



Course Report 2009

Subject	Mathematics
Levels	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 Physical Education, with your comments – 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 course content at all levels. 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.

There was a decrease of approximately 8% in the number of candidates at Standard Grade and an increase of around 10% at both Intermediate 2 and Advanced Higher. The number of candidates at Intermediate 1, Higher and Advanced Higher Applied Mathematics is very similar to last year.

The examining team reported that performance was broadly similar to recent years and the distribution of awards shows this to have been the case.

The Principal Assessors reported that candidates were being presented at an appropriate level and had been well prepared for the examinations

Improvements were seen at some levels in candidates' abilities in problem solving and in communicating answers. Centres are encouraged to continue efforts to improve these skills and that of interpreting statistics. It was recommended that centres allow adequate time for practice and consolidation of topics from the early part of the courses and consider changing the order in which topics are taught in some cases. At Higher and Advanced Higher levels, centres are also advised to encourage candidates to revise the topics which they have studied in previous years, such as algebraic manipulation and the rules of indices. It was also noted, at these levels, that mistakenly working in degrees rather than radians in some questions was a relatively common error.

Entries and Awards

Entries and Awards — Standard Grade Mathematics

Year	Entries
2009	46,779
2008	50,974
2007	53,973

Grade boundaries for each externally assessed element

Grade Boundaries 2009

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	30	21	40	27	19
R & E	45	29	19	40	27	19	40	26	18

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	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
2009	46,779	17.2%	15.0%	26.3%	16.6%	20.3%	3.8%	0.6%	0.1%
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%

Entries and Awards — Intermediate 1 Mathematics

Year	Entries
2009	12,061
2008	12,633
2007	11,434

Grade Boundaries

Year	Max Mark	A	B	C	D
2009	80	55	47	39	35
2008	80	55	47	39	35
2007	80	56	48	40	36

Distribution of awards

	Entries	A	B	C	Pass	D	No Award
2009	12,061	24.1%	16.2%	17.2%	57.4%	7.7%	34.9%
2008	12,633	23.7%	16.6%	17.5%	57.7%	7.5%	34.8%
2007	11,434	24.7%	16.7%	16.9%	58.3%	7.2%	34.5%

Entries and Awards — Intermediate 2 Mathematics

Year	Entries
2009	21,485
2008	19,474
2007	18,987

Grade Boundaries

Year	Max Mark	A	B	C	D
2009	80	56	48	40	36
2008	80	56	48	40	36
2007	80	56	48	40	36

Distribution of awards

	Entries	A	B	C	Pass	D	No Award
2009	21,485	37.3%	18.3%	15.4%	71.0%	6.4%	22.6%
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%

Entries and Awards — Higher Mathematics

Year	Entries
2009	19,631
2008	19,633
2007	18,786

Grade Boundaries

Year	Max Mark	A	B	C	D
2009	130	93	77	62	54
2008	130	101	84	67	58
2007	130	101	83	65	56

Distribution of awards

	Entries	A	B	C	Pass	D	No Award
2009	19,631	22.2%	24.75	22.8%	69.7%	10.3%	20.0%
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%

Entries and Awards — Advanced Higher Mathematics

Year	Entries
2009	3,027
2008	2,752
2007	2,484

Grade Boundaries

Year	Max Mark	A	B	C	D
2009	100	72	59	46	39
2008	100	72	59	47	41
2007	100	68	55	42	35

Distribution of awards

	Entries	A	B	C	Pass	D	No Award
2009	3,027	21.9%	20.5%	23.1%	65.4%	11.8%	22.8%
2008	2,752	23.3%	24.3%	21.4%	69.0%	8.5%	22.5%
2007	2,484	22.2%	20.2%	22.7%	65.1%	12.6%	22.3%

Entries and Awards — Advanced Higher Applied Mathematics

Year	Entries
2009	305
2008	305
2007	285

Grade Boundaries

Year	Max Mark	A	B	C	D
2009	100	71	60	49	43
2008	100	72	60	49	43
2007	100	73	60	48	42

Distribution of awards

	Entries	A	B	C	Pass	D	No Award
2009	305	35.7%	21.0%	17.7%	74.4%	6.2%	19.3%
2008	305	36.7%	17.7%	21.0%	75.4%	9.5%	15.1%
2007	285	40.7%	16.1%	13.7%	70.5%	5.3%	24.2%

Comments on Verification: Units which make up Courses

Titles/Levels of National Units Verified

D321 MATHEMATICS (INTERMEDIATE 1 – ADVANCED HIGHER) CENTRAL 2009
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Feedback to Centres

General comments:

- ◆ Material submitted by centres was on the whole in order and presented as requested.
- ◆ Centres should indicate on the Sample Form which NAB(s) were used for each candidate for whom evidence is submitted.
- ◆ Centres, in the main, correctly applied the rules for substitution where candidate evidence was not available.

Advice on good practice and areas for further development:

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

1. Special Assessment Arrangements

Any candidate who receives special assessment arrangements for SQA external 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/or scribe, should be clearly identified on the candidate's script.

2. Marking

It is important that centres apply the marking schemes as they are given and remember that follow through marks may be available to candidates subsequent to an error.

A clear indication of which marks have been awarded and which have not been given, due to an error, helps at all stages of the assessment process, from feedback to pupils through to external verification.

3. Formative Assessment Nature of NABs

Centres are reminded that NAB assessments can be used for formative assessment purposes. Feedback to pupils on their performance was evident in some scripts submitted.

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 almost inevitably picks up the issues which are highlighted in the feedback reports returned to centres without such a system.

5. Reassessment

Centres are reminded that reassessments should normally be offered on a maximum of two occasions within any particular Unit; with the second reassessment being available in exceptional circumstances.

Course Assessment: Standard Grade

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

Comments on candidate performance

General comments

Foundation

This paper was viewed as both fair and accessible to the cohort. The language used in the questions was deemed both clear and helpful to candidates. For the majority, every question was attempted with working being shown. Markers felt the candidates' responses ranged from good to very good. There were few very low scoring papers and many candidates gained high marks. Good preparation was evident and mention was made of improved responses in the RE element.

Fewer candidates achieved Grade 7 this year (0.6% compared to 1.4% in 2008).

General

This paper was also seen as well balanced, fair and accessible. Language used was clear and concise with excellent use of diagrams to enhance comprehension. Examiners remarked that candidates' responses ranged from good to excellent, with a consistent standard across papers 1 and 2.

KU and RE elements were consistent with previous years.

More candidates achieved Grade 3 this year (26.3% compared to 24.3% in 2008).

Credit

As ever, this paper produced a wide range of responses which markers viewed as good to very good, with the majority able to make reasonable attempts at each question. Some very good preparation was evident with fewer candidates who appeared to be inappropriately presented.

In paper 1, candidates performance in KU was better than that in RE. In paper 2 there was little difference between elements.

More candidates achieved a Credit pass this year (32.2% compared to 31.3% in 2008).

Areas in which candidates performed well

Foundation

Paper 1 was very well done with the following questions deserving special mention.

Question 1 - Addition of whole numbers.

Question 3 - Rounding.

Question 5 - Omission of VAT in a bill.

Question 6 - Tiling.

Question 8 - Codes.

Question 9 - Problem solving.

Question 10 - Patterns.

In Paper 2,

Question 1 - Division in money context.

Question 2 - Combinations.

Question 4 - Number pattern and rule.

Question 5 - Interpretation of data from a table.

Question - 7(a) Bar graph.

Question 8 - Problem solving.

Question 14 - Calculation using given rule.

General

In Paper 1

Question 1 - (a), (b), (c) Basic numeracy.

Question 3(a) - Number pattern.

Question 4 - Tiling

Question - 5(a) Coordinates.

Question 6 - Temperature.

Question - 8(a) Stem and Leaf.

In Paper 2

Question 2 - Money.

Question 4 - Time.

Question 5(a) - Factorisation.

Question 6 - Selections for TV package.

Question 9 - Money.

Credit

In Paper 1

Question 1 - Decimal calculation.

Question 2 - Fraction subtraction.

Question 3(a) - Evaluation of a function.

Question 4(a), (b) - Factorisation and simplification.

Question 7 - Reverse percentage (a noticeable improvement on previous years).

Question 8(a) - Forming equation.

Question 9 - Changing subject of a formula.

Question 11 - Sine rule.

In Paper 2

Question 2 - Volume.

Question 4 - Similar shapes.

Question 8 - Depreciation.

Question 9(a), (b) - Bearings and trigonometry.

Question 12(a) - Substitution.

Areas which candidates found demanding

Foundation

In Paper 1

Question 4 - A significant number of candidates did not know that $33\frac{1}{3}\% = \frac{1}{3}$

Question 7(b) - Many candidates could not identify a correct strategy for finding the time spent in class.

In Paper 2

Question 6 - Omission of negative sign.

Question 7(b) - Lack of understanding of scale.

Question 10(b) - Errors in percentage calculation (e.g. 1200.).

Question 11 - Confusion of mean and mode.

Question 15 - A common wrong answer was 24

Question 16 – A significant number of candidates did not know the number of days in the three months.

General

In Paper 1

Question 2 - Scientific Notation (some problems caused by the negative power of 10).

Question 5(c) - Identification of coordinates.

Question 9 - Angles in a triangle (candidates made wrong assumptions, e.g. angle $DBC = 20^\circ$).

In Paper 2,

Question 1 - Problems caused by converting 40 minutes to hours.

Question 7 - A significant number of candidates did not know how to find the mean.

Question 12 - Most candidates failed to use the formula $V = Ah$. Further problems were caused by failure to convert

12 centimetres to metres.

Question 13 - Many candidates lost a mark by failing to label the wind farm.

Question 14 – Many candidates failed to calculate $\sqrt{25}$ to find the length of the side.

Credit

In Paper 1

Question 3(b) - Only a tiny proportion of candidates realised that $\sqrt{49} = \pm 7$ (most answered 7 only).

Question 4(c) - A lack of understanding of indices.

Question 10(b) - Many candidates failed to make the link to the answer in part (a).

In Paper 2,

Question 1 - Many candidates multiplied instead of dividing. Further problems caused by conversion of
1 kilogram to grams and incorrect rounding or failure to round.

Question 5 - Standard deviation (a significant number of candidates attempted to use the standard deviation formulae).

Question 10 - Most candidates were unable to re-arrange $83 = \frac{1}{4}(M^2 - 4M + 272)$ into a suitable form to solve.

Question 12(b), (c) - In part (b), most candidates did not know how to start proof. In part (c), simplifying and then

factorising $T_n + T_{n+1}$ proved to be very difficult for most candidates.

Advice to centres for preparation of future candidates

Foundation candidates were very well prepared and most were able to show their knowledge under examination conditions. There has been a steady improvement in the communication of working over recent years and teachers should be congratulated for this.

As in previous years, candidates had problems in the question involving knowledge of the number of days in each month. Other areas which could benefit from extra preparation were reading data from a scale and the relationship between the radius and diameter.

At General level, teachers should also be congratulated for preparing students well and encouraging them to show detailed working. Questions involving money were particularly well done.

As in previous years, the calculation of the mean from a frequency table proved demanding and more time could be spent in preparing for this. Other areas which could benefit from more attention include angle problems and time, distance and speed problems involving conversions between hours and minutes.

The standard of work at Credit level was very good. It was particularly encouraging to see a much improved performance in reversing a percentage change, although there is still room for improvement. Volume, depreciation and the sine rule were very well done by most of the cohort.

Further work is needed on aspects of algebra such as indices and quadratic equations. In particular, the skills required to re-arrange a quadratic equation and solve by factorisation would benefit from further preparation, especially as this is of great importance to future mathematical studies.

Possibly, a review of the timing of the teaching of such topics could be undertaken to allow more time for revision.

Course Assessment: Intermediate 1

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

Comments 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 13.5% of entries were for Mathematics 1, 2 and Applications.

The mean mark for Mathematics 1, 2 and 3 candidates was marginally higher than last year.

The mean mark for Mathematics 1, 2 and Applications candidates was lower than last year.

The mean mark for candidates doing Mathematics 1, 2 and 3 continued to be significantly higher than for those doing Mathematics 1, 2 and Applications.

Areas in which candidates performed well

Mathematics 1, 2 and 3

Paper 1

Qu. 1a (adding decimals)

Qu. 1b (dividing a decimal by a whole number)

Qu. 3a (adding integers)

Qu. 4 (hire purchase) – well done by many candidates but a significant minority were unable to calculate 25% of 260 and/or 15×14 correctly.

Qu. 7a (finding mode from frequency table)

Qu. 9a (multiplication and addition of integers)

Paper 2

Qu. 1 (proportion)

Qu. 3a (interpreting a number written in standard form)

Qu. 4a (constructing a stem and leaf diagram)

Qu. 7 (volume of cuboid problem)

Qu. 8a (converting £s to €s)

Qu. 9b (comparing two pie charts)

Mathematics 1, 2 and Applications

Paper 1

Qu.1a (adding decimals)

Paper 2

Qu.2a (evaluating a formula in a spreadsheet)

Qu.4a (constructing a stem and leaf diagram)

Qu.7 (volume of cuboid problem)

Qu.9b (comparing two pie charts)

Areas which candidates found demanding

Mathematics 1, 2 and 3

Paper 1

Qu.1c ($6 \times 4\frac{1}{3}$) - Few candidates scored any marks in this question.

Qu.2 ($250 + [200 \times 4.99]$) – Many candidates attempted to carry out the calculations in the correct order but were unable to calculate 200×4.99 correctly. A significant number of candidates attempted to carry out the calculations in the wrong order and were also unable to calculate 450×4.99 correctly.

Qu.6 (evaluating formula) – Many candidates knew to calculate $(70 \times 0.5 \times 8) \div 100$ but were unable to carry out the calculations (particularly the multiplication) correctly. A significant minority calculated PTR as $70 + 0.5 + 80$.

Qu.7c (finding mean from 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 $300 \div 7$ or $40 \div 7$.

Paper 2

Qu.3b (interpreting $\frac{3}{4}$ million) – Many candidates were unable to convert $\frac{3}{4}$ million to 750000.

Qu.4c (probability) - $\frac{3}{15}$ was a common wrong answer to this question.

Qu.5 (distance, speed, time) – Most candidates scored 1, 2 or 3 marks out of 4. Common errors were the inability to convert 5.75 hours to 5 hours 45 minutes; ignoring or subtracting the 5 hour time difference; giving final answer as pm time.

Qu.8b (converting €s to £s) – Many candidates did not know how to do this question but even when the correct method was used, the answer was not rounded correctly.

Qu.9a (pie chart) – Most candidates got as far as 34° but did not know how to continue from there. The most common error was to calculate 34% of 900.

Qu.10 (trigonometry) – Many candidates attempted to use Pythagoras instead of trigonometry.

Qu.11 (% increase) - Most candidates scored 1 mark out of four for 700; a significant number of candidates scored 2 or 3 marks out of 4 for one of the options listed in the marking instructions.

Qu.12 (Pythagoras) – Many candidates attempted to use trigonometry instead of Pythagoras. A significant number of candidates used an incorrect form of Pythagoras (and did not continue to calculate the size of the gap) but scored 2 marks out of 4 for carrying out the related calculations correctly.

Qu.13 (Area of composite shape involving semi-circle) - As in previous years this question proved to be demanding but most candidates were able to pick up some marks for one of the options listed in the marking instructions.

Mathematics 1, 2 and Applications

Paper 1

Qu.1c ($6 \times 4\frac{1}{3}$) - Few candidates scored any marks in this question.

Qu.2 ($250 + [200 \times 4.99]$) – Many candidates attempted to carry out the calculations in the correct order but were unable to calculate 200×4.99 correctly. A significant number of candidates attempted to carry out the calculations in the wrong order and were also unable to calculate 450×4.99 correctly.

Qu.4 (hire purchase) Many candidates were unable to calculate 25% of 260 and/or 15×14 correctly.

Qu.3b ($-56 \div (-8)$) Common wrong answers were -7 , ± 6 , ± 8 and ± 9 .

Qu.6a (finding lower quartile) – A significant number of candidates did not order the numbers.

Qu.6b (interquartile range) – Most candidates did not know how to find the interquartile range. A significant number of candidates calculated the range.

Qu.7a (finding mode from frequency table): 11 was a common wrong answer.

Qu.7b (finding range from a frequency table): $11 - 1 = 10$ was a common wrong answer.

Qu.7c (finding mean from 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 $300 \div 7$ or $40 \div 7$.

Qu.8b Most candidates gave a variety of wrong answers and scored 0/2 in this question.

Qu.9b Most candidates scored 1/3 in this question. Many did not attempt to complete all remaining rows in the table.

Paper 2

Qu.2b (constructing formula in spreadsheet) Extremely few candidates answered this question correctly. Many candidates used ' \div ' instead of '/' and even when '/' was used the answer was usually given as $SUM=(C4/B4)$, $B4/C4$ or $384/12$.

Qu.4c (probability) $3/15$ was a common wrong answer to this question.

Qu.5 (distance, speed, time) – Most candidates scored 1, 2 or 3 marks out of 4. Common errors were the inability to convert 5.75 hours to 5 hours 45 minutes; ignoring or subtracting the 5 hour time difference; giving final answer as pm time.

Qu.6b (length of cube given surface area) – Very few candidates answered this question correctly. A few candidates scored 1 mark out of 2 for correctly finding the area of one face but either stopped or continued incorrectly from there.

Qu.8b (converting €s to £s) Most candidates did not know how to do this question but even when the correct method was used, the answer was not rounded correctly.

Qu.9a (pie chart) Most candidates got as far as 34° but did not know how to continue from there. The most common error was to calculate 34% of 900.

Qu.10b (finding point of intersection of two bearings) – Many candidates made no attempt to answer this question. Few candidates were able to correctly draw a bearing of 233° . Most candidates scored 1 mark out of 3 for either correctly drawing a bearing of 180° or for drawing two (incorrect) bearings and finding their point of intersection.

Qu.11 (% increase) Most candidates scored 1 mark out of 4 for 700; many scored 2 or 3 marks out of 4 for one of the options listed in the marking instructions.

Qu.12 (Pythagoras) Most candidates had little idea how to start this question but even those who did often used an incorrect form of Pythagoras (and did not continue to calculate the size of the gap) but scored 2 marks out of 4 for carrying out the related calculations correctly.

Qu.13 (Area of composite shape involving semi-circle) 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.

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; pie chart calculations; 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 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.

Comments on candidate performance

General comments

Markers commented that

- ◆ the paper covered the course content and was set at an appropriate standard
- ◆ the vast majority of candidates attempted all questions; very few seemed to have been presented at an inappropriate level.

As in previous years, around 25% of the cohort tackled the Applications option. These candidates did not seem to perform as well as those sitting the Units 1, 2 and 3 papers.

Candidates from S3 and S4 generally performed better than older candidates.

Areas in which candidates performed well

Paper 1

- Q1 (Both versions): Draw a dot plot
- Q2 (Both versions): Find the equation of a straight line
- Q3 (Both versions): Factorise a trinomial
- Q4 (Both versions): Multiply out brackets
- Q5a (Both versions): Find quartiles and SIQR

Paper 2

- Q2 (Both versions): Find standard deviation
- Q4 (Both versions): Simultaneous equations
- Q6 (Both versions): Use cosine rule
- Q7 (Both versions): Solve quadratic equation with formula
- Q13 (Q10 Applications): Trigonometry problem
- Q14 (Q11 Applications): Chord in a circle

- Q7 (Applications): Calculate cost of a loan
- Q8 (Applications): Calculate savings from salary

Areas which candidates found demanding

Paper 1

Q1b (Both versions): *Select the shape of the distribution.* The vast majority of candidates opted for *C: skewed to the left.*

Q5b (Both versions): *Statistical comment.* Although candidates are mostly adept at calculating the actual statistics required, they seem to lack understanding as to what these statistics mean and how they should be interpreted. There also seems to be a difficulty in expressing themselves accurately.

Q6 (Both versions): *Find a value for an angle given certain trigonometric information.* Perhaps surprisingly, this was very poorly done. A common answer was 1.

Q7 (Both versions): *Find the gradient of a straight line.* Candidates in the main selected a correct strategy, viz. drawing the line and using 2 points or re-arranging the equation into the form $y=mx+c$ and selecting m . However, very few could follow this through correctly.

Q10 (Units 1, 2, 3): *Use trigonometric identities.* Perhaps predictably, very few managed to work this out.

Q9 (Applications): *Use spreadsheets.* Even the relatively simple part (a) was poorly done.

Q10 (Applications): *Use formula.* Most candidates gained the first mark (for correct substitution) in each of parts (a) and (b). However, they had difficulty in following through the calculations correctly – even in part (a).

Paper 2:

Q9 (Units 1, 2, 3): *Change the subject of a formula.* Candidates had difficulty in processing the $\frac{1}{2}$.

Q10 (Units 1, 2, 3): *Solve a trigonometric equation.* A surprisingly large number of candidates lost the first mark because they were unable to re-arrange the equation correctly.

Q11 (Units 1, 2, 3): *Rationalise a surd.* Many candidates recognised the strategy but were unable to follow it through correctly.

Q12 (Units 1, 2, 3): *Simplify expressions with indices.* The response to this question was probably the most disappointing. Very few scored even 1 out of 2.

Q12 (Applications): *Find the mean of data in a grouped frequency table.* Many candidates used cumulative frequency here. A disappointing response to what is a fairly standard question.

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 addition:

- ◆ whilst candidates are adept at *calculating* statistics, centres should consider trying to encourage more practice of *interpreting / evaluating* data.
- ◆ Centres should consider how best to reinforce calculation skills which may be required in Paper 1.
- ◆ In some questions there is at least one mark which depends on the *communication* of findings. Candidates should be reminded to consider this when presenting their responses.
- ◆ Algebraic topics (from Unit 3) were not tackled as well this year. It may be possible to change the order of teaching topics to allow for opportunities to revisit / revise such topics, which are traditionally taught near the end of the course.

Course Assessment: Higher

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

Comments on candidate performance

General comments

The Objective Questions.

Paper 1A

The candidates found this section slightly harder this year, with an average of 27.27 as against 29.13 last year. In two of the items, less than 40% of those who gave an answer chose the correct option.

Paper 1B

The candidates found this section harder this year, with an average of 16.03 as against 19.50 last year.

Paper 2

The paper was constructed so that the more demanding questions would be in the latter half. The marks for the questions indicated that this was indeed the case.

The candidates had more difficulty with this paper this year than last year and some questions did not perform as expected. The grade boundaries were set to reflect this.

Areas in which candidates performed well

Paper 1A

The following topics were handled well in the objective questions:

Term of a recurrence relation, circle facts, gradient of tangent to curve, limit of a recurrence relation

Paper 1B

The equation of the altitude was well done, as was the trigonometric identity in question 24.

Paper 2

Stationary points, composite functions, roots of a cubic and interpreting a trigonometric graph were all well done.

Areas which candidates found demanding

The Objective Questions

Paper 1A

Question 11 related to a trigonometric equation and how many solutions it had in the interval $0 < x < 2\pi$. The fact that it was set in radians was the only feature which raised it from Standard Grade to Higher and the results were very disappointing.

Question 17 concerned a unit vector and more candidates identified $-3i + 4k$ as a unit vector than the number who chose the correct option.

Paper 1B

Question (22) was a routine vector question which was not answered as well as expected. Candidates also had difficulty in using the scalar product for perpendicular vectors. In question 23, many candidates thought that $f(2x)$ was the same as $2f(x)$ although went on to access the marks for part (b). In The opening section was supposed to be the easy part but far too many candidates thought that $\sin\left(\frac{\pi}{3} + \frac{\pi}{4}\right) = \sin\left(\frac{\pi}{3}\right) + \sin\left(\frac{\pi}{4}\right)$! This error was continued in (c) resulting in an average mark of 2.3 out of 7.

Paper 2

Question 2 there were candidates who were unable to associate differentiation with composite functions and failed to gain any marks in part (b).

In question 3 there were candidates who did not recognise the cubic obtained in part (b) was the same as the cubic factorised in part (a).

Many candidates failed to solve the logarithmic equation. Candidates still find great difficulty in producing work such as $\log_2\left((x+3)(x^2+5x-4)\right) = 3 \Leftrightarrow (x+3)(x^2+5x-4) = 2^3$.

In question 4 there were many candidates who did not understand the meaning of "touch" and were unable to sketch the correct diagram.

In question 5, many candidates did not appreciate the significance of the coordinates of the points of intersection. Many candidates wasted time solving $\cos 2x = \frac{3}{7}$. In this particular question candidates also

lost marks because they mistakenly thought that $\int \cos x^\circ dx$ was $\sin x^\circ$.

In Question 7 on vectors, only around one third of the candidates coped with the distributive law in part (a). Candidates were expected to copy the diagram and add any "useful" lines such as the perpendicular from A onto DC. This, together with a mixture of right-angled trigonometry and vectors, is what raises part (a) above the level of grade C.

Some of the candidates who attempted part (b) thought that $|q+r| = |q|+|r|$.

Advice to centres for preparation of future candidates

Candidates should continue to be encouraged to complete tidy working for the objective questions. It would appear that more candidates are doing their working on the question paper as not so much was appearing in the examination booklet.

The two areas of the syllabus which had the poorest responses were Vectors and Trigonometric equations. More practice is recommended in the following two areas: the use of the scalar product in the case of perpendicular vectors and recognising basic trigonometric equations, with a reminder to candidates not to attempt to apply the double angle formula where it is not required - as in $\cos 2x = \frac{3}{7}$.

Centres should consider how best to prepare candidates to tackle extended response questions which assess problem solving skills. This preparation is required in order for candidates to access marks in the (b) or (c) parts of the questions in Paper 2 in particular.

Course Assessment: Advanced Higher

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

Comments on candidate performance

There has again been an increase in the number of candidates presented for AH Mathematics. The overwhelming majority of candidates seem well prepared for the paper. Analysis of the marks shows that around 90% of candidates scored 30 or more.

Areas in which candidates performed well

The established pattern of good marks early in the paper was the norm. Routine calculus and algebraic questions were all done well. Many marks were obtained from the early parts of the long questions at the end of the paper.

Areas which candidates found demanding

Question 12 proved to be the most demanding in the paper.

Other demanding questions included: 5, 7, 9 and 11.

In some questions, it was often the last few marks which were demanding. This was a feature in the following questions: 4 (induction); 10 (Euclidean algorithm); 14 (Maclaurin expansion); 15 (area calculation); 16 (three-dimensional geometry).

Advice to centres for preparation of future candidates

Centres are to be congratulated on the level of preparation demonstrated by candidates and should keep up this good work.

To assist centres in this, a question-by-question set of comments is included below.

Comments on 2009 AH Mathematics

Q1

The first part was intended to be a question which tested routine differentiation of a product. For most candidates it was routine, but those who multiplied out and then differentiated found it much more of a challenge.

The second part provided a range of strategies which, on the whole, yielded success.

Q2

Although this topic is rarely assessed, the question was done well.

Q3

This produced variable results. Some candidates found it straightforward, but others had difficulty dealing with the powers and with $\int x^{-2} dx$.

Q4

This question should have been a routine proof by induction. Many candidates accessed the first three marks but very few progressed correctly to the end. A number of candidates who expressed the $(k + 1)$ th term in partial fractions found it easier to access the marks.

Q5

Both standard methods were used in this question. Many candidates gained the first two marks but were unable to progress from there.

Q6

Many candidates failed to identify the complex conjugate correctly or to find the correct value for the argument

Q7

Many candidates found this question demanding. Many candidates failed to use the hint to good effect and tried to use it to simplify the denominator. However, a significant number persevered and gained full marks. It was disappointing to find solutions which involved degrees.

Q8

Most candidates gained the marks in part (a) to be and the majority got full marks for (b). There were however, some attempts at invalid methods in part (b).

Q9

The topic of integration by parts is routine but this application was not. There were few completely successful attempts at this question. As in question 7, degrees appeared in many solutions.

Q10

It is a while since the Euclidean algorithm made an appearance on a question paper. Nearly all candidates correctly evaluated the gcd, but few correctly completed the rest of the question.

Q11

This question attempted to test logarithmic differentiation in an unusual fashion. There were many fully correct solutions but also a number of incomplete solutions.

Q12

As intended, this question proved to be demanding. There was evidence of confusion over arithmetic sequences and geometric sequences and few candidates showed that they recognised that p^{2n} was equal to $(p^n)^2$, a property which was the key to a full solution.

Q13

This question was a relatively routine graphical question. The asymptotes were generally obtained, although there was not always a clear justification of the horizontal asymptote. There very few correct justifications that $f(x)$ was strictly decreasing. However, the last 4 marks were readily accessible to candidates.

Q14

This was quite a demanding partial fraction question. Most solutions set things up as they should have been. It was disappointing that arithmetic errors quite often resulted in 2 correct coefficients then produced a third non-zero value. In the first part of the question, this error cost very little but it impeded progress in the second part, making it more challenging. It was pleasing that quite a significant proportion of solutions were fully correct.

Q15

The majority of candidates made a promising start on this question. However, a common error was to lose track of the signs and obtain an integrating factor of $(x + 1)^3$. Even those who arrived at a correct answer to part (a) found part (b) a real challenge and fully correct solutions were very rare.

Q16

Part (a) was routine and done well with the majority of attempts gaining all the marks for it. Few candidates completed part (b) correctly although many were able to access marks in part (c).

Course Assessment: Advanced Higher Applied Mathematics

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

Comments on candidate performance

General comments

The mean mark was virtually unchanged from 2008 and 90% of the candidates obtained 30 or more marks. The overall standard was completely satisfactory.

Areas in which candidates performed well

B1 on the binomial expansion and B3 on parametric differentiation were done particularly well by both mechanics and statistics candidates.

Mechanics candidates performed well in A1 and A4 in the mechanics paper.

Statistics candidates performed well in A3 and A7(a) and (b) in the statistics paper .

Areas which candidates found demanding

Statistics section:

Candidates had particular difficulty with A6(b).

Mechanics section:

The following questions were commented on as being less well done than the rest: A3; A5; A6; A8 and the second part of A10.

Section B:

Candidates found the latter part of B6 to be the most challenging in this section..

(Please see below for more detailed comments on a selection of questions.)

Advice to centres for preparation of future candidates

Candidates should be encouraged to set out their working clearly and explain the strategies being employed by using appropriate phrases, such as resolving vertically / horizontally, by energy considerations, using Newton's laws.

Comments on mechanics questions:

A3.

A couple of common errors prevented a fair number of candidates from accessing all the marks in this question.

Many candidates failed to integrate $\sin 2\pi t$ correctly and, in several cases, the constant of integration was omitted. Even when a constant appeared there was generally a lack of appreciation that it was a constant vector.

A4.

This was a straightforward bookwork question and was generally well attempted. However, some candidates expanded $(u + at)^2$ as $u^2 + a^2t^2$.

A5.

Relative motion using trigonometric methods seems to be difficult for many candidates. Candidates may benefit from additional practice in drawing appropriate sketches for these types of questions. Candidates who opted for a much more complex approach using vectors were generally unable to make much progress.

A6.

This question assessed the vector form of the impulse equation. The main challenges were to recognise the need for vectors, then to set up an appropriate coordinate system and to resolve the velocities involved. For those who managed to do this accurately, the remainder of the question was straightforward. Although this proved to be a discriminating question, there were a good number of well constructed solutions.

A8.

Circular motion on an inclined track is one of the more difficult examples of circular motion. Again, able candidates coped well, with many correct solutions. Weaker candidates struggled with resolving the forces in a consistent manner. A common mistake was the incorrect assertion that the reaction force satisfied the equation $R = mg \cos \theta$.

A9.

This was the first of the long questions and combined statics, elastic strings and energy. It was well attempted by many candidates. Many succeeded in gaining full marks on part (a) and went on to make good attempts on part (b). Some candidates failed to realize that the key quantity for elastic strings is the extension and not just the length of the string.

A10.

Many candidates dealt successfully with part (a) using a work/energy method but most found part (b) more challenging. Most failed to correctly write down the condition for contact with the track.

A11.

This year there seemed to be a noticeable improvement in candidates' ability to respond to questions on differential equations. The question was fairly complex involving both speed/time graphs and differential equations, yet there was a significant number of candidates who made good progress and a good proportion of these achieved complete or almost complete solutions.

Comments on Statistics questions:

A1b

Candidates had difficulty linking probability with time ie $p=0.3$ suggests every 50 minutes.

4b

This was a discriminating question, probably due to the last 2 marks asking for a non-routine calculation.

A5b

Some candidates appeared to confuse 'accepted' and 'rejected'.

A6b and 6c

Candidates continue to experience particular difficulty with theory questions.

A9c

Many candidates did not realise that a sign test was required here and simply gave a few general calculations with a comment.

Comments on Section B:

B1.

This question was handled well by most candidates.

B2.

There was a clear distinction between candidates who managed to access most of the marks here and those who found the question difficult. This was a discriminating question.

B3.

The majority of candidates seemed to have little difficulty with this question.

B4.

This question was generally well done.

B5.

On the whole, candidates knew how to approach this question although some solutions were incomplete.. There was evidence that the use of x and t rather than the more familiar x and y caused difficulties for some candidates.

B6.

This was intended to be a challenging question and the latter part in particular proved to be so.