

# A level maths – Maintenance of Standards Investigation: Regulatory Summary

# Contents

<b>Background.....</b>	<b>3</b>
<i>Strand 1 – statistical analysis .....</i>	<i>4</i>
<i>Strand 2 – comparing the difficulty of the 2018 and 2019 papers .....</i>	<i>4</i>
<i>Strand 3 – comparing student performance on reformed papers in 2018 and 2019.....</i>	<i>5</i>
<b>Summary and conclusions.....</b>	<b>6</b>

# Background

The reformed versions of the A level maths qualifications were available for first teaching from September 2017. Unique amongst A levels, candidates were allowed to certificate at the end of the first year of teaching, in summer 2018. These arrangements were in place due to the way in which candidates wishing to enter maths and further maths have historically structured their learning and assessment. Typically, students studying further maths enter for maths at the end of Year 12 followed by certification in further maths in Year 13.

In August<sup>1</sup> we announced our intention to investigate the reasons for the systematic and relatively large differences in the grade boundaries set in 2018 and 2019 for the reformed A level maths specifications. Boundaries in 2019 were, in general, substantially lower than in 2018.

We were clear at the time that we were confident in the 2019 awards, because the size of the entry (around 85,000 students) meant that the statistical predictions were very reliable and there was plenty of student work for senior examiners to scrutinise. In contrast, in the 2018 awards, there were only just over 2,000 students across three exam boards – mostly year 12 students – taking the reformed specification. This meant that the statistical evidence was less reliable. In addition, because these students tended to be very able mathematicians who were also studying further maths, they were clustered at the top grades, meaning that there was very little student work for senior examiners to review at the grade E boundary.

We wanted to understand why the grade boundaries were so different between the two years, once the full range of evidence from 2018 and 2019 was available.

Our maintenance of standards investigation was composed of three inter-related strands of work, as follows:

- Strand 1 – a statistical analysis of the results in 2018 and 2019, considering the results for year 12 and year 13 students separately, and comparing them to the legacy qualifications
- Strand 2 – a comparison of the difficulty of the 2018 and 2019 question papers, looking at judgements of question difficulty as well as data on how students performed on each of the questions
- Strand 3 – a comparison of student performance across 2018 and 2019

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<sup>1</sup> <https://www.gov.uk/government/news/guide-to-as-and-a-level-results-for-england-2019>

## Strand 1 – statistical analysis

In reformed qualifications, including for A level maths, our approach is to use statistics to carry forward the standard from the legacy qualifications, so that students are not disadvantaged by being the first to sit the new qualifications. In practice, this meant using predictions to carry forward the ‘value-added’ relationship between GCSE and A level maths, so that, in general, a student who would have achieved a particular grade in the legacy qualification would achieve the same grade in the reformed qualification.

Since the majority of students were in year 12, the predictions in 2018 were based on the value-added relationship between GCSE and A level maths for year 12 students in the legacy qualification. In 2019, predictions were (as is usual) based on year 13 students, as they were by far the majority entry.

In the legacy qualifications, the profile of grades obtained by year 12 students was skewed towards the top grades, because they tended to be the very able students. The profile of grades for year 13 students was far less skewed. In general, the small minority of year 12 students entered for A level maths tend, on average, to achieve higher grades than the substantial majority of year 13 students for maths. This has always been the case.

Our analysis suggests that the gap between the achievement of year 12 and year 13 students has got wider in the reformed specifications, largely as a result of the move to linear qualifications and hence the removal of the opportunity to re-sit AS units in year 13. The move to linear had much less of an impact on year 12 students because in both legacy and reformed qualifications, they took all their exams at the end of year 12.

In the transition to the reformed qualifications, we said we would use statistical predictions to compensate for structural changes to qualifications, so that students were not disadvantaged by being the first to sit new qualifications. We estimate that this compensation in 2019 for the move to linear and the removal of re-sitting opportunities explains about half of the difference in the 2018 and 2019 grade boundaries.

## Strand 2 – comparing the difficulty of the 2018 and 2019 papers

This strand of work looked at whether the lower grade boundaries were a result of more demanding papers in 2019. When grade boundaries are set, exam boards aim to take account of the relative difficulty of the papers, compared to previous years. If one year’s papers are more difficult, then grade boundaries will be lower.

We carried out a comparative judgement (CJ) exercise in which we asked A level maths teachers to judge the difficulty of individual questions. This was similar to the work we did to compare the difficulty of questions in the specimen papers.<sup>2</sup>

We also looked at data about how students actually performed on the individual questions in 2018 and 2019. However, it is more difficult to draw conclusions about question and paper difficulty because of the different cohorts in 2018 and 2019. For example, 2018 questions might have appeared to be easier because they were taken by a more able cohort.

We combined the data from the CJ exercise with the question performance data to estimate the differences in difficulty between the 2018 and 2019 papers. In 3 out of the 4 specifications, this suggests that the 2019 papers were more difficult and therefore that grade boundaries ought to have been lower to take account of that.

## Strand 3 – comparing student performance on reformed papers in 2018 and 2019

In this work, we looked at one paper per specification, choosing the paper which was judged to show the least difference in terms of expected difficulty between 2018 and 2019. Maths subject experts compared student performance, across the full grade range, on the 2018 and 2019 papers.

Making holistic judgements about the quality of the work across a whole paper can be challenging, particularly when judging work at grade E which tends to be more inconsistent. This work took into account these levels of uncertainty when drawing conclusions. A discernible difference in better student performance was identified in 3 of the 4 specifications at grade A in 2018 compared to 2019, with the same being true at grade E for 3 of the 4 specifications.

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<sup>2</sup> <https://www.gov.uk/government/publications/an-evaluation-of-the-item-difficulty-in-as-and-a-level-maths>

## Summary and conclusions

This work has revealed a number of interacting factors which led to the relatively large changes in grade boundaries in the reformed A level maths specifications between 2018 and 2019.

First, the move to linear qualifications removed the opportunity for year 13 students to re-sit AS units at the same time as taking A2 units. Of course, this move to linear was not limited to maths, but maths was unique in that a relatively large proportion of students did re-sit AS units in year 13, and the nature of the subject content is such that students are likely to do much better in AS units after an additional year's teaching.

Year 13 students taking the reformed A level maths had no such opportunity to re-sit part of the qualification. To some extent, therefore, the differences in the grade boundaries reflect this structural change.

Second, it does appear that the 2019 papers were, in general, more demanding. We had some feedback to that effect in the summer, but our investigation has allowed us to estimate the scale of the differences in difficulty. It is very likely that, even if the removal of re-sitting opportunities had not had such an impact, grade boundaries (for at least 3 of the 4 specifications) would have been lower in 2019 to take account of the increased difficulty of the 2019 papers.

The combination of the removal of re-sitting and more difficult papers in 2019 therefore meant that grade boundaries were, in general, lower in 2019 than in 2018.

We have considered with the exam boards whether there is a case to re-visit the grade boundaries set in reformed A level maths specifications in 2018. On balance, we believe there is not. Making any changes (to revise grade boundaries downwards) would introduce an unfair advantage for year 12 students taking the reformed A level in maths compared to those 17-year-olds in 2018 who took the legacy specifications (around 1,200 students). We believe that it is right to prioritise comparability of standards for a cohort within a year. We have therefore not asked any of the exam boards to revisit their 2018 awards.



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