

**Functional Skills Qualifications (FSQs)
Consultation on Mathematics Content
Response of the London Mathematical Society**

Our comments relate mainly to Level 2 FSQs, and the way they articulate with GCSE Mathematics.

- We welcome moves to organise FSQs, though more work is needed on the details.
- **Background:** We recognise the need to take account of the perceptions of "end-users" (i.e. employers). End-users are perfectly able to register dissatisfaction, and to indicate the areas in which their dissatisfaction lies. But there is no reason to assume that they have expertise in judging how their concerns should be addressed within *general education* – which has to serve a variety of clients and end-users, and has to respect the way mathematics is learned.
- **General concern:** There is a very long tradition in England of imagining that weaknesses in mathematics teaching can be addressed by a naïve, pragmatic focus on "procedures" at the expense of "underlying structure". This runs counter to everything that has emerged from recent exchanges with Europe, with Singapore, and with Shanghai. Maths teaching cannot be improved by embracing some imagined short-cut in place of thoughtful analysis, and careful teaching.
- **Two examples:** All the relevant reports here include mention of "estimation/approximation" and "the ability to work comfortably with fractions, decimals, percentages, and ratios". Yet the resulting proposals make the mistake of imagining that "estimation" does not depend on prior arithmetical fluency; and that there is some magic short-cut to mastery of "fractions, decimals, percentages, and ratio". Such beliefs have accompanied a decline in performance in these areas (e.g. as measured in CSMS/ICCAMS (1979-2010)). This, and what we have learned from Singapore and Shanghai, suggest we need to think again, rather than repeat the old mistakes.
- **General remarks:**
 1. A clear initial statement is needed in the Level 2 content listing to the effect that "Level 2 presumes everything listed in Level 1, *together with the following*:". (We realise that this is implied by the final comment on page 3, but it needs to be stated clearly at the beginning of each fresh section/level.)
 2. We urge caution in seeking to blend *content* (which seems rather limited) with *higher goals* (such as "problem solving").

Level 2 Mathematics

Listed content

We do not know who drafted the current list, or what brief they were given. The list requires significant further consideration (in which we would be happy to assist those with direct experience of this sector). Some examples:

- In **1-11** there is silence over fraction arithmetic (beyond addition and subtraction), even though there is no way to make sense of most of the topics listed without confronting multiplication and division of fractions (something which is even more true of **12-14** – to say nothing of **24**).

- There is no mention of "powers", or of making sense of the base 10 system and its "powers of 10".
- The geometry is especially weak. For example, how can anyone begin to make sense of perimeter, or of 3D (e.g. rigidity and scaffolding) while remaining silent on Pythagoras?
- **18.** As it stands the statement is inadequate: there is no point expecting students to "specify points" without doing something useful – geometrical and graphical – with this skill. Graphs are later assumed when we read the words "conversion graph" in **13**; but no groundwork has been laid.
- There is no requirement under **21-26** for students to "read and interpret tables" – which is the most basic form in which data is likely to be met.

Solving problems and decision making

There is a potentially dangerous mismatch between the current list of content and the rather poorly specified problem solving "methodology". That is, we have a very weak, conservative, content list, combined with a more "progressive" declared methodology. Both need to be thought through more carefully so that they support each other.

We welcome the idea that students are expected to understand and to use what they are taught. But this implies the need to devise a more carefully constructed (and tested) content list, and to adopt a modest, achievable approach to "problems" and to "decision making" (and assessment) that is consistent (a) with the target audience, and (b) with the proposed content list. In the current draft, it is hard to avoid the conclusion that the two parts are at odds with each other – with content poorly constructed and conservative, and methodology over-optimistic and likely to lead to tears. (The dangers are illustrated by earlier English – flawed – attempts to use "Functional mathematics" as a pre-requisite for GCSE Grade C.)