

GCE AS AND A LEVEL MATHEMATICS AND GCE AS AND A LEVEL FURTHER MATHEMATICS



**Summary of decisions and analysis of responses
to our consultation on reforming GCE AS and A
Level Mathematics and GCE AS and A Level Further
Mathematics for first teaching in September 2017**

Summary of decisions and analysis of responses to our consultation on reforming GCE AS and A Level Mathematics and GCE AS and A Level Further Mathematics, for first teaching in 2017

Executive Summary

Between 4 April and 15 May 2016, Qualifications Wales consulted on proposals for a reformed AS and A Level Mathematics qualification and an AS and A Level Further Mathematics qualification to be Approved for first teaching in Wales from September 2017. A copy of the consultation proposals and questions is available at [This Link](#).

In July 2016 we published Approval Criteria for GCE AS and A Level Mathematics (2016)¹ and Approval Criteria for GCE AS and A Level Further Mathematics (2016)², which set out the detailed requirements for how the reformed qualifications should be designed and assessed. The requirements are informed by the responses to our online consultation and by views expressed by learners through a supplementary engagement exercise.

This report summarises the responses we received to the consultation of the proposals and explains the decisions that we took in light of these, which are reflected in the Approval Criteria for GCE AS and A Level Mathematics (2016)¹ and Approval Criteria for GCE AS and A Level Further Mathematics (2016)².

This report is available in English and in Welsh. Respondents' comments have been translated, where appropriate, in accordance with the language of the report.

Percentages used throughout this document have been rounded to the nearest whole number.

Background

AS and A Level Mathematics and AS and A Level Further Mathematics qualifications are being reformed in Wales for first teaching from September 2017, as part of a wider programme of reforms to GCSEs, AS and A Levels. The only awarding body who will develop and offer the reformed AS and A Level Mathematics and AS and A Level Further Mathematics qualifications in Wales will be WJEC, as it is the only awarding body who have agreed to develop reformed AS and A Levels designed specifically for award in Wales.

The proposals on which we consulted were developed through engagement with a number of stakeholders including the awarding body WJEC, schools and further education institutions (FEIs), higher education institutions (HEIs) and the Welsh Government (WG).

¹ [Approval Criteria for GCE AS and A Level Mathematics](#)

² [Approval Criteria for GCE AS and A Level Further Mathematics](#)

Summary of proposals and decisions

Subject aims and objectives

We proposed a set of aims and objectives for the reformed qualifications. In the Approval Criteria, we have made some small amendments to the final wording of the subject aims and objectives to improve the clarity of the statements. **Subject content**

We proposed that the content to be assessed in the new qualification should adopt the recommendations set out by the A Level Content Advisory Board (ALCAB).

Assessment Structure

We proposed that AS Mathematics and AS Further Mathematics must consist of two units and the A2 Mathematics and A2 Further Mathematics must consist of a minimum of two units and maximum of three units. In the published Subject Approval Criteria, we have decided not to specify the detail of the assessment structure for AS and A Level Mathematics and AS and A Level Further Mathematics. However, the Awarding Body will be required to follow the criteria outlined in the GCE AS and A Level Qualification Approval Criteria (2016)³.

Assessment objectives and weightings

We have adopted the proposed assessment objectives and weightings which we consulted on.

Non-examination assessment

We have adopted the proposal that the reformed qualifications will be fully assessed through written examinations only.

Use of large datasets in statistics

We adopted the proposal that the reformed qualifications will incorporate the use of large datasets in teaching and learning and learners will be assessed on these through written examinations.

Calculators

We adopted the proposal that scientific calculators should be permitted be permitted in assessments and that the specification should make clear which types of calculators will be permitted for any given assessment component, together with any restrictions on functionality.

Consultation responses

In total, forty-six respondents completed all, or part of, the online consultation for AS and A Level Mathematics and AS and A Level Further Mathematics. Of these, the majority of participants identified themselves as teachers or lecturers. We also received responses from a parent and two respondents who identified themselves as

³ [GCS AS and A Level Qualification Approval Criteria](#)

“other”. Nineteen respondents chose not to respond to the personal details section of the consultation.

Subject aims and objectives

For the reformed AS and A Level Mathematics and AS and A Level Further Mathematics qualification, we proposed retaining the current subject aims and learning outcomes, with learning outcomes being replaced with the term ‘objectives’. The proposed subject aims and objectives are as follows:

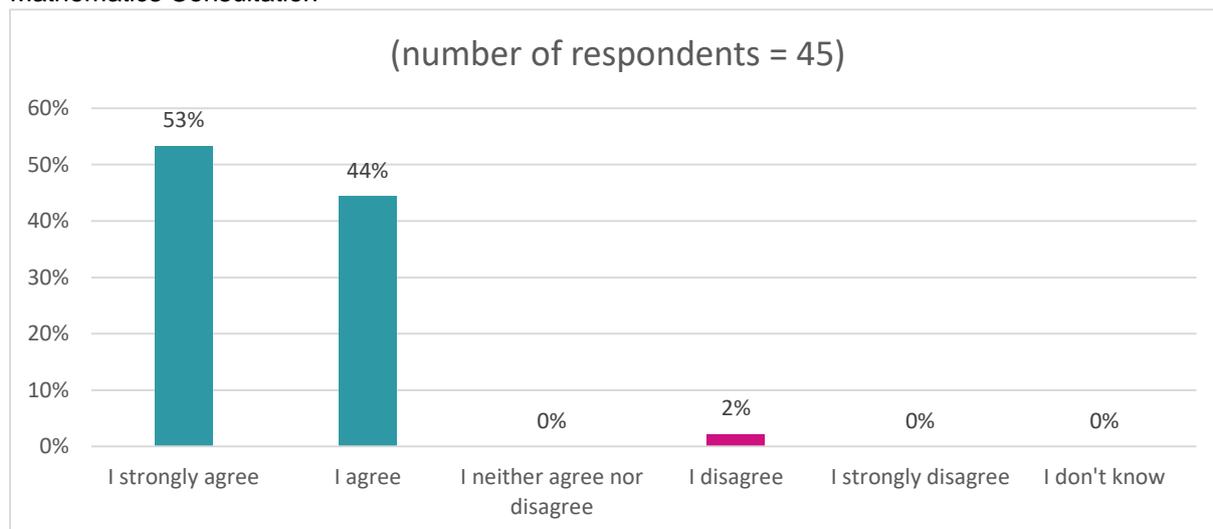
- AS and A Level specifications in Mathematics should encourage learners to:
 - develop their understanding of mathematics and mathematical processes in a way that promotes confidence and fosters enjoyment;
 - develop abilities to reason logically and recognise incorrect reasoning, to generalise and to construct mathematical proofs;
 - extend their range of mathematical skills and techniques and use them in more difficult, unstructured problems;
 - develop an understanding of coherence and progression in mathematics and of how different areas of mathematics can be connected;
 - recognise how a situation may be represented mathematically and understand the relationship between ‘real world’ problems and standard and other mathematical models and how these can be refined and improved;
 - use mathematics as an effective means of communication;
 - read and comprehend mathematical arguments and articles concerning applications of mathematics;
 - acquire the skills needed to use technology such as calculators and computers effectively, recognise when such use may be inappropriate and be aware of limitations;
 - develop an awareness of the relevance of mathematics to other fields of study, to the world of work and to society in general;

take increasing responsibility for their own learning and the evaluation of their own mathematical development. In our consultation, we asked:

Question 1: To what extent do you agree/disagree that the current subject aims should be used in the reformed A Level Mathematics and Further Mathematics?

As illustrated in Chart 1, nearly all (97%) of respondents agreed or strongly agreed with the proposed subject aims and objectives, with the remaining 2% of respondents disagreeing.

Chart 1. Responses to Question 1 of the AS and A Level Mathematics and AS and A Level Further Mathematics Consultation



- Respondents who agreed or strongly disagreed with the proposal commented that:
 - “the aims and learning objectives are comprehensive”
 - “the aims are perfectly reasonable as they stand”.

We have decided to retain the current aims and objectives which were consulted on, with a small amendment to the wording of subject aim 1.5 to improve the clarity of the statement:

“recognise how a situation may be represented mathematically and understand the relationship between ‘real world’ problems and standard and other mathematical models and how these can be refined and improved”

has been amended to,

“recognise how a situation may be represented mathematically and understand the relationship between ‘real world’ problems and mathematical models and how these can be refined and improved”.

The proposed subject aims and objectives, along with the amendment are reflected in the published *Approval Criteria AS and A Level for Mathematics (2016)*¹ and *Approval Criteria for AS and A Level Further Mathematics (2016)*². **Subject Content**

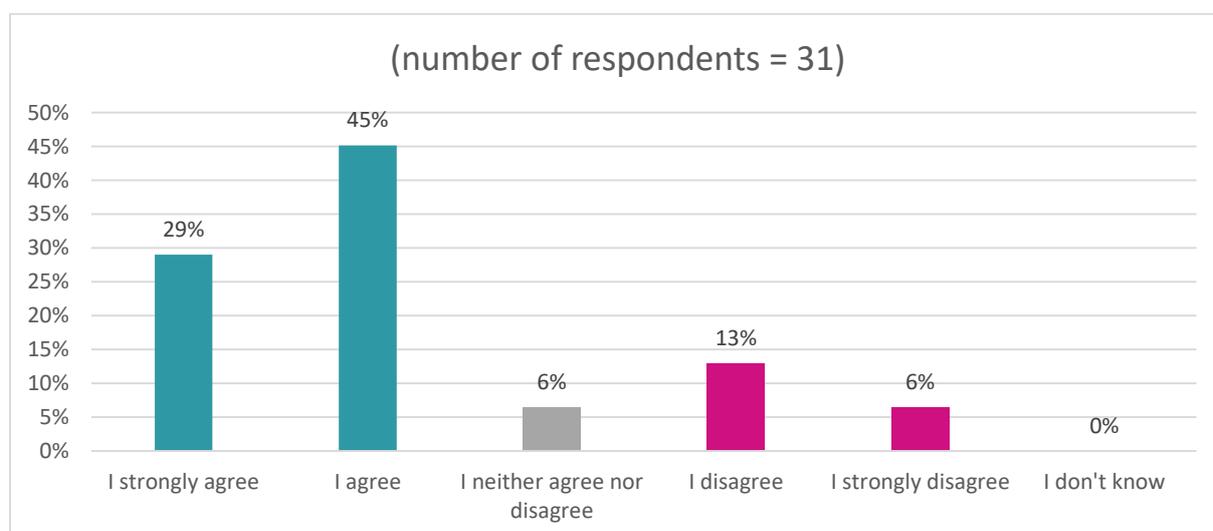
We proposed adopting the A Level Content Advisory Board (ALCAB) recommendations, and therefore the subject content prescribed by the Department for Education (DfE) in England, but with minor alterations to the subject content (namely in the statistics content of AS and A Level Mathematics and moving topics such as simple harmonic motion from the AS content to the optional A2 content in A Level Further Mathematics).

In our consultation, with reference to GCE AS and A Level Mathematics, we asked:

Question 2a: To what extent do you agree/disagree with the proposal described for A Level Mathematics in Wales?

As Chart 2 below shows, the majority (74%) of respondents agreed or strongly agreed with the proposal, 19% disagreed or strongly disagreed and 6% neither agreed nor disagreed.

Chart 2. Responses to Question 2a of the AS and A Level Mathematics and AS and A Level Further Mathematics Consultation



- Of the respondents who agreed or strongly agreed with the proposal, respondents stated the importance of parity with England to ensure portability of qualifications and equal access to Higher Education.
- Of the respondents who disagreed or strongly disagreed with the proposal, respondents raised concerns with:
 - staffing problems
 - disappointment with losing decision mathematics.
- Of the respondents who neither agreed nor disagreed with the proposal, one respondent noted the importance of parity and grades being transferable “regardless of country that exam was sat in”.

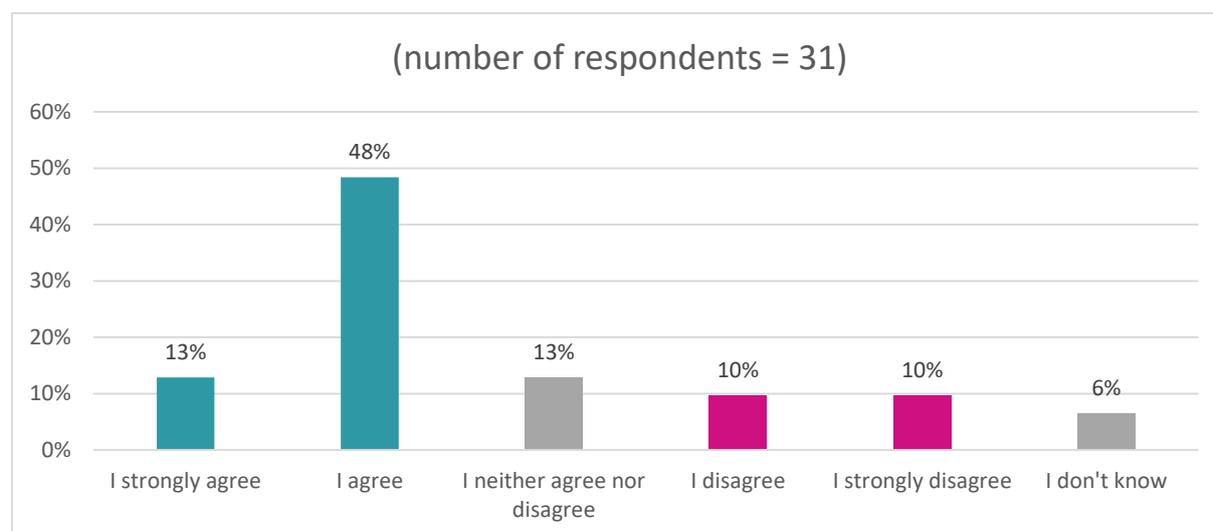
We have included the proposed subject content in the published *Approval Criteria for AS and A Level Mathematics (2016)*¹.

In our consultation, with reference to GCE AS and A Level Further Mathematics, we asked:

Question 2b: To what extent do you agree/disagree with the proposal described for A Level Further Mathematics in Wales?

As chart 3 below shows, 61% of respondents agreed or strongly agreed with the proposal, 20% disagreed or strongly disagreed, 13% neither agreed nor disagreed and 6% did not know.

Chart 3. Responses to Question 2b of the AS and A Level Mathematics and AS and A Level Further Mathematics Consultation



- Of the respondents who agreed or strongly agreed with the proposal, respondents stated they were “very glad that there is room for flexibility [sic]”.
- Of the respondents who disagreed or strongly disagreed, respondents stated:
 - “how it could be made possible to deliver Maths and Further Maths at the same time due to the vast difference in difficulties of the exams”.
 - “would need to see sample questions to assess this further”
 - “the prescribed content should be much higher”.
- Of the respondents who neither agreed nor disagreed with the proposal or did not know, respondents stated that they currently do not teach further mathematics which reflected their response.

We have decided to use the proposed subject content and this is reflected in the published *Approval Criteria for AS and A Level Further Mathematics (2016)*².

Assessment Structure

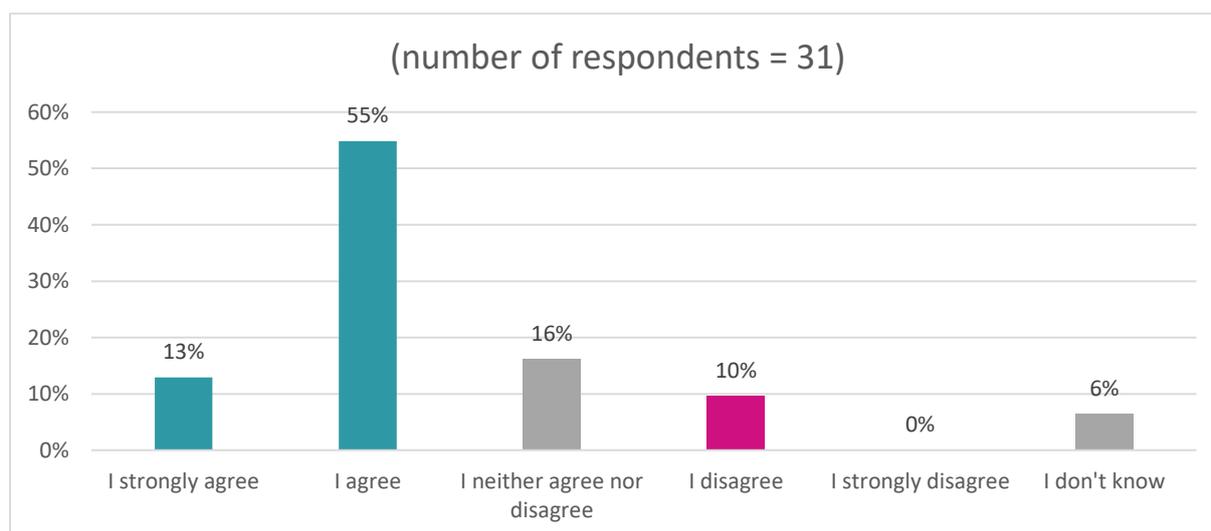
Qualifications Wales proposed that the AS Mathematics and AS Further Mathematics must consist of two units and the A2 Mathematics and A2 Further Mathematics must consist of a minimum of two units and a maximum of three units.

In relation to the assessment structure in GCE AS and A Level Mathematics, we asked:

Question 3a: To what extent do you agree/disagree with the proposed assessment structure for A Level Mathematics in Wales?

As Chart 4 below shows, 68% of respondents agreed or strongly agreed with the proposal, 10% disagreed, 16% neither agreed nor disagreed and 6% did not know.

Chart 4. Responses to Question 3a of the AS and A Level Mathematics and AS and A Level Further Mathematics Consultation



- Of the five respondents who neither agreed nor disagreed and the two respondents who did not know, it was noted that more detail in regards to the assessment structure would be needed before they were able to make a decision.
- Of the respondents who disagreed with the proposal, respondents stated that they felt there would be timetabling issues for centres.

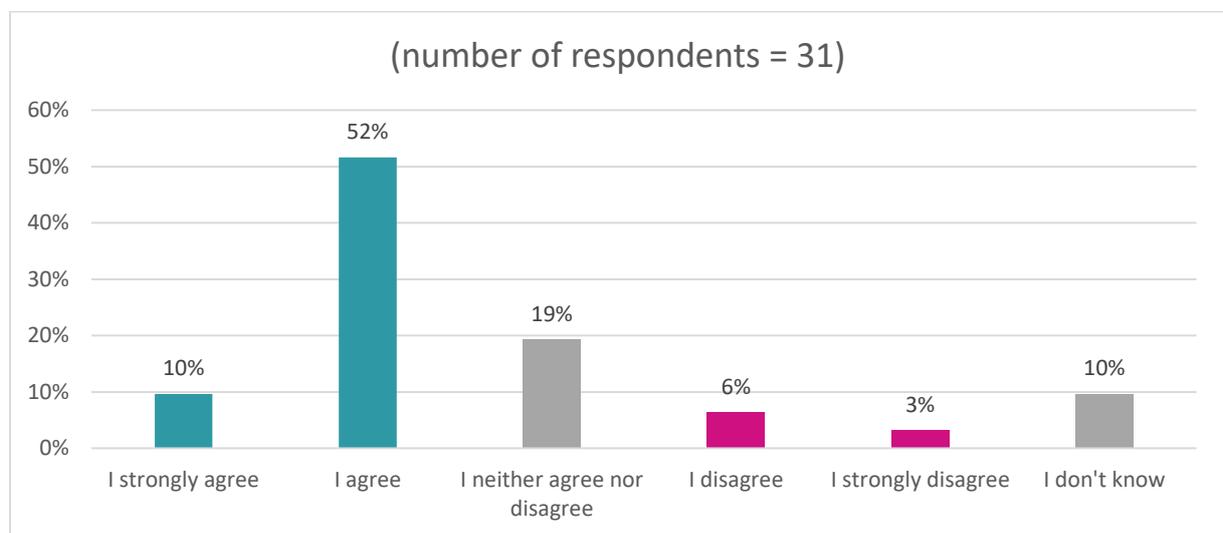
On review, we have decided not to specify the detail of the assessment structure within the subject approval criteria. However, the awarding body will be required to follow the criteria in regards to assessment structure outlined in the *GCE AS and A Level Qualification Approval Criteria (2016)*³.

In relation to the assessment structure in GCE AS and A Level Further Mathematics, we asked:

Question 3b: To what extent do you agree/disagree with the proposed assessment structure for A Level Further Mathematics in Wales?

As Chart 5 shows, the majority of respondents (62%) agreed or strongly agreed with the proposal, 9% disagreed or strongly disagreed, 19% neither agreed nor disagreed and 10% did not know.

Chart 5. Responses to Question 3b of the AS and A Level Mathematics and AS and A Level Further Mathematics Consultation



On review, we have decided not to specify the detail of the assessment structure within the subject approval criteria, however, the awarding body will be required to follow the criteria in regards to assessment structure outlined in the *GCE AS and A Level Qualification Approval Criteria (2016)*³.

Assessment objectives

For the reformed AS and A Level Mathematics and AS and A Level Further Mathematics qualifications, Qualifications Wales proposed the following assessment objectives:

Objective	Requirements
AO1	<p>Use and apply standard techniques</p> <p>Learners should be able to:</p> <ul style="list-style-type: none"> • select and correctly carry out routine procedures; and • accurately recall facts, terminology and definitions
AO2	<p>Reason, interpret and communicate mathematically</p> <p>Learners should be able to:</p> <ul style="list-style-type: none"> • Construct rigorous mathematical arguments (including proofs); • Make deductions and inference; • Assess the validity of mathematical arguments; • Explain their reasoning; and • Use mathematical language correctly. <p><i>Where questions/tasks targeting this assessment objective will also credit Learners for the ability to 'use and apply standard techniques' (AO1) and/or to 'solve problems within mathematical and other contexts' (AO3) an appropriate portion of the marks for the question/task must be attributed to the corresponding assessment objective(s).</i></p>
AO3	<p>Solve problems with mathematics and in other contexts</p> <p>Learners should be able to:</p> <ul style="list-style-type: none"> • Translate problems in mathematical and non-mathematical contexts into mathematical processes; • Interpret solution in the context of a problem, and, where appropriate, evaluate their accuracy and limitations; • Translate situations in context into mathematical models; • Use mathematical models; and • Evaluate the outcomes of modelling in context, recognise the limitations of models and, where appropriate, explain how to refine them. <p><i>Where questions/tasks targeting this assessment objective will also credit Learners for the ability to 'use and apply standard techniques' (AO1) and/or to 'reason, interpret and communicate mathematically' (AO2) an appropriate portion of the marks for the question/task must be attributed to the corresponding assessment objective(s).</i></p>

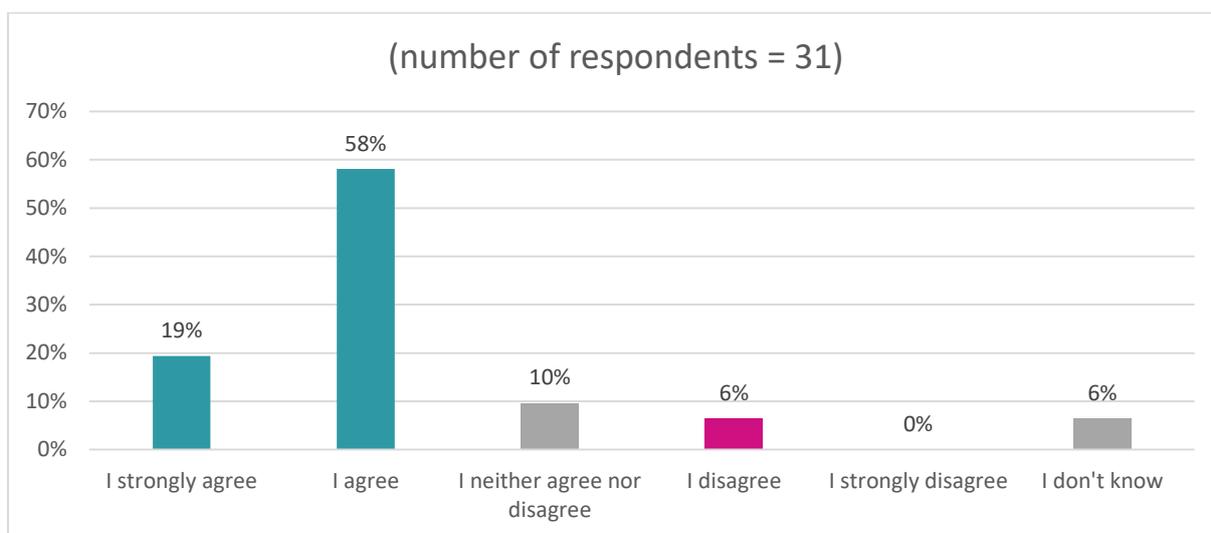
Table 1. showing the proposed assessment objectives for the reformed AS and A Level Mathematics and AS and A Level Further Mathematics.

In our consultation, we asked:

Question 4: To what extent do you agree/disagree that the proposed assessment objectives in England should apply in Wales?

As illustrated in Chart 6 below, 77% of respondents agreed or strongly agreed with the proposal, 6% disagreed, 10% neither agreed nor disagreed and 6% did not know.

Chart 6. Responses to Question 4 of the AS and A Level Mathematics and AS and A Level Further Mathematics Consultation



- Of the respondents who disagreed, respondents stated that:
 - “we need to establish our own objectives”
 - they disagreed with Mathematics becoming “ever more contextualised”.

The proposed assessment objectives are reflected in the published *Approval Criteria for AS and A Level Mathematics (2016)*¹ and *Approval Criteria for AS and A Level Further Mathematics (2016)*².

Assessment objective weightings

For the reformed AS and A Level Mathematics and AS and A Level Further Mathematics qualification, Qualifications Wales proposed the following assessment objective weightings:

Objective	Requirements	Mathematics			Further Mathematics		
		AS Level	A2 Level	Full A Level	AS Level	A2 Level	Full A Level
AO1	Use and apply standard techniques	50%	50%	50%	50%	50%	50%
AO2	Reason, interpret and communicate mathematically	25%	25%	25%	At Least 10%	At least 15%	At least 15%
AO3	Solve problems with mathematics and in other contexts	25%	25%	25%	At Least 10%	At least 15%	At least 15%

**Like Ofqual we propose to apply accepted tolerances to the prescribed assessment objective weightings to support assessment production.*

**With the assessment objective weightings in A Level Further Mathematics, the weightings of AO2 and AO3 are not fully specified. This is due to the optionality in 50% of the subject content.*

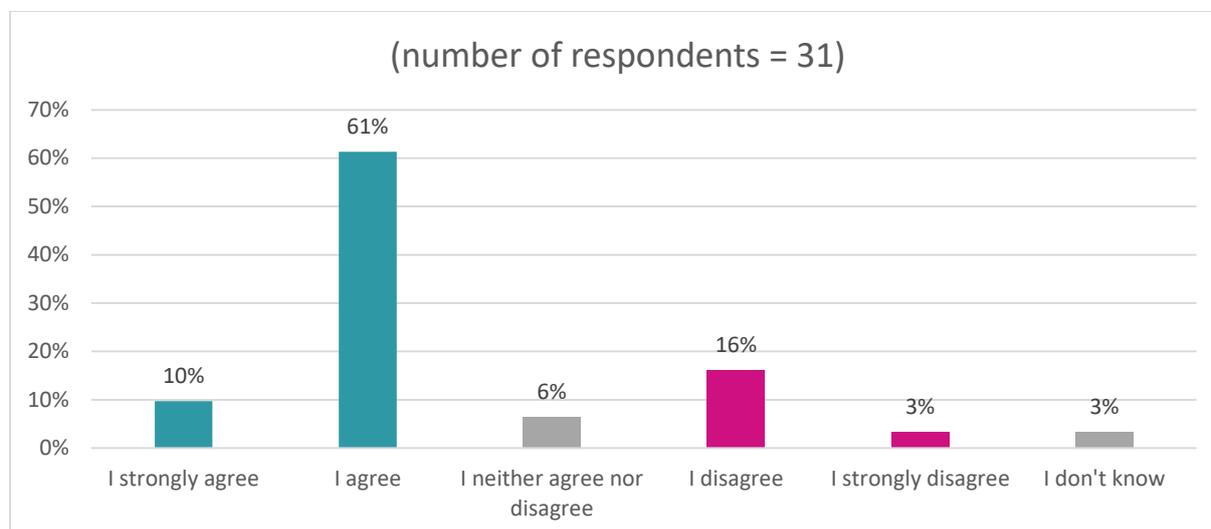
Table 2. showing the proposed assessment objective weightings for the reformed AS and A

Question 5: To what extent do you agree/disagree that these assessment objective weightings should apply in Wales?

Level Mathematics and AS and A Level Further Mathematics. In our consultation, we asked:

Chart 7 below shows that the majority (71%) of respondents agreed or strongly agreed with the proposal, 19% disagreed or strongly disagreed, 6% neither agreed nor disagreed and 3% did not know.

Chart 7. Responses to Question 5 of the AS and A Level Mathematics and AS and A Level Further Mathematics Consultation



- Of the respondents who agreed or strongly agreed with the proposal, a respondent stated that the “balance seems reasonable”.
- Of the respondents who disagreed or strongly disagreed with the proposal, respondents stated:
 - They felt that the weightings would “distort the papers out of recognition”
 - “English weightings are more appropriate”.

The proposed assessment objective weightings are reflected in the published *Approval Criteria for AS and A Level Mathematics (2016)*¹ and *Approval Criteria for AS and A Level Further Mathematics (2016)*².

Non-examination Assessment (NEA)

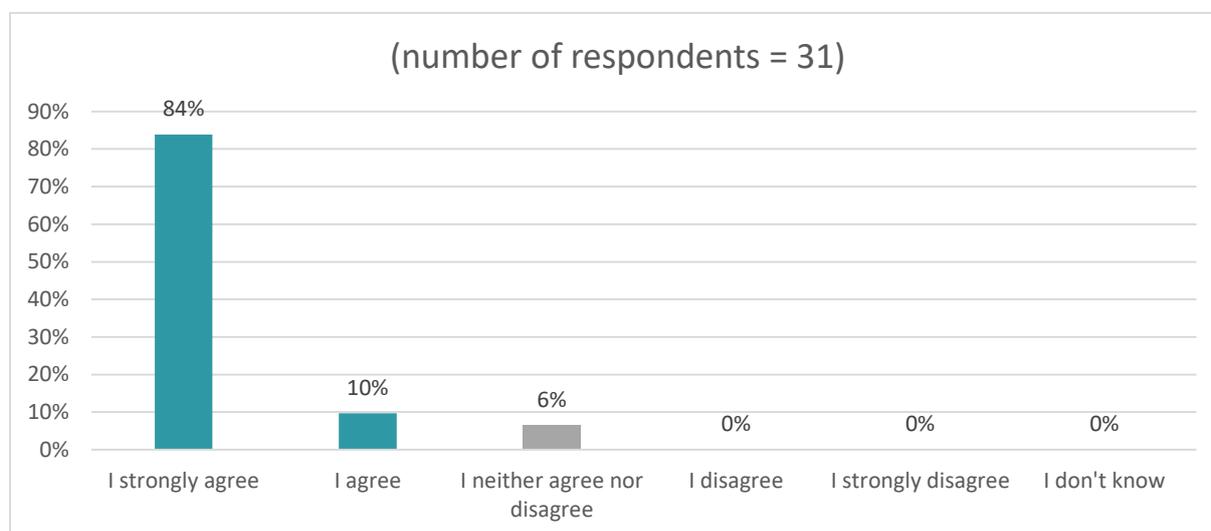
We proposed that the reformed AS and A Level Mathematics and AS and A Level Further Mathematics qualification should be fully assessed through written examinations.

In our consultation, we asked:

Question 6: To what extent do you agree/disagree that A Level Mathematics and Further Mathematics should be fully assessed through written examinations?

As shown in Chart 8 below, 94% of respondents agreed or strongly agreed with the proposal with the remaining respondents neither agreeing nor disagreeing.

Chart 8. Responses to Question 6 of the AS and A Level Mathematics and AS and A Level Further Mathematics Consultation



- Of the respondents who agreed or strongly agreed with the proposal, respondents suggest that NEA would be appropriate for statistical content.

The proposed non examination assessment structure is reflected in the published *Approval Criteria for AS and A Level Mathematics (2016)*¹ and *Approval Criteria for AS and A Level Further Mathematics (2016)*².

Use of large datasets in statistics

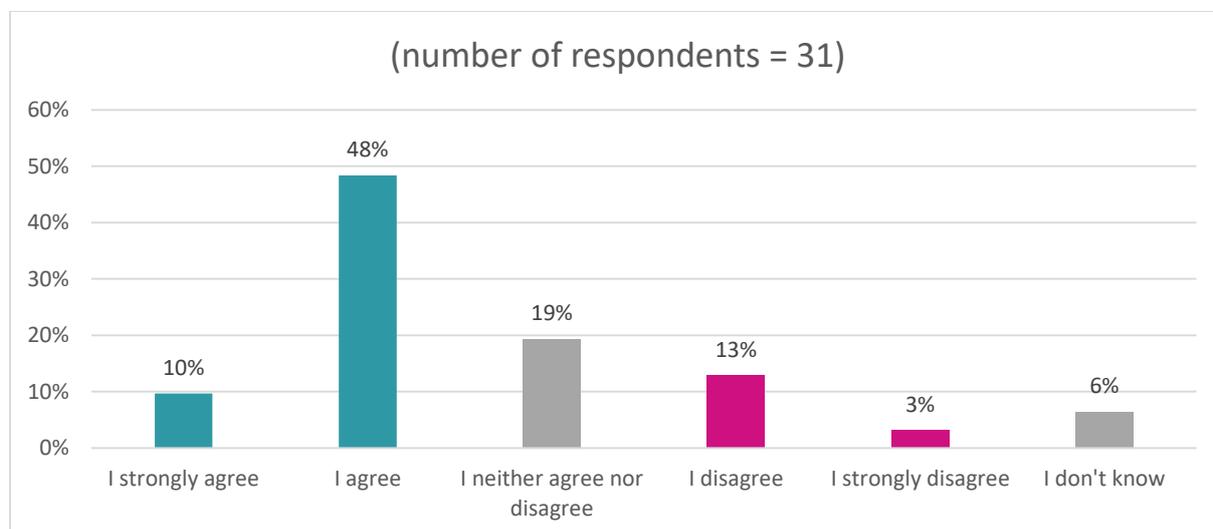
For the reformed AS and A Level Mathematics and AS and A Level Further Mathematics qualifications, we proposed that the A Level Mathematics and A Level Further Mathematics qualifications will incorporate the use of large datasets in teaching and learning and learners will be assessed on the skills obtained from such activities through examinations.

In our consultation, we asked:

Question 7: To what extent do you agree/disagree that the use of large datasets should be assessed in A Level Mathematics and Further Mathematics?

As Chart 9 below shows, the majority (58%) of respondents agreed or strongly agreed with the proposal. 16% disagreed or strongly disagreed, 19% neither agreed nor disagreed and 6% did not know.

Chart 9. Responses to Question 7 of the AS and A Level Mathematics and AS and A Level Further Mathematics Consultation



- Of the respondents who agreed or strongly agreed with the proposal, one respondent felt that “it is an appropriate use of Maths in the real world”.
- Of the respondents who disagreed or strongly disagreed with the proposal, respondents commented that datasets are something that is performed by technology and computers.

The proposed use of large datasets is reflected in the published *Approval Criteria for AS and A Level Mathematics (2016)*¹ and *Approval Criteria for AS and A Level Further Mathematics (2016)*².

Calculators

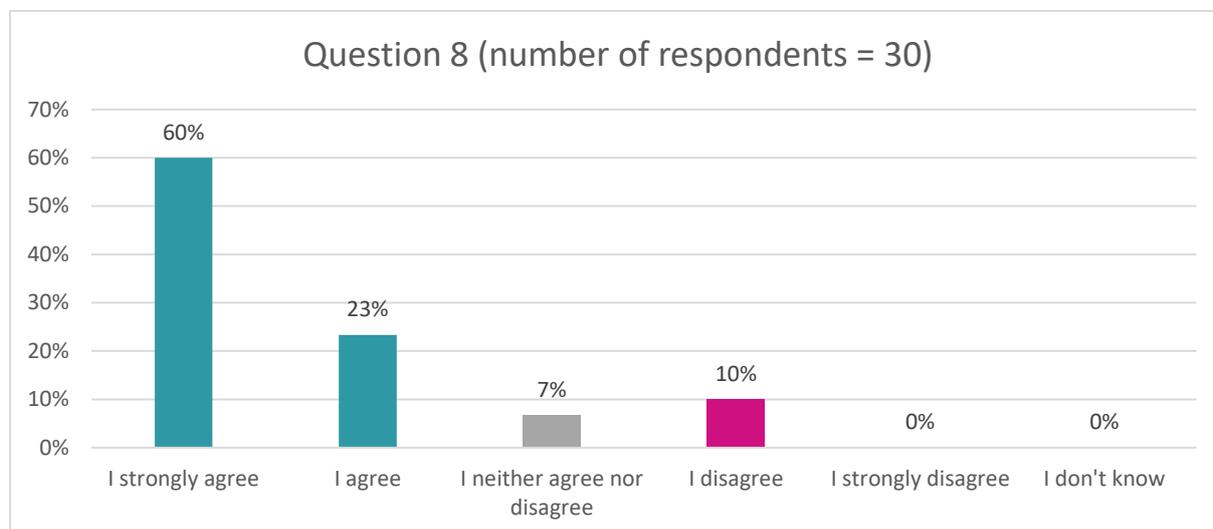
For the reformed AS and A Level Mathematics and AS and A Level Further Mathematics qualifications, we proposed that the use of scientific calculators should be permitted in assessments. To ensure transparency and fairness for all candidates we proposed that the specification should make clear which types of calculators will be permitted for any given assessment component, together with any restrictions on functionality.

In our consultation, we asked:

Question 8: To what extent do you agree/disagree that scientific calculators should be permitted in A Level Mathematics and Further Mathematics assessments?

As illustrated in Chart 10 below, 83% of respondents agreed or strongly agreed with the proposal. Ten percent disagreed and 7% neither agreed nor disagreed.

Chart 10. Responses to Question 8 of the AS and A Level Mathematics and AS and A Level Further Mathematics Consultation



- Of the respondents who agreed or strongly agreed with the proposal, respondents also expressed the desire for non-calculator aspects and an emphasis on mental arithmetic.
- Of the respondents who disagreed with the proposal, a respondent suggested having a non-calculator paper.

The published *Approval Criteria for AS and A Level Mathematics (2016)*¹ and *Approval Criteria for AS and A Level Further Mathematics (2016)*² reflects the proposal and the view of most respondents. **Support and Resources**

In all our consultations, we asked the following question:

What support and resources do you feel centres and teachers may require to achieve maximum readiness to deliver the revised specification? Please provide comments

Those who responded to this question highlighted, amongst others:

- the need for “sample materials” to demonstrate the range of possible questions
- support and training especially for the delivery of “handling large data sets”
- textbooks
- adequate time before the implementation of the new specifications.

We will share the points raised with the awarding body, consortia and Welsh Government.

Impact on respondents with protected characteristics

In all our consultations, we asked the following question:

Please highlight below if you feel any of this proposal has the potential to have a positive or negative impact on respondents with protected characteristics and whether any of the proposal would cause accessibility issues for learners in Wales.

For the reformed qualifications, no respondents highlighted any positive or negative impacts on individuals with protected characteristics.

Further information

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