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Dear Colleague

National Qualifications Update – Mathematics

This letter is intended to provide an update of developments in Mathematics with particular reference to further progress with the agreed recommendations for Mathematics arising from the National Qualifications Review.

1. Progress with the NQ Review recommendations for Mathematics since Spring 2002

The Mathematics update letter of 12 June 2002 indicated how it was proposed to take forward the three approved NQ Review recommendations for Mathematics.

- (i) Course frameworks for Advanced Higher Mathematics and Applied Mathematics**
- (ii) Design of questions in examination papers in Mathematics**
- (iii) Advances in calculator technologies and capabilities**

(See Mathematics update letters of January 2002 and June 2002 for specific details)

Progress since Spring 2002 on each of the recommendations is as follows:

- (i) Course frameworks for Advanced Higher Mathematics and Applied Mathematics**
NB No change for the 2003 Diet of examinations

Consultation took place as outlined in the Mathematics update letter of 12 June 2002. There were two specific recommendations resulting from the consultation, one in relation to the restructure of AH Mathematics and the other in relation to the restructure of AH Applied Mathematics. Both recommendations offer substantial simplifications of the frameworks and have gained approval from SQA's Mathematics and Statistics Assessment Panel and the Mathematics and Statistics Advisory Group. The recommendations are:

AH Mathematics

Recommendation: The AH Mathematics course should consist of three mandatory 40 hour units. The three units will be the existing mathematics units, Mathematics 1, Mathematics 2 and Mathematics 3.

AH Mathematics: Maths 1, 2 and 3

The consultation revealed a broad consensus that the Advanced Higher Mathematics course should consist of Mathematics units 1, 2 and 3 with no optional units. This represents a reduction in the number of 'courses' on offer in AH Mathematics and reduces the complexity of the framework considerably.

The Mathematics 1, 2 and 3 option was by far the highest uptake option and accounted for the vast majority of candidates who were entered for AH Mathematics in Diet 2002, with 2306 candidates entered for Mathematics 1, 2 and 3 out of a total of 2619 AH Mathematics entries. Universities also rated mathematics 1, 2 and 3 as the most important combination of units for an AH Mathematics course when awarding 1st year credits or offering direct entry to 2nd year degree courses.

AH Applied Mathematics

Recommendation: AH Applied Mathematics should consist of 3 distinct and discrete courses with no optional units. Each course would consist of three mandatory 40 hour units, the cores of which would remain as Statistics, Mechanics and Numerical Analysis.

AH Applied Mathematics: Statistics 1, 2 and Mathematics

AH Applied Mathematics: Mechanics 1, 2 and Mathematics

AH Applied Mathematics: Numerical Analysis 1, 2 and Mathematics

In the recommended course models a new broad based Mathematics unit would require to be developed. It would be the same unit for each of the three courses, the content of which would be selected from the mathematics content of Mathematics Unit 1, Mathematics Unit 2 and Mathematics Unit 3 from AH Mathematics.

This model represents the consensus view from the consultation and reflects the fact that the majority of candidates who were entered for an AH Applied Mathematics course chose an Applied core along with Mathematics 1 e.g. Statistic 1, 2 and Mathematics 1 as their combination of core and optional units to make up the course. The ability to choose Mathematics 1 as part of an Applied Mathematics course is not permitted under the new NQ course design criteria; therefore an alternative has to be found. This model retains a breadth of mathematics that universities and centres welcome and consider essential in any Applied Mathematics course.

The recommendations have been approved in principle by the National Qualifications Management Group within SQA. However, **only the AH Mathematics recommendation** will go forward to the Validation Panel on 17 December 2002 and thereafter to the National Qualification Task Group for final approval. If approved, centres will be notified by January 2003 in order to allow for timetable and course option choices to be made for session 2003/4 with **only the new AH Mathematics arrangements applying to the 2004 diet of examinations.**

Because of the need to develop a new broad based Mathematics unit for the AH Applied courses, the timescale for approval is more extended. There will be **no changes to the**

current AH Applied course for the 2004 diet of examinations. SQA will require time to develop new NABs, issue new specimen question papers if required, make changes to Arrangement Documents and notify centres of changes. Centres will be kept informed of progress towards approval of the recommendation for AH Applied Mathematics.

(ii) Design of questions in examination papers in Mathematics

Consideration has been given to this recommendation in the light of experience with recent Higher Mathematics examinations. As a result, the recommendation is now focussed more directly on assessment at Higher Level. Consultants have been commissioned to embark on the following three projects:

- (a) Investigate the effect on the percentage of candidates achieving each of the awards available by increasing the total number of marks available in the 2002 Higher Mathematics marking instructions. The first stage of this - amending the 2002 marking instructions and re-marking a sample of candidate scripts - has already been completed and a report is awaited.
- (b) Investigate the feasibility of building headroom into NAB assessments or incorporating NAB unit assessments into prelim type assessments. A report on the findings will be submitted to SQA.
- (c) To update the Additional Question Banks at Higher, Intermediate 1 and 2 and Advanced Higher by incorporating past paper questions, question analyses and marking schemes from the examinations which have taken place since the banks were issued. SQA will issue updates to the question banks in due course.

(iii) Advances in calculator technologies and capabilities

The Advanced Calculator Working Group has decided on a strategy based on an incremental approach to extending and accommodating the use of advanced calculators.

Accompanying this letter is a document referring to acceptable calculator solutions to examination questions. The document is essentially a re-issue of the Appendix document issued in October 1992 by the then Scottish Examination Board clarifying the amendment to rubric of Higher Papers I and II for examinations in and after 1993.

The importance of issuing this slightly amended appendix document now is that it emphasises that calculator solutions to some examination questions are currently acceptable, but, more importantly, it heralds the forthcoming issue of guidance on further acceptable calculator solutions to examination questions. This is currently under consideration by a subgroup of the Advanced Calculator Working Group.

The Intermediate 2 Mathematics marking instructions on the SQA Web-site (See item 2), include acceptable calculator solutions. As a result of other issues surrounding the 2002 Higher Mathematics examination, it was not possible to include similar acceptable calculator solutions in the Higher Mathematics marking instructions. This will be done in future.

2. Principal Assessor and Senior Moderator Reports

The Principal Assessor and Senior Moderator reports for the 2002 diet of examinations are to be found on the SQA Web-site-www.sqa.org.uk. The Principal Assessor reports also include the marking instructions for each level of the mathematics examinations.

3. Pass Rate for Higher Mathematics in 2002

On the SQA Web-site is a paper arising from the investigation into the fall in the pass rate in Higher Mathematics in 2002. One of the recommendations in the report is that information should be communicated to centres regarding:

- Progression rates data: Standard Grade and Intermediate 2 to Higher
- Appropriate presentations: advice to centres.

See the appendix to this letter for this information.

4. Algebra at Standard Grade Credit Level and Intermediate 2

Success at Higher depends heavily on a full in depth understanding and competence in the algebraic content of Standard Grade Credit level or Intermediate 2. Teachers of SG Credit or Int 2 students intending to progress to Higher are advised to give more attention to algebraic content than the minimum necessary for success in the SG Credit or Int 2 examinations.

5. Appeals evidence

Experience from the Appeals procedures this year indicates that many centres are still submitting inadequate evidence in support of appeals. The SQA document *Guidance on generating evidence for National Course Estimates and Assessment Appeals* sets out general and subject specific advice on this topic. The two paragraphs below are extracts from page 113 of the document which contains the guidance for Mathematics.

“The aim should be to get as close as possible to the balance of approximately 60% grade C questions and 40% of the marks allocated to questions which allow for a range of responses beyond grade C, as in the external assessment.

Evidence assembled in support of an Assessment Appeal should cover the content of **all** component Units. This should be compiled by combining the evidence gathered for the estimate with other assessment evidence generated towards the end of the Course, ie between the submission of Estimates and the examination (for the remaining component Unit). It should provide evidence of attainment as measure against the Grade Descriptions. It should always include assessment evidence to cover all component Units. High-scoring evidence generated in the NAB Unit assessments at the appropriate level would lend weight to an Appeal for a grade C award, particularly where it covers content not assessed by other assessment instruments.

I hope that you find the information in this letter helpful. If you require any clarification please do not hesitate to contact me.

Yours faithfully



Charles Penman
Qualification Manager

Appendix

During the investigation into the fall in the pass rate of the 2002 Higher Mathematics examination an outstanding issue came to light regarding progression links. The report from the Mathematics and Statistics Assessment Panel provides details on progression rates from Standard Grade and Intermediate 2 to Higher Mathematics. The progression rates from Standard Grade are well documented. However, Intermediate 2 is still bedding in and there is no consistent approach emerging on progression from Intermediate 2 to Higher. Conclusions about progression rates from Intermediate 2 cannot be drawn until more settled trends emerge. The extract from the report on the purpose of Intermediate 2 is as follows:

Purpose of Intermediate 2

This investigation has led SQA to make a closer inspection of the way in which centres are making use of the Intermediate 2 qualification. It is apparent that there are three main ways in which centres are using the Intermediate 2 qualification in Mathematics:

- As an exit qualification
- As a progression route to Higher Mathematics for candidates who achieve Standard Grade level 3 or 4
- As a replacement for Standard Grade Mathematics

Exit qualification

In 2001, 11792 candidates were entered for Intermediate 2 Mathematics, of which 1624 went on to Higher in 2002. This means that over 10,000 candidates used Intermediate 2 as an exit qualification. This was clearly one of the uses that Intermediate 2 was designed to fulfil and therefore already in year three of the qualification can be said to be very successful. These 10,000 candidates achieved a level in Mathematics that simply did not exist prior to the introduction of National Qualifications.

Progression route to Higher Mathematics for candidates who achieve Standard Grade level 3 or 4

Some centres are using Intermediate 2 as a progression to Higher Mathematics. In 2002, 1624 candidates came through to Higher from Intermediate 2. It is very important to note that the candidates entering Higher from this route are at present likely to have achieved a Grade 3 or possibly 4 in Standard Grade and as a group will be different from candidates from centres which replace Standard grade with Intermediate 2. The progression of candidates from Standard Grade 3 or 4 is well documented and is detailed in the tables which follow.

A replacement for Standard Grade Mathematics

Centres who opt to replace Standard Grade Mathematics with Intermediate 2 are at this time relatively few. The numbers are expected to increase next year and in future years as the effect of the relaxation of age and stage is realised. When these candidates come through to Higher there will be a clearly different situation to take account of as candidates who currently are presented for Credit are entered for Intermediate 2 in S4 then on to Higher in S5. It is our expectation that these candidates will perform as the current Credit level candidates do. This is an area that SQA will monitor closely to ensure that emerging trends are investigated.

SQA cannot stipulate entry requirements for courses. However, it has become clear that there is an increasing number of candidates being presented at an inappropriate level. SQA would

urge centres when entering candidates for courses to take account of the minimum recommended entry requirements for the course as specified in the Arrangements documents. To assist with the process of determining suitable entry levels, the extract from the report on 2000 and 2001 progression data for candidates from Standard Grade and Intermediate 2 to Higher is provided below.

Progression rates for candidates from Standard Grade and Intermediate 2 to Higher Mathematics

Progression in Mathematics: Standard Grade (2000) to Higher in (2001)

		Higher Mathematics Result 2001 (Pre-Appeal)											
		A		B		C		Comp	No Award		No Result		Total
		1	2	3	4	5	6	76	8	9	No Result		
SG Mathematics Result 2000	1	1,486	1,654	1,715	1,559	1,259	878	536	326	256	47	9,716	
	2	10	53	147	372	604	746	746	624	906	196	4,404	
	3	0	0	0	7	16	41	36	66	179	36	381	
	4	0	0	0	0	0	1	0	0	3	0	4	
Total		1,496	1,707	1,862	1,938	1,879	1,666	1,318	1,016	1,344	279	14,505	

		Higher Mathematics Result 2001 (Pre-Appeal)											
		A		B		C		Comp	No Award		No Result		Total
		1	2	3	4	5	6	76	8	9	No Result		
SG Mathematics Result 2000	1	15%	17%	18%	16%	13%	9%	6%	3%	3%	0%	100%	
	2	0%	1%	3%	8%	14%	17%	17%	14%	21%	4%	100%	
	3	0%	0%	0%	2%	4%	11%	9%	17%	47%	9%	100%	
	4	0%	0%	0%	0%	0%	25%	0%	0%	75%	0%	100%	
Total		10%	12%	13%	13%	13%	11%	9%	7%	9%	2%	100%	

Progression in Mathematics: Intermediate 2 (2000) to Higher in (2001)

		Higher Mathematics Result 2001 (Pre-Appeal)										Total
		A		B		C		Comp	No Award		No Result	
		1	2	3	4	5	6	76	8	9	No Result	
Int 2 Mathematics Result 2000	A	2	17	39	80	101	111	107	94	119	36	706
	B	1	2	6	17	33	52	72	108	193	56	540
	C	0	0	0	2	8	16	26	33	155	43	283
	Comp No Award	0	0	0	0	1	2	2	4	25	8	42
	Total	0	0	1	0	2	1	3	8	17	14	46
Total		3	19	46	99	145	182	210	247	509	157	1,617

		Higher Mathematics Result 2001 (Pre-Appeal)										Total
		A		B		C		Comp	No Award		No Result	
		1	2	3	4	5	6	76	8	9	No Result	
Int 2 Mathematics Result 2000	A	0%	2%	6%	11%	14%	16%	15%	13%	17%	5%	100%
	B	0%	0%	1%	3%	6%	10%	13%	20%	36%	10%	100%
	C	0%	0%	0%	1%	3%	6%	9%	12%	55%	15%	100%
	Comp No Award	0%	0%	0%	0%	2%	5%	5%	10%	60%	19%	100%
	Total	0%	0%	2%	0%	4%	2%	7%	17%	37%	30%	100%
Total		0%	1%	3%	6%	9%	11%	13%	15%	31%	10%	100%

Progression in Mathematics: Standard Grade (2001) to Higher in (2002)

		Higher Mathematics Result 2002 (Pre-Appeal)											
		A		B		C		Comp	No Award		No Result		Total
		1	2	3	4	5	6	76	8	9	No Result		
SG Mathematics Result 2001	1	1,333	1,928	1,542	1,245	1,298	889	679	317	436	55	9,722	
	2	4	45	136	204	455	556	601	524	1,212	174	3,911	
	3	0	0	1	6	15	19	40	28	141	16	266	
	4	0	0	0	0	0	0	0	0	3	1	4	
Total		1,337	1,973	1,679	1,455	1,768	1,464	1,320	869	1,792	246	13,903	

		Higher Mathematics Result 2002 (Pre-Appeal)											
		A		B		C		Comp	No Award		No Result		Total
		1	2	3	4	5	6	76	8	9	No Result		
SG Mathematics Result 2001	1	14%	20%	16%	13%	13%	9%	7%	3%	4%	1%	100%	
	2	0%	1%	3%	5%	12%	14%	15%	13%	31%	4%	100%	
	3	0%	0%	0%	2%	6%	7%	15%	11%	53%	6%	100%	
	4	0%	0%	0%	0%	0%	0%	0%	0%	75%	25%	100%	
Total		10%	14%	12%	10%	13%	11%	9%	6%	13%	2%	100%	

Progression in Mathematics: Intermediate 2 (2001) to Higher in (2002)

		Higher Mathematics Result 2002 (Pre-Appeal)										Total
		A		B		C		Comp	No Award		No Result	
		1	2	3	4	5	6	76	8	9	No Result	
Int 2 Mathematics Result 2001	A	2	15	26	36	75	91	68	82	153	13	561
	B	0	5	5	11	40	62	86	92	290	43	634
	C	0	0	3	3	9	8	32	40	207	32	334
	Comp No Award	0	0	1	0	0	0	4	4	32	7	48
	Total	1	1	0	0	1	1	5	3	28	7	47
Total		3	21	35	50	125	162	195	221	710	102	1,624

		Higher Mathematics Result 2002 (Pre-Appeal)										Total
		A		B		C		Comp	No Award		No Result	
		1	2	3	4	5	6	76	8	9	No Result	
Int 2 Mathematics Result 2001	A	0%	3%	5%	6%	13%	16%	12%	15%	27%	2%	100%
	B	0%	1%	1%	2%	6%	10%	14%	15%	46%	7%	100%
	C	0%	0%	1%	1%	3%	2%	10%	12%	62%	10%	100%
	Comp No Award	0%	0%	2%	0%	0%	0%	8%	8%	67%	15%	100%
	Total	2%	2%	0%	0%	2%	2%	11%	6%	60%	15%	100%
Total		0%	1%	2%	3%	8%	10%	12%	14%	44%	6%	100%