



# **AS and A Level Mathematics and Further Mathematics**

Consultation on Conditions and Guidance



December 2015

Ofqual 2015 75

## Responding to the consultation

### Your details

To evaluate responses properly, we need to know who is responding to the consultation and in what capacity. We will therefore only consider your response if you complete the following information section.

We will publish our evaluation of responses. Please note that we may publish all or part of your response unless you tell us (in your answer to the confidentiality question) that you want us to treat your response as confidential. If you tell us you wish your response to be treated as confidential, we will not include your details in any published list of respondents, although we may quote from your response anonymously.

Please answer all questions marked with a star\*

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**Would you like us to treat your response as confidential?\***

If you answer yes, we will not include your details in any list of people or organisations that responded to the consultation.

Yes  No

**Is this a personal response or an official response on behalf of your organisation?\***

Personal response (please answer the question ‘If you ticked “Personal response”...’)

Official response (please answer the question ‘If you ticked “Official response”...’)

**If you ticked “Personal response”, which of the following are you?**

Student

Parent or carer

Teacher (but responding in a personal capacity)

Other, including general public (please state below)

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**If you ticked “Official response”, please respond accordingly:**

**Type of responding organisation\***

Awarding organisation

Local authority

School or college (please answer the question below)

Academy chain

Private training provider

University or other higher education institution

- Employer
- Other representative or interest group (please answer the question below)

**School or college type**

- Comprehensive or non-selective academy
  - State selective or selective academy
  - Independent
  - Special school
  - Further education college
  - Sixth form college
  - Other (please state below)
- 

**Type of representative group or interest group**

- Group of awarding organisations
- Union
- Employer or business representative group
- Subject association or learned society
- Equality organisation or group
- School, college or teacher representative group
- Other (please state below)

MEI is a charity and a membership organisation. It is an independent curriculum development body for mathematics. It is a major provider of mathematics teaching and learning resources, and of mathematics CPD for secondary school and post-16 mathematics teachers.

MEI developed and manages the DfE-funded Further Mathematics Support Programme.

MEI developed the current OCR(MEI) suite of AS/A level Mathematics and Further Mathematics qualifications which are administered by OCR.

**Nation\***

England

Wales

Northern Ireland

Scotland

Other EU country: \_\_\_\_\_

Non-EU country: \_\_\_\_\_

**How did you find out about this consultation?**

Our newsletter or another one of our communications

Our website

Internet search

Other

\_\_\_\_\_

**May we contact you for further information?**

Yes  No

## Questions

**Question 1: To what extent do you agree or disagree that the proposed assessment objectives are appropriate for AS and A level mathematics and further mathematics?**

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

Please explain your reasons:

We welcome the tidying up of assessment objectives which has taken place since the last consultation, but have two concerns.

The title of AO2 is 'Reason, interpret and communicate mathematically'. It is not clear that the bullet points contain anything which could be construed as interpreting, whereas interpreting is mentioned in AO3 bullet point 2.

In AO3 it is not clear where the modelling equivalent of 'interpret solutions in the context of a problem' is covered. When the mathematical answer is interpreted in the original context, is this covered by 'use mathematical models' or by 'evaluate the outcomes of modelling in context'? This should be clarified.

**Question 2: To what extent do you agree or disagree that the proposed weightings of the assessment objectives are appropriate for AS mathematics?**

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

Please explain your reasons:

The weightings seem to be achievable and to reflect the intentions of the curriculum reform.

The  $\pm 2\%$  tolerance for each AO is a much more sensible approach than the previously suggested rule.

**Question 3: To what extent do you agree or disagree that the proposed weightings of the assessment objectives are appropriate for A level mathematics?**

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

Please explain your reasons:

We have not heard any convincing reason why A level Mathematics should have different weightings from AS Mathematics, and would prefer the weightings to be 60/20/20, with the  $\pm 2\%$  tolerance.

We are concerned that the increased weighting towards AO2 and AO3 for A level Mathematics will result in the qualification being more demanding, which is not the intention of the reform. Our evidence for this is our own attempts to write question papers which fit the weightings.

**Question 4: To what extent do you agree or disagree that the proposed weightings of the assessment objectives are appropriate for AS further mathematics?**

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree

Strongly disagree

Please explain your reasons:

The approach to the balance between AO2 and AO3 is very sensible, allowing flexibility between different routes.

**Question 5: To what extent do you agree or disagree that the proposed weightings of the assessment objectives are appropriate for A level further mathematics?**

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

Please explain your reasons:

We have not heard any convincing reason why A level Further Mathematics should have different weightings from AS Further Mathematics, and would prefer the weighting for AO1 to be 60%, with a  $\pm 2\%$  tolerance.

Our experience of writing question papers to match the proposed AO1 weighting is that these papers are more difficult than the current A level Further Mathematics standard.

**Question 6: To what extent do you agree or disagree that we should introduce a Condition which requires exam boards to comply with the relevant subject content – including the two proposed new appendices – and assessment objectives?**

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

Please explain your reasons:

This is an essential part of Ofqual's regulation of the qualifications.

**Question 7: To what extent do you agree or disagree that we should introduce guidance which clarifies that awarding organisations should explain and justify in their assessment strategies how their qualification design reflects the 'Overarching themes' and 'Use of technology' sections of the subject content?**

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

Please explain your reasons:

Guidance is needed, but it must be robust. We have lost an opportunity to embed a consistent approach to problem solving, modelling and the use of technology in the curriculum and in assessment. An important reason for this lost opportunity is that Ofqual announced a year ago that non-exam assessment is not necessary in AS/A level Mathematics because no part of the subject content requires it. It is MEI's view, based on considerable experience of the use of non-examination assessment in A level Mathematics, that mathematical problem-solving and modelling could be better assessed through non-examination assessment, as they often are in Higher Education; furthermore, no attempt has been made to learn how technology could permeate assessment as well as the curriculum. Given the well-known effects of backwash from examinations, it is entirely predictable that the outcome will be that many learners will not have access to the full problem solving and modelling aspects of the intended curriculum and will not follow a curriculum permeated with the use of technology. The approach outlined in sections 3.8 – 3.10 is not sufficient to ensure the curriculum intentions of the reform, and the UK will remain behind other successful jurisdictions in this regard.

**Question 8: To what extent do you agree or disagree that we should introduce guidance which clarifies how awarding organisations should interpret our assessment objectives?**

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

Please explain your reasons:

Clear strong guidance is vital to ensure a common understanding of what the assessment objectives mean and how they should be implemented.

**Question 9: To what extent do you agree or disagree that we should allow the first exams for new mathematics A levels in summer 2018 (at the end of the first year of teaching)?**

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

Please explain your reasons:

This seems the fairest way of dealing with the matter. There would need to be appropriate measures to ensure that Learners are not entered for the old and new A levels in the same series. The proposed arrangements for resits for the legacy A levels means that the door is being opened for students starting the course in September 2017 to follow the current specifications.

**Question 10: To what extent do you agree or disagree with our proposed approach to regulating the sampling of subject content in AS and A level mathematics?**

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

Please explain your reasons:

The different content statements within each content heading in the DfE documents are not of equal importance, and would not be considered so by ALCAB. For example, in the non-bold sentence in E3 about exact values for sin, cos and tan, there are 17 facts to be known (infinitely many if you include 'and multiples thereof'). It cannot be sensible to think that knowledge of each of these will be assessed within a small number of assessments; nor the domain and range and graphs of each of the six functions in E4; nor the eleven formulae, with proofs, implicit in the first sentence of E6. They are important facts and techniques for learners to be familiar with because they come up in solving problems. It would be inappropriate to construct artificial questions so as to assess each of them every few years. It would be appropriate to insist that each of these is dipped into regularly, but not in all their detail.

**Question 11: To what extent do you agree or disagree with our proposed approach to regulating the use and assessment of large data sets in AS and A level mathematics?**

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly disagree

Please explain your reasons:

Many teachers will only learn about the reform through exam boards, some of whom are opposed to this aspect of the reform. This guidance must ensure that exam boards cannot minimise the intended effect of the reforms in classrooms. This would not be acceptable.

We are concerned about para 3.25: 'This section sets clear expectations that exam boards will design their specifications to include one or more large data sets which schools will be expected to use when teaching statistics, and that assessments should reflect this.' This could be read as meaning that the large data sets to be used are laid down in the specification, and so do not change from year to year. This is not a requirement of the DfE subject content, and we think it highly unlikely that this is ALCAB's intention. It would restrict exam boards' flexibility unnecessarily. An exam board might wish to issue a fresh data set every year to keep the data relevant and up to date and the questions unpredictable; our view is that data sets should be replaced periodically. The expectation should be that exam boards justify their policy of choice of data sets in their assessment strategy, describing how they will mitigate against the risk of predictable questions if they do not renew the data set and against the risk of centre confusion if they do.

We note again, referring to para 3.28, how much more satisfactory it would be from a validity point of view to assess the statistical problem solving cycle using real data with access to technology in non-exam assessment.

**Question 12: To what extent do you agree or disagree with our proposed approach to regulating non-core content in AS and A level further mathematics?**

Strongly agree

Agree

Neither agree nor disagree

Disagree

Strongly disagree

Please explain your reasons:

We very much welcome the fact that Ofqual is trying to accommodate the intention that there may be different optional routes through Further Mathematics, and we welcome the insistence on exam boards justifying the equivalent levels of demand for different routes through the same qualification.

We believe that the approach to the choice of optional content is inadequate, and give Decision Maths as an example.

The place of Decision Maths within further mathematics is highly controversial. In previous reforms of AS/A level Mathematics and Further Mathematics there was considerable discussion between stakeholders, including exam boards, about the place and content of Decision Maths. This has been replaced by each exam board doing its own preparation in secret, having to satisfy a small number of Ofqual experts (who may well have no expertise in the particular option being discussed) who come to their judgement in secret. There are no clear criteria for what is acceptable. Leaving exam boards to find their own support from HE and employers leaves Ofqual having to evaluate the quality of this support in what is a hotly-debated area.

This approach is highly unsatisfactory. There is a high risk that what is accredited may not be in the best interests of the young people who take the qualifications.

We regret that we are in this position, which we believe has arisen because of the fractured nature of the reform process – the curriculum and assessment arrangements being developed by separate bodies. This cannot be an excuse for poor outcomes.

All that is written above applies equally, though perhaps less controversially, to other domains which exam boards may choose to offer in Further Mathematics.

**Question 13: Do you have any comments on our proposed Conditions and requirements for AS and A level mathematics?**

Yes  No

See responses to questions 1 and 3 for comments about the assessment objectives and their weightings.

See response to question 10 for comments about coverage of the detailed content statements.

**Question 14: Do you have any comments on our proposed Conditions and requirements for AS and A level further mathematics?**

Yes  No

See responses to questions 1, 5 and 10 above.

The sentence 'Any optional content must be at the same level of demand as the prescribed core' is ill-defined. The same content is being used for AS and for A level qualifications, so it is rather hard to know what the phrase means. Although the mathematics community has been opposed to this for many years, we are now required to assess the same content at AS and at A level standard. Does the phrase about level of demand of content refer to assessment, or is it in some way independent of it? We would prefer the phrase 'Any optional content must be capable of being satisfactorily assessed at the same level of demand as the prescribed core'.

We welcome the flexibility given to exam boards to propose different weightings for different routes through the Further Mathematics qualifications.

We believe that a condition is required to regulate the implementation of paragraph 7 from the DfE content for Further Mathematics, and other issues regarding overlap and dependency between Mathematics and Further Mathematics. It is inevitable that there will be overlap and dependency between the two pairs of qualifications, and it would seem sensible that awarding organisations are required to show in their assessment strategy how this is managed in the design of the specification and in the setting of question papers.

**Question 15: Do you have any comments on our proposed guidance for AS and A level mathematics?**

Yes  No

See previous responses about technology, large data sets and overarching themes.

In the guidance on Questions/tasks targeting large data sets, the second bullet point should include reference to statistical diagrams as well as summary statistics. E.g. 'use selected data from, or summary statistic or statistical diagrams based on, the prescribed...'.  
Guidance on AO1: this is fine.

Guidance on AO2

The given definitions of mathematical argument, deduction and inference are contentious. In particular 'inference' has a wider meaning than that given in the guidance. We suggest changing the wording to '**Inference** includes the process of reasoning from relative or partial evidence to results that are likely to be correct'; this involves the least change while avoiding writing something which is incorrect.

Guidance on AO3

'Translate problems may involve...'. The second sentence 'It includes identifying...' should read 'It may include...'. Similarly in the last sentence of the guidance beginning 'Translate situations in context...'.

'Within strand 2 and 5, where appropriate...' This guidance is welcome, though targeting it in every set of assessments will be hard to achieve. It is particularly challenging in Further Mathematics where, depending on the structure which exam boards choose, it will have to be targeted in either a mandatory paper or in every optional paper.

'Taken together .... at least 40% ...' This works for A level Mathematics because of the compulsory mechanics and statistics sections.

'Each set of assessments ...complete problems...' This guidance is very welcome.

'Within each set of assessments ...extended questions...'. This guidance is very welcome.

More guidance is needed on AO 3.3, 3.4, 3.5 and the relationship between them. It seems as though the threshold for modelling (3.3, 3.4 and 3.5) is rather lower than for problem-solving (3.1, 3.2). There are several places in mechanics and statistics where Learners only have one model to use, so they will use it 'unthinkingly', whereas a task being credited against 3.1 will require some decision/choice between processes, techniques or methods. The use of a context may well distinguish it from AO 1.1, but often there is little modelling going on.

The guidance is not clear as to whether the context in 3.3 can be a mathematical context. We consider that a spreadsheet or a program can be a model for a mathematical situation, even in the absence of a real-world context. Nothing in the conditions or guidance precludes this, but if our interpretation is incorrect then this needs to be made clear.

**Question 16: Do you have any comments on our proposed guidance for AS and A level further mathematics?**

Yes  No

See response to question 15, most of which applies here as well.

For Further Mathematics, it is particularly hard to meet the rule about complete modelling questions in each set of assessments – some of the optional Further Mathematics routes may have only 10% AO3; if 20% of this 10% has to be modelling it would be only 2% of the qualification. To insist that this 2% has to include all of AO3.3, 3.4 and 3.5 in all optional routes is unreasonable. If it is done in the

compulsory content, we suspect that there are a relatively small number of question types possible and this will lead to predictability in assessment.

The guidance on weightings for AO 2 and 3 seems clear and sensible, though it is not clear why some of it is guidance rather than requirements.

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**Question 17: Do you have any comments on DfE’s proposed new appendices to the subject content for mathematics and further mathematics?**

Yes  No

The status of the Notation document needs to be clear, and should be the same as for the current specifications. Suitable wording would be *This document gives the notation to be used in AS/A level Mathematics and Further Mathematics, where appropriate.*

Mathematical formulae required to be learned. This is a helpful document. There is a risk that the introductory wording rules out perfectly acceptable questions which ask for the proof of a result in the list. Wording such as this is needed: *These formulae must not be given to candidates in any examination for AS/A level Mathematics, unless as the starting point for a proof or as a result to be proved. Candidates are expected to remember the formulae which are relevant to the qualification they are sitting.*

**Question 18: We have not identified any ways in which the proposals for AS and A level mathematics and further mathematics would impact (positively or negatively) on persons who share a protected characteristic.<sup>1</sup> Are there any potential impacts we have not identified?**

Yes  No

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<sup>1</sup> ‘Protected characteristic’ is defined in the Equality Act 2010. Here, it means disability, racial group, age, religion or belief, pregnancy or maternity, sex, sexual orientation and gender reassignment.

**Question 19: Are there any additional steps we could take to mitigate any negative impact resulting from these proposals on persons who share a protected characteristic?**

Yes  No

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**Question 20: Have you any other comments on the impacts of the proposals on students who share a protected characteristic?**

Yes  No

.....

.....

## **Accessibility of our consultations**

We are looking at how we provide accessible versions of our consultations and would appreciate it if you could spare a few moments to answer the following questions. Your answers to these questions will not be considered as part of the consultation and will not be released to any third parties.

**We want to write clearly, directly and put the reader first. Overall, do you think we have got this right in this consultation?**

Yes  No

**Do you have any comments or suggestions about the style of writing?**

Yes  No

.....

**Do you have any special requirements to enable you to read our consultations? (for example, screen reader, large text, and so on)**

Yes  No

**Which of the following do you currently use to access our consultation documents? (select all that apply)**

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- Braille reader
- Screen magnifier
- Speech-to-text software
- Motor assistance (blow-suck tube, mouth stick, and so on)
- Other .....

**Which of the following document formats would meet your needs for accessing our consultations? (select all that apply)**

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- Accessible web pages
- Large-type PDF (16 point text)
- Large-type Word document (16 point text)
- eBook (Kindle, iBooks, or similar format)
- Braille document
- Spoken document

Other .....

**How many of our consultations have you read in the last 12 months?**

1

2

3

4

5

More than 5

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