The A Level Content Advisory Board

REPORT OF THE ALCAB PANEL ON MATHEMATICS AND FURTHER MATHEMATICS

July 2014

EXECUTIVE SUMMARY

The aim of the recommended revisions in mathematics content is to provide modern A levels that contain necessary material and that are also interesting to learn and teach. Although we have recommended significant changes, we were not seeking to make the qualifications harder. The ALCAB mathematics panel recommends that the content of the single mathematics A level be fully prescribed and has gone into considerable detail with the recommended content. The content itself is not radically different from the existing A level but making it a requirement would ensure consistency across awarding organisations. On a practical level it is key that co-teaching of pure mathematics between the single A level and AS level further mathematics should be achievable and the detailed content reflects this aim.

The AS levels in mathematics and further mathematics are welcomed by university departments and have considerable value in their own right. They should be supported and retained.

Further mathematics qualifications will contain a minimum amount of prescribed pure mathematics: 30% at AS level and 50% at A level. Flexibility has been left to allow students to specialise, awarding organisations to innovate and new strands to be introduced if needs be.

Background

Over the last decade the number of students taking A level mathematics has risen very substantially, from 50,612 in 2003 to 88,060 in 2013, an increase of 74%. There has been an even greater proportional increase in the uptake of further mathematics

over the same period, from 5,315 to 13,821, an increase of 160%. The numbers taking these A levels are the highest on record.

However, it is still the case that admissions tutors for a number of important user subjects, such as chemistry, economics and computer science, are not able to fill their places with students who have taken A level mathematics, even in highly rated universities. So welcome though the increases are, there is still a need for more students to take A level mathematics.

The same is true for further mathematics, where the key user subjects in higher education are mathematics, engineering and physics. Thus the proportion of new physics undergraduates who have taken further mathematics has risen from 11% to 30%, but still has a long way to go. Consequently we have been very conscious of the need to sustain the increases in numbers taking both A levels and the momentum that has built up with year-on-year increases.

There is widespread concern that the changes planned for A levels will reduce the number of those taking mathematics, and especially of those taking further mathematics. These concerns are highlighted in the Review of Specification Content of July 2013 that states “New qualifications will have to be carefully designed so that uptake of subject continues at existing levels”. There are also concerns over the scale of change required with the moves to linear qualifications. Since these topics range wider than the content of the qualifications we will convey them in a separate letter.

At the outset we identified a number of perceived problems with the current provision which university departments of mathematics would wish to see overcome or ameliorated:

- The mathematical thinking of the most able students is not developed.
- The distinction between A and A* grades seems based on the avoidance of careless slips rather than genuine mathematical ability, making it hard for admissions tutors to pick out the students with the greatest potential. The A* should be awarded for demonstrating understanding and flair, not the ability to do routine calculations accurately, and the assessments should be developed accordingly.
- It is not clear what applied mathematics students have learnt.

- Current statistics provision tends to focus on routine calculations at the expense of interpretation and understanding.

The Review of Specification Content of July 2013 also highlights the role that mathematics takes in the support of other disciplines, the requirement for problem solving skills, the core content for stand-alone AS levels, and the content of further mathematics. Our report aims to address these points.

However, only about 10% of those taking A level mathematics go on to become mathematics undergraduates; for most of the other 90% it will be a service subject. That raises quite different problems:

- The numbers taking A level mathematics are insufficient for the needs of higher education.
- Some mathematics students do not develop transferable skills.

Meeting the concerns of both groups of end-users is difficult to achieve within a single A level; some would argue that their needs are mutually incompatible. However, we believe that the existence of further mathematics qualifications makes it possible to design a provision that addresses both. The support and nurturing of further mathematics must therefore be taken very seriously.