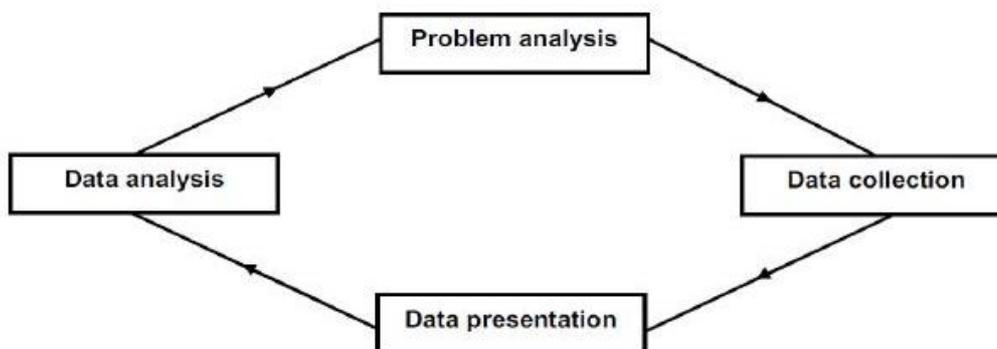


Royal Statistical Society response to the DfE Policy Statement on 16 to 18 Core Mathematics Qualifications in England

Background

1. The Royal Statistical Society (RSS) is both a learned society for statistics and a professional body for statisticians. We are active in a wide range of areas both directly and indirectly relevant to the study and application of statistics. We were first founded as the Statistical Society of London in 1834, and became the Royal Statistical Society by Royal Charter in 1887. There are more than 6000 members of the RSS around the world, of whom some 1500 are professionally qualified as Chartered Statistician.
2. The RSS has experience and understanding of the teaching of statistics both within the UK and internationally. Statistics is fundamentally about information, numerical data, and about applying quantitative skills to real problems. This **statistics cycle** (below) promotes a way of understanding the world that is transferable across a range of subjects and situations. Students analyse a problem to plan their own experiment or statistical approach. They then collect their data, they process or present their data, and they interpret their findings through data analysis.

Diagram: the statistics cycle



3. As we have previously noted in our response to the new KS4 curriculum,¹ GCSE Mathematics will mainly test students on individual data presentation techniques. It continues to do little to assess students' statistical problem-solving abilities. Consequently we fear that the teaching of these skills will be neglected, leaving students without the adequate statistical skills they need for understanding and applying problem solving approaches in many other subjects.

¹ Royal Statistical Society (2013). *RSS response to DfE consultation on reformed GCSE subject content*, 20 August 2013. Available from: <http://www.rss.org.uk/uploadedfiles/userfiles/files/Reformed%20GCSE%20subject%20content%20consultation%20response%20form%20-%20RSS%20response%20-%20FINAL.docx> [Accessed: February 2014]



4. The new proposed Core Mathematics qualifications provide an opportunity to address this deficit, giving young people the chance to become much better at engaging with data. We hope that this opportunity will be recognised in the design of the qualifications, with the full statistics cycle built-in, and appropriate attention being paid to the transferability of numerical problem solving to other subjects.
5. A further big opportunity is to prioritise computing as appropriate technology for delivering Core Mathematics. Computing is an essential tool for interpreting data, and has greatly improved our powers of statistical analysis. Experience of the power of computing will allow students to interrogate and present data more easily, and will support the development of skills for their adult lives. We think that teaching and assessment of data analysis should be encouraged in the technical framework, and that computing should be promoted as an ideal approach to this.

Content and assessment

6. In terms of the content of Core Mathematics qualifications, we welcome the requirement to consult both higher education institutions and employers. The statistics content of Core Mathematics must be up-to-date and relevant to the future lives of the target students, whether in higher education or in work. We consider that it should be made explicit that the Core Mathematics qualifications support the statistics needed in subjects, both non-STEM and STEM, across the AS level and A level curriculum. As we have outlined in our reports *A World Full of Data*² and *The Future of Statistics in our Schools and Colleges*³, there is an increasing need for quantitative skills in both higher education and employment, which the qualifications should help to address. Our interests also include the potential to transfer into AS and A Level Statistics, and into AS and A Level Mathematics.
7. As in the diagram of the statistics cycle above, 16 to 18 year olds need to gain experience of working with data. Assessments that take account of this would markedly increase the teaching of these skills. In contrast to the Expert Panel's report⁴, which recommended a 50:50 split between external and internal assessment, the DfE's Policy Statement favours exams, with a maximum of 20% internal assessment. Our view is that 20% internal assessment, consisting of coursework, should be set as the minimum to better satisfy the practical aspects of learning about statistics, and should be increased up to 50% in line with the expert panel recommendation. We are also keen to explore with exam boards the possibility for innovative external assessments, such as the use of pre-release data sheets. In this case, students would have access in class time to a set of data offered by the exam board, with which they would do some practical work. They would later be externally examined with questions testing their ability to interpret the data under exam conditions. Through internal assessment and more innovative external assessment, we expect that students' understanding of how to analyse a problem, collect data, and analyse data, would improve.

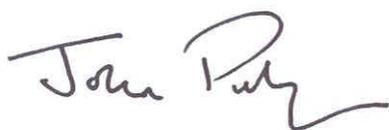
² Porkess, R. & Dudzic, S. (2013). *A world full of data: Statistics opportunities across A-level subjects*. Available from: <http://www.rss.org.uk/uploadedfiles/userfiles/files/A-world-full-of-data.pdf> [Accessed: February 2014]

³ Porkess, R. (2011). *The Future of Statistics in Our Schools and Colleges*. Available from: <https://www.rss.org.uk/uploadedfiles/userfiles/files/The%20Future%20of%20Statistics%20in%20our%20Schools%20and%20Colleges.pdf> [Accessed: February 2014]

⁴ Browne, R., Koenig, J., MacKay, N., Sheldon, N., Silcott, N., & Wake, G. (2013). *Report from the expert panel on core mathematics to the Department for Education*, October 2013. Available from ACME: <https://www.acme-uk.org/media/13699/final%2007october2013.%20expert%20panel%20on%20core%20mathematics%20report.pdf> [Accessed: February 2014]

Piloting

8. The RSS strapline “data, evidence, decisions” reflects that we are strongly in favour of good-quality pilot studies to inform decision-making. There are several aspects of Core Mathematics that we hope will remain open to adjustment based on the findings of the planned pilot study. We are concerned about the timetable and planning for this.
9. Firstly, we hope that during the pilot stage, effort will be made to assess the likely impact of synoptic assessment on participation and drop-out, compared to the modular format that students have previously experienced. Prior to and during the pilot, the route that students take into Core Mathematics should also be made very clear, such as the extent of catch-up support needed for students with no prior experience of higher tier GCSE Mathematics.
10. There is also a clear challenge for teachers. Quantitative skills in the UK need to be addressed in part through Core Mathematics. However as research by the RSS Centre for Statistical Education in 2012 has shown, there is already a challenge for teachers in terms of their skills and confidence to handle the teaching of statistics⁵. Investigation of teacher training and professional development needs should therefore be a further priority during the pilot stage.
11. Finally, we also think that the precise size of the qualification should be finalised after the pilot study. One advantage of a larger qualification (half an A-Level in size) may be the scope to include topics that students did not encounter in the Level 2 GCSE curriculum, such as risk and statistical process control. These were highlighted by ACME in 2011⁶ as important skills for employers. But it is also important that a sufficient number of trained teachers are available to teach to Level 3 standards and with the desired amount of content. ACME’s expert advice was that if Core Mathematics exceeds one third of a A-level in size, it will not be practical for schools in terms of teaching hours. We share their concern, although we hope teachers’ capacity and training can be improved as far as possible. We think that the capacity to deliver a qualification of the size proposed by the DfE should be tested prior to and during the pilot stage.



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⁵ RSSCSE (2012). *Teaching Statistics in British Secondary Schools*, September 2012, Available from: http://www.rsscse.org.uk/images/stories/ts_pedagogy_full_report.pdf [Accessed: February 2014]

⁶ ACME (2011). *Mathematical Needs: The Mathematical Needs of Learners*, June 2011, available from: https://www.acme-uk.org/media/7627/acme_theme_b_final.pdf [Accessed: February 2014]