading to difficulties in the solution. Other candidates formed 2 inconsistent equations-

$x + y = 60$  and  $x + y = 17.40$  - thus losing the final 3 marks.

Question 11(c)- More practice is required to enable candidates to solve- algebraically- a quadratic equation.

Question 12- Too many candidates unfamiliar with the strategy required for finding the coordinates of intersection of a line and a trig. graph.

## **Advice to centres for preparation of future candidates**

Foundation candidates were well prepared and the majority were able to show their knowledge under examination conditions. Both the understanding of topics and the communication of working have improved and their teachers should be congratulated for this.

Time, area, volume and perimeter continue to cause difficulties. The last three topics could perhaps be taught in isolation from each other as candidates are competent in the calculations but show lack of understanding in the definitions of area, volume and perimeter.

Further, each candidate should have access to necessary equipment-calculator, protractor and ruler- to support them in maximizing their scores in the final examination.

At General level, congratulations to centres for good preparations. Money and number questions remain well done and the improved responses in Pythagoras and trigonometry questions are encouraging.

A better understanding of order of operations is required together with a clearer explanation of the standard bomdas/bodmas acronyms. Percentage profit or loss will require to be revisited. Time is also required for the calculation of the mean from a frequency table, a straightforward task which should be achievable at General level.

At Credit level, much good work is in evidence. Number, statistics, equation of a line and trigonometry were very well done by many of the cohort.

Further work is required on algebra, quadratics and indices. Many candidates displayed a superficial understanding of these topics which are fundamental to their further mathematical studies.

Perhaps the timing of the teaching of these topics could be reviewed to allow candidates more opportunity for revision and consolidation.

# Course Assessment: Intermediate 1

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

## Feedback to centres on candidate performance

### General Comments

The paper was considered to have provided a good coverage of the syllabus at an appropriate level of difficulty.

Approximately one in seven entries were for Mathematics 1, 2 and Applications.

The mean mark for Mathematics 1, 2 and 3 candidates dropped slightly from last year.  
The mean mark for Mathematics 1, 2 and Applications candidates rose slightly from last year.  
The mean mark for candidates doing Mathematics 1,2 and 3 continued to be higher than for those doing Mathematics 1,2 and Applications, although the gap has closed since last year.

### Areas in which candidates performed well

#### Mathematics 1, 2 and 3 and Mathematics 1, 2 and Applications

Paper 1 – Qu.1 (basic calculations) – good for the majority but basic numeracy is still a problem for a number of candidates.

Qu.2 (time interval)

Qu.4 (income)

Qu.5a (probability)

Paper 2 – Qu.1 (coordinates)

Qu.2a (car insurance)

Qu.4ab (median & range)

Qu.9 (foreign exchange) – although a surprisingly large number of candidates changed the total price for the tickets from 255 euros to 225 euros during their working.

## Areas which candidates found demanding

### Mathematics 1, 2 and 3 Paper 1

Qu.5b (mean from a frequency table) – As in previous years few candidates knew how to calculate the mean from a frequency table. Most candidates completed the table correctly but then did no more or continued incorrectly.

A significant number proceeded to calculate  $147 \div 6$ ,  $147 \div 5$ ,  $70 \div 6$  or  $70 \div 5$ .

Qu.6 (listing) – This question proved to be more demanding than in previous years. Few candidates scored 3 marks but nearly all scored 1 or 2 marks.

Qu.8 (straight line) – Many candidates were unable to complete the table in part (a) correctly. Few candidates drew the line  $y=3$  correctly; many did not attempt this part of the question; a significant number drew the line  $y=3x$ .

Qu.9 (evaluate expression involving negative numbers) – Many candidates were unable to find  $(-8)^2$  and then carry out a subtraction involving negative numbers.  $(-8)^2 = -64$  or  $\pm 16$  were common errors.

Qu.10 (simple interest for 3 months) - Most candidates scored 2/4. Many were able to find the annual interest but were unable to proceed correctly from there.  $72 \times 3 = 216$  and  $72 \div 3 = 24$  were common answers. Some knew the correct method but were unable to carry out the calculations correctly. A number of candidates believe that  $(72 \div 10) \div 2$  is equivalent to  $72 \div 12$ .

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

Qu.3b (spreadsheet) – Most candidates were unable to give an appropriate formula for finding the average.

Qu.8 (scale drawing) – Most candidates calculated the correct distance but few found the correct bearing.

### Mathematics 1,2 and 3 Paper 2

Qu.2b (car insurance) – Nearly all candidates calculated the correct discount but most did not realise that they had to subtract the discount from the basic premium.

Qu.3a (multiply out brackets and simplify) – Most candidates multiplied out the brackets correctly but many were unable to collect the like terms correctly.  $20u - 8 + 15 = 20u - 23$  was a common answer.

Qu.4c (interpret median & range) – Some candidates interpreted the median correctly but hardly any interpreted the range correctly.

Qu.5 (distance, speed, time problem) – Many candidates had difficulty correctly interpreting the information given in this question but nearly all were able to gain some marks for one of the options listed in the marking instructions.

Qu.6 (pie chart) – Most candidates got as far as  $126^\circ$  but did not know how to proceed from there. Many found 110 flies then halved and halved again for the ants and spiders.

Qu.8 (volume/proportion) – Nearly all candidates calculated the volume correctly but many were unable to calculate the weight correctly.  $300 + 80 = 380$  was a common answer.

Qu.10 (inequation) – Many candidates scored 0 marks; those who gained 1 mark for  $1/2y > 10$  did not proceed further or gave  $y > 5$  as their answer.

Qu.11 (trigonometry) – This question was poorly done with a wide variety of (usually wrong) methods. However candidates often picked up 1 or 2 marks.

Qu.13 (finding % weight loss) – Most candidates scored 1 mark for 6(kg); many scored 2 or 3 marks for one of the options listed in the marking instructions.

Qu.14 – As in previous years this question proved to be demanding but many candidates were able to pick up some marks for one of the options listed in the marking instructions.

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

Qu.3 (flowchart) – Few candidates scored full marks;  $1/3$  or  $2/3$  was common. Most got basic cost = 43; some multiplied by 6 or 4 but not by both; some multiplied by 0.9

Qu.10a (loan repayment) – Many candidates were unable to calculate 1.6% of 1700.

Qu.11(overtime) – Few candidates scored full marks as they found it difficult to cope with the number of steps involved ; most candidates picked up some marks for one of the options listed in the marking instructions.

Qu.12 (curved surface area of cylinder) – Few candidates did well in this question considering the formula is given. Many successful candidates appear not to use the given formula; they find the circumference and then multiply by the height.

### **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 (e.g. mean from a frequency table; distance, speed, time calculations involving fractions of an hour; expressing one quantity as a percentage of another are routine topics which candidates regularly answer poorly in the external examination.)

Centres should consider how best to practise interpreting calculated statistics.

Centres should consider how best to prepare candidates to tackle extended response questions which assess problem solving skills.

# Course Assessment: Intermediate 2

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

## Feedback to centres on candidate performance

### General comments

Markers commented that the papers sampled the course well and were set at an appropriate standard. In addition markers were satisfied that candidates were being presented at the appropriate level.

Candidates responded well, the vast majority attempting all questions. Generally candidates performed better in Paper 2 than Paper 1. Most laid out their responses so that markers found them easy to follow.

Candidates who sat Units 1, 2 and Applications generally performed less well than candidates who sat Units 1, 2 and 3.

In general, there was a greater percentage of high scoring papers among younger candidates.

### Areas in which candidates performed well

Paper 1:

Q2 (Both versions):	Breaking brackets
Q3a, b (Both versions):	Stem and leaf; probability
Q4a (Both versions):	Factorising difference of 2 squares
Q5a (Both versions):	Cumulative frequency
Q10a (Applications):	Drawing a histogram

Paper 2:

Q2b (Both versions):	Given volume of cuboid, find height
Q3a (Both versions):	Standard deviation
Q7a (Units 1, 2, 3):	Indices

## Areas which candidates found demanding

Paper 1:

- Q4b (Both versions): Most candidates failed to link part (b) with part (a) despite the word *Hence* as a clue in part (b). Instead they tried to multiply out then subtract. Unfortunately the vast majority could not carry out these calculations without errors and so lost the second mark.
- Q5b (Both versions): Candidates found it difficult to obtain the quartiles from the frequency/cumulative frequency table. Those who listed the data in full mostly managed to get 3 out of 3. However others failed to select a valid strategy and tended to use the data incorrectly to find 'quartiles'.
- Q6 (Both versions): A common mistake here was to use  $\frac{1}{4}$  for angle P instead of for  $\sin P$ .
- Q7 (Both versions): Identifying angles tended to cause difficulty here. Some candidates had the  $19^\circ$  marked in the correct place on the diagram but failed to identify angle BAC correctly and wrote down a different value for their final answer.
- Q9c (Units 1, 2, 3): Most candidates obtained the first mark for finding the x-coordinates of P and Q. However many could not progress beyond that.
- Q10 (Units 1, 2, 3): A common wrong answer was  $\tan x^\circ = 2/5$ . Candidates seemed to think this was a sequence.
- Q9 (Applications): The vast majority of candidates accessed the first mark easily but found the % calculation beyond them.
- Q11 (Applications): Calculating  $2^4$  proved difficult for many candidates (most thought it was 8). Those who did not show detailed working at this stage also risked losing the 3<sup>rd</sup> mark (for evaluating the whole expression).

Paper 2:

- Q1 (Both versions): This type of percentage question is usually done very well and, indeed, this year most candidates accessed the first 2 marks as usual. However, the third mark, for knowing how to work out *compound interest* as opposed to the *final amount* was often lost, as was the last mark where candidates rounded incorrectly.
- Q4c (Both versions): In parts (a) and (b) many candidates left the amounts in £ instead of converting to pence. This led them into difficulty in part (c) both in the calculation and also in the communication of the answers.
- Q10 (Units 1, 2, 3): The progression from  $\sqrt{a}$  as the subject to  $a$  as the subject proved difficult for candidates. However many gained the first mark.

Q11 (Units 1, 2, 3):	As always the algebraic fraction calculation proved difficult despite being a 'grade C' question.
Q6a (Applications):	A large number of candidates seemed to be unfamiliar with the layout of a credit card statement. Calculating B and C proved problematic.
Q7 (Applications):	In parts (a) and (b), candidates seemed not to know how to present formulae, i.e. use = at the beginning; * and / instead for multiply and divide; no %, £ signs in formulae.
Q8 (Applications):	In general, candidates accessed the first mark (for working out taxable income) and the second mark (for knowing how to calculate the base rate of tax) but lost the last two marks. There seemed to be a lot of confusion over how to calculate the second tier of tax.

## Advice to centres for preparation of future candidates

**Hopefully the notes above will be useful to centres in preparing candidates for presentation at Intermediate 2 level.**

In summarising:

- ◆ It may be useful to remind candidates that when *hence* is used in a question, this is leading the candidate to use an earlier part of the question as a model or lead-in.
- ◆ In finding quartiles, candidates have to be able to work with data presented in a variety of diagrams/formats, including cumulative frequency tables.
- ◆ Centres should continue to remind candidates of the importance of reading the question carefully and being clear about what is being asked. (See note on Paper 2, Q1)
- ◆ Candidates should be encouraged to consider diagrams as a way of presenting evidence of strategy, e.g. when calculating angles in a circle (paper 1 Q7), or when calculating distances (Paper 2 Q9).

# Course Assessment: Higher

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

## Feedback to centres on candidate performance

### General comments

The general performance of candidates this year would suggest that the examination was well received. The format of the examination changed this year and candidates coped well with the section containing the objective questions. Candidates found the remainder of the paper satisfactory with its structure of harder questions towards the end of the paper.

There was a noticeable fall in the number of candidates doing poorly and this helped to raise the quality of the overall response and the pass rate.

### Areas in which candidates performed well

Candidates coped well with the majority of the objective questions, especially so those candidates who carried out their working in their examination booklet in a fairly neat manner. Although it was not necessary to show this working, neatness and precision were clearly important factors in gaining a good score.

#### In Paper 1 Section B

Qu. 21a and 21b (stationary points and roots) were well done as was the composite log functions in qu. 23a.

#### In Paper 2

Qu. 1 (straight line geometry) and qu.2 (vectors) were both exceptionally well done

### Areas which candidates found demanding

#### Paper 1 Section A

The following four areas were not handled as well as the rest of the paper: using the general equation of a quadratic curve (qu.13), special integrals (qu.14), the distributive law for the scalar product (qu.18) and expressing a log equation as an exponential equation (qu.20).

#### Paper 1 Section B

Some difficulty was encountered in qu.22a where candidates were asked to find the equation of a tangent to a curve with a given gradient. The solving of the "log" equation in qu.23b was very poorly done with many candidates unable to carry out the following manipulation :

$$\log_2 \left( \frac{x^2 - x + 10}{5 - x} \right) = 3$$

$$\therefore \frac{x^2 - x + 10}{5 - x} = 2^3$$

## Paper 2

In qu.3 a fair number of candidates were unable to recall the shapes of the sine and cosine curves with any degree of accuracy and there was a noticeable drop in the level of responses to arranging the data in "wave function" viz

- <sup>3</sup>  $k \cos x \cos a - k \sin x \sin a$  *stated explicitly*
- <sup>4</sup>  $k \cos a = \sqrt{7}$  and  $k \sin a = 3$  *stated explicitly*
- <sup>5</sup>  $k = 4$                       and                      •<sup>6</sup>  $a = 0.848$

In the last part of qu.3 many candidates were trying to differentiate with a trig. function expressed in degrees which naturally earned no credit.

In qu. 4 the response to finding the intersection of a line and a circle was disappointing with many casual errors being introduced with the expansion of  $(4 - x)^2$ . This often meant that candidates were unable to factorise the resulting quadratic equation. The results for qu. 5 (quadratic trig.) were just about acceptable but there is very little to the technique other than factorising a quadratic- more candidates should recognise this situation:

$$3\sin^2 x - 2\sin x - 1 = 0 \text{ is equivalent to}$$

$$3Y^2 - 2Y - 1 = 0$$

$$i.e. (3Y + 1)(Y - 1) = 0$$

$$(3\sin x + 1)(\sin x - 1) = 0$$

Qu. 6a was poorly done; candidates do not cope well with similarity. Often a simple piece of knowledge works best - some candidates stated that

$$\tan(\hat{T}SO) = \tan(\hat{Q}SR)$$

$$\frac{6}{3} = \frac{QR}{3 - t}$$

$$QR = 2(3 - t)$$

Unfortunately, a high number of candidates failed to recognise the optimisation part having found an expression for the area.

As one of the harder questions, qu.7 produced some good responses with failure only really occurring when a sound strategy was missing.

## Advice to centres for preparation of future candidates

For the objective questions, candidates should be encouraged to work out their answers neatly with questions numbered so that they can go back if required.

Candidates should practice questions from the bank 144 questions available to schools. These questions show the style of question to be used in the examination. Other sources are not so reliable.

For the written parts of the examination, there are a number of routine procedures which occur with a fair degree of regularity. Candidates should be able to:

- Factorise (where possible) any equation of a quadratic form - this skill is required on more than one occasion.
- Find a point(s) of intersection of a line and a curve – this occurs fairly regularly and there is little excuse for making errors in the expansion of, say,  $(2x - 3)^2 = 4x^2 - 12x + 9$ .
- Write a trig. expression as a single wave function – this is also a routine piece of work and candidates should ensure that they write down what is expected (see above).

# Course Assessment: Advanced Higher

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

## Feedback to centres on candidate performance

### General comments

It is very pleasing both to me and to the examining team that the number of candidates has increased by around 15% on 2007. The number of presenting centres rose by 32 to 336 which is also extremely encouraging. This represents a high proportion of the possible number. We hope both of these are sustained in 2009.

It is pleasing that the vast majority of scripts were well written and it was easy to see what the candidate intended. Some scripts were very difficult to read and candidates should be reminded that untidy work is more difficult to mark. As remarked in previous years, carelessness early on in a solution is quite likely to cause a significant loss of marks. Markers do apply 'follow through' but an error may result in an easier process or a much harder process which might well prevent a candidate demonstrating the skills needed to obtain marks.

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

### Areas in which candidates performed well

See comments on individual questions in "Advice to centres for preparation of future candidates".

### Areas which candidates found demanding

See comments on individual questions in "Advice to centres for preparation of future candidates".

### Advice to centres for preparation of future candidates

Centres are advised to take notice of the comments below on the questions.

The following comments are best considered alongside the question paper and the marking instructions.

#### Question 1.

This question was accessible to the vast majority of candidates. Most errors came from errors in remembering the necessary formula.

#### Question 2(a)

Testing  $\cos^{-1}$  - most responded well.

#### Question 2(b)

This part was intended to assess both parametric differentiation and the derivatives of sec and tan. Many rose to the challenge.

#### Question 3.

On curve sketching. Many lost track of either the translation or the rotation or even both. Few candidates gained full marks.

#### Question 4.

Partial fraction questions are often done well and this proved to be no exception. The irreducible quadratic proved to be demanding, with mistakes leading to significant changes in the actual integration.

Many scripts claimed that  $\int \frac{8x}{x^2 + 5} dx$  was  $\frac{1}{4} \ln(x^2 + 5)$ .

#### Question 5.

This was quite a demanding question with many candidates going wrong. It was disappointing that so many forgot to differentiate the right-hand side. It was also disappointing that some candidates failed to solve the quadratic equation  $y^2 + 3y = 4$  correctly.

#### Question 6.

Although set as (a) and (b), the two parts were independent. This proved very useful to those who failed with (a) either by making an error or by not knowing what was needed. Part (b) was generally done well.

#### Question 7.

This was a more complex and challenging question. It was good to see so many decent attempts, many of which succeeded. The majority of the errors were predictable, relating to the fractions in the constituent integrals.

#### Question 8.

This proved to be a discriminating question. Very few achieved the correct expression, most simply ignored the first part and expanded the expression to answer the second part.

#### Question 9.

Most made a reasonable attempt at this and fitted together the various hints to obtain the correct answer.

#### Question 10.

This question attempted to use calculus in a context. Part (a) was easy, part (b) less so. Many candidates lost a mark by omitting the constant of integration.

#### Question 11.

This question, of a type which many would have seen before, produced a range of attempts. It provided a good challenge to the concept of proof. For B, the true (but naive) statements that odd cubed is odd and even squared is even were not enough for full marks.

Question 12.

Very few candidates produced the hoped for solution which was to use Maclaurin for the first part and then apply that answer to the other parts. In fact, Maclaurin was very often used for all three parts, leading to the introduction of various errors.

Question 13.

The responses to second order differential equation questions have improved steadily over the years. The difficulty in this case was to correctly find the particular integral with using  $ax^2$  as the trial integral being common. However, it was good to see many complete and accurate solutions.

Question 14.

This assessed a difficult topic which requires both mathematical insight and skilful manipulation. Many candidates did not attempt this question.

Question 15.

Definitely a challenging question on calculus, with many producing worthwhile attempts. Many candidates seemed unsure of what was required to simplify the answer.

Question 16.

A discriminating question where few candidates gained full marks.

# 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

As the table below shows, there has again been a slight increase in the number of candidates.

Year	2005	2006	2007	2008
Candidate numbers	313	280	285	305

The breakdown across the two options was:

Statistics	144	Also doing AH Mathematics 62 (= 43.3%)
Mechanics	161	111 (= 68.9%)

Taken overall, the performances in 2007 and 2008 were virtually identical. The mean mark rose by 0.1% but, interestingly, the standard deviation fell by 4.8 to 19.5.

Option	No. of candidates	Section A average	Section B average	Overall average
Mechanics	161	39.7	24.3	64.0
Statistics	144	39.9	19.7	59.6

Analysis of this data indicates that the Statistics candidates performed less well than the Mechanics candidates. (Note that the marks available for Sections A and B were 68 and 32 respectively.) Compared with 2007, the number of centres which presented candidates for AH Applied dropped from 47 to 40. It may be worth noting that there were just 30 centres that presented in both 2007 and in 2008.

## Areas in which candidates performed well

### Section A

#### Mechanics:

Candidates did particularly well in the following questions:

Q1 : displacement and velocity in vector format

Q2: motion with uniform acceleration

Q3a : forces in equilibrium

Q7a : terminal velocity

Q8a : basic SHM

**Statistics:**

Candidates did particularly well in the following questions

Q3a: Normal Distribution

Q6: performing a chi-squared goodness-of-fit test

Q10a: calculating the upper and lower control limits in a p-chart

**Section B**

**For both Statistics and Mechanics:**

Q1 on matrices, Q2 on differentiation, and Q3 on partial fractions were particularly well done

Most candidates scored 2 or 3 out of 3 in Q5a on summing  $r$  and  $r^2$  although many failed to achieve any marks in part b

**Mechanics:**

These candidates also did well in Q4a using integration by parts although many were unable to complete part b.

**Areas which candidates found demanding**

**Section A**

**Mechanics:**

Q6: relative velocity

Q7b: motion with variable acceleration

Q8b : more advanced SHM

Q9b : applying energy considerations in a complicated context

Q10a: conservation of momentum proved to be demanding although candidates were still able to access marks in part b in which they performed slightly better

**Statistics:**

Q2a: understanding how to obtain a random sample

Q4b: the difference between prediction and confidence intervals

Q8d: the last part of the question on the Poisson distribution

Both 2a and 4b asked for an explanation which candidates traditionally

find harder than carrying out statistical calculations

## **Section B**

### **Mechanics:**

Q 5b: (summation) proved to be the most demanding for the mechanics candidates.

### **Statistics:**

Q6: Variables separable differential equation using Newton's law of cooling. Many candidates failed to achieve any marks in this question although approximately one sixth achieved full marks.

Q4b: volume of a solid of revolution proved to be the most demanding question for these candidates.

## **Advice to centres for preparation of future candidates**

### **Mechanics:**

Candidates should be given plenty of opportunities to tackle non-routine questions

### **Statistics:**

Candidates should be encouraged to practise explaining and interpreting the results of statistical calculations in the context of the question.