DfE consultation on Additional reformed GCSE and A level subject content

(closing date 5 November 2015):

Response from the London Mathematical Society

Our comments relate to **Statistics (at GCSE and at A/AS level)**

The consultation process. Before presenting our response in 1 and 2 below we would like to express our concern at the procedures adopted in the reform of these qualifications. As with other recent reforms, the procedures make plain the lack (which we and others have often pointed out) of a body which oversees curriculum reform and development, ensuring proper, effective and transparent use of expertise as well as coherence and intellectual rigour.

Particular concerns include:

- The consultations on content and assessment are being made simultaneously. Normal procedure is first to agree content, and then to design an appropriate assessment.
- It is not clear who has drawn up the documents setting out the proposed content for these qualifications. One can merely infer something about this in the information about from Annex 1 of the consultation document where it lists those who were consulted (rather than those who were the primary writers).
- According to the consultation document 'Awarding organisations were unable to consult with all subject groups and we welcome the input of organisations, teachers and students in this public consultation'. This suggests that awarding organisations have drawn up the content. If this is correct, then a serious departure from proper procedure seems to have occurred. Policy for curriculum content is not supposed to be determined by these bodies, although of course they may be consulted.
- Consultation is at a late stage in proceedings (we have been told policy will be published two weeks after the closing date of the consultation). This is particularly serious given the admitted gaps in the consultation process at earlier stages.
- Apart from reference to GCSE Mathematics, which may be taken simultaneously with GCSE statistics, there is little sign that full account has been taken of current developments of the assessment of statistics in Mathematics qualifications including particularly Mathematics A-level (which will have a compulsory statistics element) or the new Core Maths qualifications (of which there is no mention).

1. A/AS level Statistics. We see no possible justification for including a specification for "Statistics AS/A level" within the current review.

1.1 The government's own "productivity plan" (July 2015) states clearly that:

> "the government will simplify and streamline the number of qualifications so that individuals have a clear set of routes which allow for progression to high level skills, rather than thousands of qualifications." (p. 25)

1.2 Statistics is now a compulsory part of all A/AS level "Mathematics" courses, which are currently taken by more than 160 000 students each year.

Statistics is also a major constituent of all "Core mathematics" syllabuses, which are being developed as the preferred numerate qualification for those who choose **not** to study mathematics at A/AS level.

1.3 Hence, the only conceivable reason for including a specification for "A/AS level Statistics" would be if there were a significant *additional* cohort of potential candidates, whose needs would not be addressed by the provision outlined in 1.2. **Current A/AS level provision suggests the precise opposite.**

[**Evidence supporting this claim:** As far as we can tell, there is currently just one A level in Statistics, which attracted 811 entries in 2015; and two AS levels – one attracting 1601 entries and the other attracting just 29 entries in 2015. Hence bland references in the consultation document to what AS and A levels in Statistics "build upon" (para 2), "encourage" (para 3), "assume" (para 4), "require" (paras 5-8), etc. – which give the impression that we are discussing well-established qualifications, which has to be replicated in any new regime, are thoroughly misleading.]

1.4 In these circumstances, if the government commitment to
"simplifying the number of qualifications so that individuals have a clear set of progression routes" means anything at all, then it would seem to imply that **the A/AS level Statistics specification should be discontinued.**

1.5 Statistics is widely used within many A-level subjects. We would also like to draw attention to recent report by ACME and The Royal Statistical Society on Embedding Statistics at A-level . This report does not seem to identify a role for A-level Statistics, or even mention it.

2. GCSE Statistics: Background. In contrast, there would seem to be positive reasons for retaining a GCSE Statistics qualification. However, the details relating to (a) the content specification and (b) its assessment need to be competently and openly drafted, widely scrutinised, and transparently adapted in the light of comments received. It is hard to see how this can be achieved under the present arrangement whereby the two interacting functions are handled separately – yet simultaneously – with a very short period allowed for comments to be assessed and acted upon.

The current draft, and the manner in which the work has been handled up to this point, should be unacceptable in an open society. The published timeline for first assessment may incline officials to "soldier on" regardless; but to do so would be wrong. Even though "GCSE Statistics" is a relatively minor qualification, the shortcomings in the drafting, and the apparent lack of discussion in the relevant community must be addressed as a matter of urgency.

2.1 The changed rules relating to GCSE results (where only the *first* result obtained contributes to certain school accountability measures) appear to have reduced the number of 'early entry' candidates (those taking GCSE Mathematics entries before the summer of Year 11). This is to be welcomed.

This trend has consequences for GCSE Statistics. In the past, those who achieved a reasonable GCSE Mathematics grade by the end of Year 10 were often "rewarded" by being entered for GCSE Statistics in Year 11. This was entirely inappropriate – but the practice seems to have diminished to some extent in recent years. (Between 2013 and 2015, early entries for GCSE Mathematics dropped by over 100 000, and the number of entries in Year 11 rose by over 100 000. In the same period,

entries for GCSE Statistics in Year 10 or below almost doubled to 29212, while entries in Year 11 fell from a high of 34730 in 2014 to 26597 in 2015. So it looks as though students are increasingly being entered for GCSE Statistics *before* taking GCSE Mathematics – rather than the other way round.)

Note: This makes the GCSE Statistics entry larger than that for German or Music, and roughly half the size of Physics, or Chemistry or Biology or ICT.

We therefore see considerable potential value in having a GCSE Statistics available for a range of abilities, provided central pressure continues to ensure that it is **not** the main numerate subject studied in Year 11.

2.2 However, there are two features of the design implicit in the draft, which need to be changed.

2.3 The simplest change that is needed concerns **coursework**. Whether candidates are taking GCSE Statistics because they find mathematics easy, or to provide practical support for their numerate development, there is no escaping from the extent to which learning statistics, and assessing that learning, demands a strong practical element.

2.3.1 The requirement seems so clear, that the lack of such an emphasis in both the draft content and in the assessment can only be explained in terms of an understandable, but over-zealous, bureaucratic commitment to assessing solely through exams *wherever possible*.

2.3.2 In the case of GCSE Statistics, both the discipline itself and the educational value which it can offer to students, would seem to demand a specification which presumes, and an assessment regime which incorporates, a suitable coursework component.

2.3.3 In core subjects, we understand the administrative reasons for wanting to control the coursework component of assessment wherever possible. But GCSE Statistics lies outside the EBacc; so there is no reason why its educational and assessment character should be approached *more* dogmatically than other academic, vocational, and arts qualifications that 'supplement' the EBacc subjects within "Progress 8" or "Attainment 8". We suspect that a coursework, or practical, component is fairly common in other qualifications which 'supplement' the EBacc core; so it is hard to see why anyone should try to distort GCSE Statistics by denying it the same opportunity.

2.4 The more serious change that is needed is to urgently subject the draft specification to the scrutiny of an experienced panel of curriculum drafters

(a) to eliminate some of its more undesirable features, and
(b) to consider carefully any essential, but more substantial, changes.

If the draft were the result of a transparent process, one might list a small number of improvements. To do so here would convey the wrong impression – even though some bits made no sense to us (so it is hard to assess the impression of 'overload'; or the misguided bias in favour of 'advanced' methods which will not be understood, at the expense of expecting a robust understanding of basic statistics). What is needed is a thorough and open review.

2.5: The overlap between this specification and that for GCSE Mathematics certainly needs careful thought: some material should definitely appear in both syllabuses, but needs to be given a clearly distinctive flavour in the Statistics syllabus.

Further thought is also needed concerning:

(i) the *exclusion* of some material which would seem to be important (such as the idea of a "null hypothesis"), and

(ii) the *confusion* of key ideas which deserve to be more clearly stated (such as the fact that the highlighted summary in "**A**" (para 8 on page 4) should begin by emphasising the kind of questions, or hypotheses that can be subjected to statistical scrutiny, and that a statistical enquiry needs to identify such a question, or hypothesis, before moving on to consider what data to collect, or how to collect it)

(iii) the *inclusion* of some material, which appears arbitrary, or which is not liable to quantitative analysis at GCSE level, or which cannot really be understood at this level (thereby officially encouraging a "cook-book" approach – which is especially worrying when fundamental ideas are presented in the content draft as things candidates merely need to "know" – with no recognition or indication of their subtlety: see e.g. section E).

The flaw indicated in (iii) pervades the whole specification, where one finds an emphasis on words at the expense of key ideas: (e.g. Is the idea of a *distribution* addressed appropriately anywhere? If so, we missed it.) We realise that part of the challenge of GCSE Statistics is to raise questions that are far more subtle than mere "applied number"; but the draft fails to clarify how the emphasis on language and ideas in pages 3-6 relates to the techniques implicit in pages 6-8.

More worrying still is the blatant attempt to re-frame the whole of statistics teaching in England in terms of "the statistical enquiry cycle" via Appendix 4 of a draft content list, which has never been openly debated, or refined. **This is simply wrong.**

The idea of a "statistical enquiry cycle" can be helpful; but the version concocted in Appendix 4 of the content draft does not appear to have been trialled or refined in any way. The idea has some strengths: e.g. it recognises the need to start with a question or hypothesis. But the proposed form also has major shortcomings: e.g. the "cycle" is never summarised in memorable form – as, for example, in Porkess's four-stage cycle, or in New Zealand's five stage PPDAC [Problem, Plan, Data, Analysis, Conclusion], and the proposed version has a disproportionate emphasis on qualitative presentation at the expense of *analysis*.)

It may be that content and assessment can usefully be framed in such terms – but in the absence of open discussion, professional consensus, trialling, and consequent refinement, nothing is gained (and much may be lost) by replacing familiar criteria by an unfamiliar, opaque, mantra "the statistical enquiry cycle" – especially one which is so elaborated so poorly (in Appendix 4).